Higher Education, Innovation and Economic Development

2008

A B C D E

Annual World Bank Conference on Development Economics Regional

Higher Education and Development

Edited by
Justin Yifu Lin and
Boris Pleskovic

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1 2 3 4 5 10 09 08

ISBN: 978-0-8213-7123-7
eISBN: 978-0-8213-7124-4
DOI: 10.1596/978-0-8213-7123-7
ISSN: 1020-4407

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About This Book

The Annual World Bank Conference on Development Economics is a forum for discussion and debate of important policy issues facing developing countries. The conferences emphasize the contribution that empirical economic research can make to understanding development processes and to formulating sound development policies. Conference papers are written by researchers and academics in and outside the World Bank. The conference series was started in 1989. Conference papers are reviewed by the editors and are also subject to internal and external peer review. Some papers were revised after the conference, to reflect comments made by discussants or from the floor, while most discussants' comments were not revised. As a result, discussants' comments may refer to elements of the paper that no longer exist in their original form. Participants' affiliations identified in this volume are as of the time of the conference, January 16–17, 2007.

Justin Yifu Lin and Boris Pleskovic edited this volume. As in previous years, the planning and organization of the 2007 conference was a joint effort. Special thanks are due to Alan Gelb for overall guidance. We thank several anonymous reviewers for their comments and Aehyung Kim for her useful suggestions and advice. We also thank the conference coordinator, Leita Jones, whose excellent organizational skills helped ensure a successful conference. Finally for pulling this volume together we thank the editorial staff, especially Stuart Tucker and Mark Ingebretsen from the Office of the Publisher. Book production and dissemination were coordinated by the World Bank Office of the Publisher.

Introduction

JUSTIN YIFU LIN AND BORIS PLESKOVIC

The Annual Bank Conference on Development Economics (ABCDE) is one of the best-known conferences for the presentation and discussion of new knowledge on development. It is an opportunity for many of the world's finest development thinkers to present their ideas. The papers in this volume were presented at the ABCDE that was held on January 16–17, 2007, in Beijing, China. Each year the topics selected for the conference represent either new areas of concern for future research or areas that we believe will benefit from a reexamination.

The topic of the 2007 conference was "Higher Education and Development," which encompassed five themes: higher education and migration, private-public provision of higher education, financing of higher education, technological innovation (linkages between universities and industry), and higher education and labor markets in Asia.

Welcome Addresses

In her welcome address, *Wu Qidi* notes that the exchange of ideas at this ABCDE conference are important for promoting the development of higher education in East Asia, especially in China. She then introduces seven aspects of recent progress in China's higher education. First, China has established the world's largest higher education system by rapidly increasing the enrollment rate during the last decade. Second, the quality of higher education has been improving steadily due to reforms that have modified teaching methods. Third, educational infrastructure, including libraries and teachers' quality, has been consistently improved. Fourth, a breakthrough has been made in reform of the higher education system, including the

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reform of administrative mechanisms giving provincial governments a major role in managing their higher education institutions and in assisting low-income students with financial aid. Fifth, remarkable progress has been made by supporting projects to build world-class universities and research centers. Sixth, the research capacity in science and technology, as well as in humanities and social sciences, has been strengthened. Finally, the international status of higher education has been promoted by establishing educational cooperation and exchange with 178 countries, regions, and international organizations. Qidi concludes that, although the progress has been remarkable, China still confronts many challenges, including the need to devote more resources for higher education.

François Bourguignon states that Regional Bank Conference on Development Economics (RBCDE) is an important event, which has evolved over the years into a major forum for international researchers to focus on development issues in particular regions of the world. He notes that the focus of this conference—higher education and development—is a topic of great importance for the East Asia region and for middle-income countries in general. Bourguignon observes that, at relatively low levels of national development, the focus of educational policy is mostly on primary education, an emphasis embedded in the Millennium Development Goals. He argues that, as development proceeds, economic growth creates demand for workers with higher education, thus shifting the emphasis from primary to both the secondary and tertiary levels, a process that has been reflected in recent educational developments in China. In this regard, he observes that historically the World Bank made its first loan to China a quarter century ago, and it was intended for higher education. Many other World Bank loans for higher education have followed.

Bourguignon notes that, while primary education can be justified easily in terms of the benefits of and costs to society, the issues are much more complex for higher levels of education. Specifically, he lists several issues that require special consideration, such as who should pay for education, how it should be provided (public or private), and how the challenge of the brain drain of highly skilled professionals should be managed.

Keynote Addresses

In his keynote address, *François Bourguignon* discusses three questions. First, he asks whether developing countries are realizing higher returns to higher education, as observed the United States in the 1970s and 1980s. Second, he asks what is causing the trend in returns and whether this is a structural or a transitory phenomenon. Finally, he discusses policy issues that need to be addressed in responding to these trends.

In the United States, the college premium has continued to rise since the late 1970s and 1980s, and several other high-income countries have shown a similar pattern. However, this is a broad trend that is not universal among Organisation for Economic Co-operation and Development (OECD) countries. On the basis of limited data, Bourguignon concludes that the evidence currently available suggests that, in

many countries, the relative return to higher education tended to increase in the 1980s and 1990s. Moreover, the trend appears to be even more consistent in the middle-income countries than in the OECD. He then discusses issues related to the demand for and supply of skills, noting that the literature has tended to show a global trend toward rising demand for skills. But for individual countries, trends in returns to skills depend on a complex, country-specific interaction of supply and demand.

Bourguignon also discusses several issues for governments to consider regarding how best to address rising returns to tertiary education. He identifies three steps: (1) investing public resources for tertiary education efficiently; (2) expanding the pipeline of qualified entrants to tertiary education; and (3) assuring quality of both publicly and privately provided tertiary education. He argues that together this constitutes an agenda for ensuring that the tertiary sector can respond flexibly and efficiently to higher demand for skills. In conclusion, Bourguignon argues that, if the broad trend toward increasing earning differentials between highly educated people and other workers is allowed to continue, income and social inequalities will deepen. He states that it is important to take steps to avoid creating these fundamental inequalities in countries that enjoy rapid growth. He recommends that this can be achieved by the right combination of policies to expand access to tertiary education efficiently and on the basis of merit.

Weifang Min presents the success story of several East Asian countries in achieving dynamic economic growth in the last 40 years. Min argues that many factors can explain the success. Among them are the priority given to industries with comparative advantages, export-oriented policies, policies supporting a free or managed market, relatively high saving and investment rates, and attitudes and work ethics supportive of development. Perhaps even more important, the values and cultural traditions of many East Asian economies attach a high priority to education, which has helped East Asia to produce relatively well-developed human resources and to absorb and apply new scientific and technological inventions relatively easily. These long-standing values and beliefs result in ever-increasing demands for education and have had a significant effect on development. According to the International Monetary Fund, "One lesson from the past is that the economies—such as Japan and South Korea—which committed themselves to education and training made great strides in both human development and economic development." Thus it is a shared belief among East Asian economies that higher education is the key to advancing economic development. However, financing higher education poses a critical challenge. In addressing the financing issue, Min presents analyses of financing patterns for higher education in East Asia and discusses what a country like China may learn from the experience of other East Asian economies.

Alan Winters presents a subject that lies close to the heart of the Global Development Network and the World Bank's Development Economics Vice Presidency: the training and employment of highly skilled labor. Winters argues that the largest single contrast between developed and developing countries lies in the availability and use of highly skilled labor, although it is not the only cause of the differences in their economic, social, and political achievements. However, it seems safe to assert that it is a

major contributor and that successful development will require markets for highly skilled labor that operate with a reasonable degree of social efficiency. He specifies *social* efficiency because there are good reasons to believe that skilled labor creates strong positive externalities, economically (for example, creating opportunities for others to be more productive), socially (delivering services where value exceeds cost or price), and even politically (strengthening institutions by enhancing accountability).

Winters makes four propositions: universities are central to the training of highly skilled labor; the so-called brain circulation is an important topic for research because, whether positive or negative, its effects seem likely to be significant; building capacity to undertake policy research in developing countries is both difficult and important for enhancing development; and because labor is scarce, we should not waste it. The author concludes that highly skilled labor is one of the magic ingredients of development, yet there is much we do not know. The research agenda about how to produce highly skilled labor and allocate it across sectors is challenging.

Higher Education and Migration: Brain Drain and Sharing Skills in the Region

Mark R. Rosenzweig considers a neglected component of the international mobility of skilled individuals: domestic schooling policies and the supply of schooling to the foreign-born in high-income countries. He shows that much of the mobility of international students can be explained by the same factors that cause international migration: the search of workers for better-paying jobs.

Based on new estimates of the global prices of skills, Rosenzweig finds that students out-migrate at greater rates from low-income countries and to host countries with the highest skill prices. However, student outflows also respond directly to domestic investments in higher education. The results indicate that upgrading the quality of higher education reduces student outflows to other countries, but that increasing the number of colleges increases the outflow of students for foreign (postgraduate) training. This phenomenon results from the fact that increasing the number of college graduates increases the population of workers who benefit more from migrating to high skill-price countries.

The most important feature of student mobility is that a large fraction of students schooled abroad return to their home country. This is especially true for students from Asian countries. Rosenzweig finds that return rates of foreign-trained students are lower for low-wage countries. However, such countries have larger domestic populations of foreign-trained graduates, because they export larger numbers of students than high-wage sending countries. Rosenzweig points out that the subsidization of foreign students is disproportionate in high-income countries compared with low-wage countries.

Even though low-income countries appear to be net beneficiaries, he identifies two issues of concern. First, because most foreign students are likely to come from higher-income elites, it is not clear that the best and the brightest from the sending countries

are being educated abroad. Second, because of incomplete data, it is not clear how many students return, and therefore, we lack sufficient evidence to characterize accurately the net brain drain from low-income countries. In conclusion, Rosenzweig states that higher education policies in countries with low skill prices cannot be appropriately formulated without paying attention to the causes of and returns to the out-migration of students seeking higher education and higher-paying jobs.

Private-Public Provision of Higher Education

Daniel C. Levy highlights the contribution of public and private higher education to national development. Higher education rarely remains a single-sector phenomenon, yet most analyses ignore or deal only perfunctorily with private sector provision. Levy departs from that pattern by identifying the principal characteristics of the fast-growing private sector. We need to know how the two sectors contrast and interact.

Levy points out that, for the most part, private and public sectors of higher education are significantly distinct from each other, playing largely contrasting roles for higher education and national development. Rapid for-profit growth is a current and dramatic example of such private-public distinctiveness. Patterns of interaction are quite varied, from conflict and competition to complementarity, emulation, and cooperation, both across and within regions as well as over time. Levy notes that strong empirical reality shows that there is more weight in private-public differences than in private-public similarities. The differences are fundamental in several key aspects of finance, governance, and functions. Levy concludes that the growth of private higher education has shaken up higher education, with the interrelationships between the private and public as well as between each and national development in a state of rapid flux.

Financing Higher Education

Nicholas Barr argues that education faces a collision between fiscal constraints and a need for more resources for investment in all levels of education. Technological change requires more varied and more frequent education and training, and demographic change points to a need for more investment in physical and human capital. However, international competition exerts downward pressure on fiscal capacity, and fiscal pressures are compounded by competing demands connected with aging populations and medical advances. In the face of these pressures, policy makers face a tradeoff between the size of the higher education system, its quality, its capacity to widen access, and its fiscal cost. Student loans can ease the tradeoff by supplementing public funding with private finance. But loans have institutional capacity requirements that frequently receive insufficient weight.

Barr explores policy design, drawing on economic theory and international experience, and also discusses the institutional prerequisites for a loan system to be

implemented effectively. In addition to considering how to locate resources, he discusses how to use resources most effectively; that is, mechanisms through which to allocate them to educational institutions (for example, competitive regime) and to students (loans or grants, needs-based or merit-based transfers). Finally, he explores the instruments that policy makers can use to expand educational opportunities, arguing that the issue is much wider than education finance. Financial measures include savings schemes, government subsidies (for example, "free" tuition), and cost sharing through current charges and student loans. Information measures seek to inform schoolchildren and raise their aspirations. Educational measures include improved early education. Thus an important message is that policy makers should consider higher education policies not in isolation, but from a life-cycle perspective that includes early education—a message very much in accord with those of the 2007 *World Development Report*.

Technological Innovation: Linkages between Universities and Industry

Maryann P. Feldman and Ian I. Stewart examine the relationships among institutions of higher education, innovation, and local economic development. Knowledge is arguably the most important commodity of the modern economy, and universities and other higher education institutions are the primary creators of this currency. One of the new responsibilities of institutions of higher education is to create effective knowledge transfer mechanisms, whether the purpose is to promote social or economic development, to enhance economic competitiveness, or simply to increase the stock of knowledge. The fact that much of the benefit of higher education is captured in a local area is part of the story related to the emergence and genesis of technology-based clusters. Many developing and developed economies attempt to emulate the U.S. experience and to replicate the success of Silicon Valley. The emphasis is typically on leveraging university resources to increase economic growth. The literature concludes, however, that universities are necessary, but not sufficient, for technology-based economic development to occur and that universities typically lag rather than lead economic development by becoming responsive once an entrepreneurial spark has been ignited.

Feldman and Stewart then address the role of institutions of higher education in innovation systems and consider how best to create and enable human capital with the ultimate goal of reaping rewards in terms of wealth creation and higher standards of living. While considerable attention has been paid to the role of research universities, it is more appropriate to consider the entire sector of higher education, which includes the complementary and reinforcing institutions such as liberal arts colleges, institutes of technology, professional schools, community colleges, and continuing education programs. Taken together, these academic institutions provide the basis for the range of skills required for advanced economies and form the fabric of competitive regions. Feldman and Stewart emphasize the different roles and types of higher

education institutions as well as the contribution of each to the innovation system. They conclude by providing a framework for considering the evolving role of institutions of higher education. In addition, they argue that the policy implications of how best to organize higher education in order to create knowledge transfer to sustain innovation and economic growth is an important question for both advanced and developing economies.

Bengt-Åke Lundvall links higher education to economic development and draws policy implications through an analysis of how graduates contribute to innovation and learning. Lundvall refers to recent empirical research and demonstrates that graduates act both as *innovators* and as *equilibrators* in the learning economy. The policy discussion focuses on two questions. First, how can higher education be designed so as to break the vicious circle of stagnating supply of and demand for graduates? Second, how can a general strategy be designed to vitalize national innovation systems that include investment in higher education as an important element? He encourages less developed countries to build universities more strongly rooted in the regional context, a model based on the U.S. land grant colleges, including extension services.

Lundvall also recommends a deep reform of teaching methods by emphasizing problem-based learning, where problems are taken from the domestic reality, as well as integration of local practical experience in study programs. Without reform and with the focus on building universities as national centers of excellence, the major outcome of investments may be further brain drain toward the rich countries. He concludes by arguing that reforms of higher education cannot break vicious cycles on their own. Ambitious national strategies are needed to vitalize the innovation system. Reforming higher education should be seen as a key element of such a strategy.

Higher Education and the Labor Markets in Asia

Pawan Agarwal argues that skill-biased technical changes have created demand for a more qualified workforce. This has put pressure on higher education institutions to expand. Over the last few years, India has witnessed a healthy, but nontraditional, model of growth, with growth in services preceding growth in manufacturing. This growth has been driven primarily by the growth of information technology (IT) and IT-enabled services and skill-intensive manufacturing. The large pool of qualified manpower has helped to fuel this growth, initiating a perpetual cycle requiring even larger numbers of qualified people to sustain it.

With the bulk of the publicly funded higher education system not equipping students with skills required in the labor market, the burden of providing people with requisite skills is on the private institutions. Private institutions emerged amid government ambivalence and produce graduates of uneven quality. The private institutions operate in a dysfunctional regulatory environment that neither maintains quality nor allows them to experiment and innovate.

Agarwal undertakes a sector-by-sector analysis of the education and skills of the existing and projected workforce and matches them with existing and projected demand, concluding that the absolute number of qualified people is adequate, but the mismatch and poor quality of skills are serious concerns. Reorienting the public system of higher education, reforming the regulatory environment for the private sector, and building pathways between the formal and informal systems seem to be the way to make the connection between higher education and job creation. Taking the lessons from experience of other countries and adapting them to the Indian situation, Agarwal suggests various specific institutional mechanisms for better and continued alignment of the higher education and training systems with the labor market in India.

Opening Address

WU QIDI

It gives me great pleasure to welcome you to the Regional Bank Conference on Development Economics. On behalf of the minister of education, I would like to extend my sincere congratulations for the successful opening of this conference.

With the theme of higher education and development, this conference has gathered together a number of prominent economists, researchers, policy makers, education experts, and students to discuss and share their views on topics such as higher education and the exchange of skills and talent, higher education and development, technological innovations, integration of the university and industry, and higher education and the labor market. These discussions and exchanges are important both now and in the future because they will help to promote the development of higher education in East Asia, especially in China.

I would like to take this opportunity to share with you some information on the development of higher education in China. Given the country's sustained and rapid economic development since the end of 1990s, China has made remarkable progress in expanding and improving its system of higher education.

First, as a developing country with a large population, China manages the largest system of higher education in the world. From 1998 to 2005, the number of higher education institutions grew from 1,080 to 5,048, an increase of 4.7 times, and the total number of students enrolled in higher education grew from 8 million to 23 million, an increase of 2.9 times. The growth rate of enrollment in higher education also accelerated from 9.8 to 21 percent. China has entered a period of mass higher education, and these developments have laid a solid foundation for enhancing the quality of China's human resources, for promoting rapid, sustainable, and healthy economic and social development, as well as for supporting reform and development within higher education itself.

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Second, the quality of higher education has improved steadily. The Chinese government considers quality to be the central goal of higher education and is making every effort to balance quality, scale, and outcome. We have initiated and implemented various projects to improve the quality of higher education by reforming and modifying the institutions themselves, the structure of disciplines, and teaching methods. We have also been giving awards for excellence in teaching, developing an outstanding national curriculum, promoting reform of how universities teach English, and assessing undergraduate teaching and the learning process. All of these efforts have energized both teachers and students.

Third, the conditions in China's colleges and universities have improved greatly. By 2005, some 2,273 higher education institutions had been established in China, employing more than 1 million teachers. The quality of teaching has been improving. Funds for teaching materials have grown at an annual average rate of 28.7 percent, and the number of library books has increased 15.1 percent annually. As conditions have improved, higher education institutions have been able to operate more efficiently.

Fourth, breakthroughs have been made in the reform of higher education. Remarkable progress has been achieved in the reform of administrative and financial management. Under the new administrative arrangements, higher education institutions will be managed by a two-tiered system involving both the central and provincial governments, with provincial governments assuming the major role. A number of comprehensive universities have been founded, and this has improved efficiency overall. Great achievements have also been made in personnel and logistics. The policies governing financial assistance and the mechanisms for making financial help available have been improved. Our policy is to offer strong support for students in financial difficulties.

Fifth, remarkable progress has been made in building world-class universities and key disciplines. Implementation of the so-called 985 and 211 projects through the ninth and tenth five-year plans has supported this effort by constructing universities and expanding their offerings. Today, we are meeting in Beijing University, one of the world-class universities created since 1998. These projects not only have built numerous universities but also have cultivated and retained teachers and researchers with higher-level skills. Our goal remains to conduct world-class research in Chinese universities. Much work remains, and we need to exert more effort in that direction.

Sixth, the capacity of higher education to serve the needs of society has been strengthened. Our institutions are building their capacity to conduct research in science and technology, to function as think tanks in the humanities and social sciences, and to develop advanced culture and build a well-off, well-rounded society. We are building universities capable of speaking to both sides: science and technology and the humanities and social sciences.

Seventh, the international status of China's system of higher education has been enhanced by stronger cooperation between China and other countries. China has established educational cooperation and exchange with 178 countries, regions, and international organizations. In addition, China has signed mutual degree accreditation

agreements with 32 countries and various regions, including 26 developed countries such as Austria, France, Germany, and the United Kingdom.

Although remarkable progress has been made, China confronts many difficulties, including insufficient financing, large demand for jobs, growing demand for innovation in science and technology, and shortage of skilled workers.

The Chinese government has paid a great deal of attention to these problems and is making every effort to address them. New projects are being designed to improve higher education even further, and we welcome the suggestions and discussion of experts from other countries.

If higher education institutions in the world were regarded as a big international family, then universities and colleges of each country and region would be family members living in mutual connection and cooperation. I hope that this conference will deepen our cooperation and exchanges, making them more extensive and fruitful. On behalf of the minister of education, I would like to express my heartfelt thanks to the World Bank for its continuous support of China's educational development. Long-term cooperative relationships have been established between the Ministry of Education of China and the World Bank. We look forward to expanding our mutual understanding and strengthening our cooperation in the future, making greater contributions to the development of China's education. I wish the conference great success and everyone good health while they are in China.

Opening Address

FRANÇOIS BOURGUIGNON

I would like to begin by thanking the various partners that have made this conference possible. First, I would like to thank the Global Development Network, with which we coordinated over the last three years so that we could hold our two conferences in the same place and at the same time, maximizing externalities between those two events. I would also like to thank our Chinese hosts, who have provided logistical and financial support for this conference, the large group of supporters from Peking University, and the many other groups whose participation and enthusiasm have made this event possible.

For those of us from the World Bank, this Regional Bank Conference on Development Economics is an important event. It has evolved over the years into a major opportunity for the international research community to focus on development issues of specific relevance in various regions of the world. Its strength lies in bringing together academics from top universities in the world and in the region where the conference is being held. Today, we have participants from no less than a dozen countries, including, of course, a sizable number from East Asia.

The focus of this conference—higher education and development—is a topic of unquestionable importance for this region and for middle-income countries in general. At relatively low levels of national development, education policy is concentrated, although not exclusively, on broadening the access to and improving the quality of primary education, an emphasis embedded in the United Nations Millennium Development Goals, which seek to achieve universal primary education by 2015.

But as development proceeds, economic growth brings with it structural transformation that creates growing demand for workers with increasingly higher levels of education, shifting the emphasis from the primary to the secondary level and, increasingly, the university level, often with quite specialized skill profiles. Much of what

François Bourguignon, at the time of this conference, was senior vice president and chief economist of the World Bank In October 2007 he became director of the Paris School of Economics.

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Minister Wu just said about China illustrates that fantastic transformation and the growing emphasis that has to be put on higher education.

From that point of view, it is quite interesting that—and I learned this today—the World Bank's first loan to China was made exactly 26 years ago, and it was done for higher education. Before entering this room, Minister Wu told me about the various World Bank loans for higher education that have benefited China. So, from that point of view, a conference on higher education that is organized by the World Bank and held in Beijing is a natural fit.

But while the move across educational levels may seem a natural progression for the development process, the transition raises difficult and often vexing questions for policy makers. While primary education can easily be justified for the benefits and basic opportunities it generates for individuals, as well as the broader gains to society from a literate population, the issues become much more complex with higher levels of education. Issues such as who should pay for education, how it should be provided, and how the challenge of the brain drain from higher-skilled occupations should be managed all require special consideration.

The sessions and keynote speeches that have been organized for this conference are intended to shed some light on these difficult issues. Topics that address how to organize the higher education sector will focus on the financing of higher education and the challenges and opportunities of getting public and private education providers to work together. The role of skills migration and whether it leads to brain drain or, as we say today, "brain circulation," will also be considered. How best to organize higher education institutions to support innovation will be considered in another session. And, finally, the role of labor markets and institutions in facilitating or, in some cases, hindering the accumulation and use of higher education will be examined.

We are beginning a two-day conference on an extremely important topic. We have assembled a diverse group of experts to help us to understand the options in the field of higher education. I expect that we will learn a great deal from one another over the next two days.

Without further fanfare, let me again welcome you all to this Regional Bank Conference on Development Economics. I look forward to our collective engagement during this time together.

Keynote Address

Skilled Labor and the International Economy: Whence It Comes, Whither It Goes

L. ALAN WINTERS

This brief note deals with a subject that lies close to the hearts of the Global Development Network and the World Bank's Development Economic Vice Presidency: the training and employment of highly skilled labor. Arguably the largest single contrast between developed and developing countries lies in the availability and use of highly skilled labor. One might not want to argue that it is the only cause of the differences in their economic, social, and political outcomes, but it clearly is a major contributor, and successful development will require markets for highly skilled labor that operate with a reasonable degree of social efficiency. I specify *social* efficiency because there are good reasons to believe that skilled labor creates strong positive externalities, economically (for example, creating opportunities for others to be more productive), socially (delivering services whose value exceeds their cost or price), and even politically (strengthening institutions, improving debate, and enhancing accountability).

This note advances four simple assertions, which are simple to make, if not to implement or achieve:

- Universities are central to the training of highly skilled labor.
- The so-called brain circulation is an important topic for research because, whether positive or negative, its effects are likely to be large.
- Building capacity to undertake policy research in developing countries is both difficult and important for enhancing development.
- Since labor is scarce and productive, we should not waste it.

L. Alan Winters was director of the Development Research Group, the World Bank. He is now professor of economics in the University of Sussex, UK. This note is based on a speech given to the joint dinner of the Global Development Network's Eighth Annual Conference and the World Bank's Regional Conference on Development Economics, January 17, 2007, Beijing. The author is grateful to Shahid Yusuf for comments and to Audrey Kitson-Walters and Nina Cunanan for logistical help.

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I do not offer detailed analysis of these propositions, still less assemble a large body of empirical evidence in their favor, but I hope to offer enough justification to persuade readers that they deserve thought and further research attention.

The Centrality of Universities

It is tautological to define universities as central to the creation of highly skilled labor if we define "highly skilled" as having a particular level of undergraduate study, a postgraduate degree, or a certificate issued by a university.[1] I want to go beyond tautology and recognize that other routes to high skills are conceivable and, indeed, necessary for some skills; even so, it is plain that almost every highly skilled worker builds on his or her university education. If a country's universities are closed or short of staff and facilities and if they cannot be substituted for by universities abroad, the level of *practical* skills within that country is bound to decline.

Initially, universities were almost exclusively training institutions for high-level professions, especially the church and the law. Their extension to sciences and engineering, which on current views represent the apex of the pyramid of high skills, was a nineteenth-century phenomenon, led by people such as Humboldt (see Yusuf and Nabeshima 2006: chap. 1). From around 1980, however, development theory and practice turned against supporting universities as a means to development in low-income countries and in favor of boosting primary and, more recently, secondary school enrollment. At the time, this attitude seemed well justified in terms of equity: universities were the preserve of the (currently) rich, and the unit costs of university education were high, whereas primary education would help to unlock the capacities of all. Moreover, since primary education was necessary for students to advance to secondary and tertiary levels, extending the former's enrollment would enhance the benefits of the latter by increasing the pool from which they could draw. Secondary enrollment was later justified as a necessary step to obtaining tertiary education for some and as a key to improving manufacturing productivity.

As we enter the twenty-first century, however, the earlier stages of education are generally starting to show stronger enrollment, and the emphasis in economic performance is increasingly on the quality of education, skills, innovation, and flexibility (Hanushek and Woessmann 2007). As a result, it is now widely accepted that the neglect of universities has been allowed to go too far Developing countries are seeking to boost their universities and to define their role in promoting development (see, for example, Hershberg, Nabeshima, and Yusuf 2007, which deals with university-industry linkages in Asia and a similar project under way in the World Bank for Africa). Moreover, in many cases the impetus is as much from the private as from the public sector.

Nowhere is progress faster than in India and China, where expenditure, university formation, and student enrollment are all booming. In India, the number of colleges and universities has increased from around 5,000 to 12,000 since 1990; there are now 3 million graduates per year, of whom 400,000 are engineers (United Nations Educational, Scientific, and Cultural Organization, UNESCO). In China,

between 1997 and 2005, the number of 'regular' higher education institutions nearly doubled to 1792 , and admissions to all tertiary institutions quintupled from about 1.1 million to 5.7 million. Admissions to post-graduate degree courses numbers 365 thousand. Of nearly a million first degree students in 2003, over half studied science and engineering subjects. (All these statistics are from Li and others 2008.)

These numbers are staggering and seem to suggest that India and China will shortly swamp the global market for graduates and engineers. But, in fact, that is not true. First, both countries are faced with rapidly rising domestic demand. In India, experienced software engineers and managers more generally are beginning to command salaries on the same order of magnitude as in the United States and, especially, Europe. In China, the demand for skills in general management, teaching, and public administration is strong enough to absorb all of the graduates produced well into the future (Winters and Yusuf 2007).

Second, there are questions about quality. Both India and China have some excellent institutions of learning, but they also have many very weak ones, with poor curricula, poor standards, and weak links between learning outcomes and qualifications granted. The McKinsey Institute (2005) argues that only 25 percent of Indian and 10 percent of Chinese engineering graduates have the skills required to work at their nominal skill level in an international company. Some of this reflects language difficulties and immobility for noneconomic reasons, but much reflects weak curricula, inadequately trained and motivated teaching staff, and the lack of effective measures for enforcing quality.

Thus, while increasing global supply will presumably constrain the rates of return to tertiary education somewhat, they are likely to remain high enough to warrant more training efforts and expenditure in both developed and developing countries well into the current century (see, for example, Freeman 2006).

The Brain Drain Warrants More Research

Creating a stock of highly skilled labor is not the same as keeping and using it, and these are the issues I turn to now. Highly skilled workers are highly mobile, both nationally and internationally. They generally provide services that their host communities want (for example, medicine) or that create better jobs for locals (for example, engineering design), and they face fewer challenges in integrating into these communities. Highly skilled workers generally have the means to move, being less prone to liquidity constraints, and greater ability to find jobs outside their home country because, compared with less-skilled workers, they have better networks and their jobs are more frequently subject to advertising and explicit qualifications.

We do not know yet whether—or, perhaps more precisely, under which circumstances—the loss of highly skilled labor (the brain drain) is detrimental or beneficial. Strong arguments have been made on both sides of this debate, and the answer is almost certainly context specific. Commander, Kangasniemi, and Winters (2004) offer one of several surveys that have been undertaken, and I do not repeat the arguments here. I just want to make two separate points that have long fascinated me.

First, given that there are economies of agglomeration in use of the most highly skilled labor, I hypothesize that a threefold classification of countries is significant. India and China have, respectively, the third and sixth largest overseas diasporas of skilled labor (graduate level and above) in the world (Docquier and Marfouk 2005). The others in the top six are, in declining size, the United Kingdom, the Philippines, Mexico, and Germany. However, as a percentage of all graduates, the émigrés account for 4.3 percent for India and 3.8 percent for China. Provided that there is not huge positive selection (that is, that not only the very brightest leave), these are probably manageable proportions. In other words, India and China are probably large enough that no plausible amount of emigration to developed countries will undermine their ability to create viable agglomerations of skills. Brain drain could still raise issues about who pays for training, but the effects are essentially marginal.

Now consider, say, Jamaica and Guyana, where 85 and 89 percent, respectively, of nationals (defined as having been born there) with degrees reside abroad. The provision of high-level services may suffer in these economies, but realistically they are so small that efficiently sized agglomerations of high skills probably would never emerge. Again, there may be losses on the margin, but it is plausible that the only efficient thing for Guyanese high-fliers to do is to relocate abroad, even in terms of social efficiency.[2] Finally, consider, say, Ghana (population 22 million) or Mozambique (19 million). These economies might aspire to agglomerations of skills in certain sectors, and the brain drain—47 and 45 percent, respectively, of all national degree holders reside abroad—may prevent them from emerging. In these middle-size economies, the effect of the brain drain might not be marginal—that is, it might induce a different type of equilibrium.

This hypothesis applies, if at all, to the highest levels of skill. At lower levels of graduate attainment, agglomeration economies are probably less strong but still positive, and so brain drain concerns may arise for smaller countries. Mauritius (population 1.5 million) is said to have difficulty transitioning to a more knowledge-intensive economic structure because of the shortage of skills. Even in the provision of primary health care, there may be some agglomeration effects in terms of learning and peer groups, which seem a priori to have constant returns to scale above a very low threshold core.

The second point I want to make is that the possibility of migration may affect the propensity to become highly skilled and hence the stock of highly skilled workers remaining in a country. This was first observed formally in the "beneficial brain drain" literature stemming from Mountford (1997). Migration raises the return to education. If, starting from zero, the probability of a skilled person migrating increases to p, the expected returns to education increase by pD, where D is the difference in skilled labor earnings at home and abroad. If this increases the proportion obtaining education by q, the number of people with education in the home economy will increase if $(1 + q) > (1 - p)$, that is, if more people start to obtain an education at home than leave.

Several conditions are required for this argument to apply—for example, that training places are not rationed as they often are for, say, doctors (that is, that education numbers can actually increase) and that p applies equally to anyone who gets

educated (see Commander, Kangasniemi, and Winters 2004). The latter condition essentially means that overseas employers do not screen out the people who took education *only* because the possibility of migration had been introduced. If, as seems possible, the brightest would have found it worthwhile to get educated anyway, whereas the "second division" required the incentives of extra rewards to make it worthwhile, this amounts to saying that overseas employers cannot or do not screen by ability. My recent work with colleagues suggests that screening and the apparent insensitivity of education decisions to migration make the beneficial brain drain unlikely to apply to doctors (Kangasniemi, Winters, and Commander 2004), whereas for information technology specialists, the hypothesis seems quite plausible (Commander and others 2008).

A further wrinkle is that the beneficial brain drain can operate in reverse. McKenzie and Rapoport (2006) have shown that the opportunity to migrate to the United States to do an *unskilled* job is reducing secondary school enrollment among Mexican males. Giles and de Brauw (2006) have identified the same phenomenon in rural-urban internal migration in China.

Building Capacity for Policy Research

This section is more parochial than the rest of the paper. It is predicated on the assertion—I would like to say "fact"—that developing countries, especially the poorest, would benefit from greater capacity to analyze policy options in a rigorous, research-based fashion, especially in the areas of economic and social policy. Building such capacity is, in my opinion, the most important of the Global Development Network's objectives, and it is shared by the World Bank.

Policy research capacity entails more than just tertiary education.[3] It requires highly skilled researchers and experienced project managers, incentives for policy to be subjected to rigorous high-quality analysis, and the existence of institutions that can provide the environment and tools for research and provide continuity so that the whole enterprise does not collapse if a single individual leaves.

The problem is that policy research suffers from weak market incentives and sometimes from market failures in the classical sense. Thus there is a public good element to policy research: why not just let someone else do it? In addition, the international publishability and kudos of policy research often fall short of those of theory, methodology, and tests of apparently universal hypotheses; developing countries often cannot generate the volume of policy research needed to make developing tools and institutions to simplify it seem worthwhile; the return on policy research is also uncertain and difficult to pin down; governments are sometimes hostile to independent research; and successful researchers are often bid away by the private sector or by government so that institutions and cultures of policy research never take root. There is nothing wrong with talented people working in the private sector or in government—indeed, we should encourage it—but society also benefits from the presence of an established independent research capacity.

How should we tackle these weaknesses? The market failures suggest that there is a case for public support, so this is partly a matter of how institutions like the Global Development Network and the World Bank should spend their money. A necessary input is training and longer-term mentoring of policy researchers in developing countries: not just degrees and general research skills, but also training oriented toward the intricacies of real policy. The provision of tools is important, too, such as access to library facilities, data, and analytical tools with which to carry out relatively standard analyses. Nearly all researchers draw on networks of peers, partly for support (validation that what they do is worthwhile), partly for advice and support on approaches, and partly as stimuli and competition (which is uncomfortable at times but nearly always constructive). It is also important to give researchers individual incentives for good work. Researchers rarely seek riches, but relatively small rewards can greatly increase their motivation and also their self-esteem and status within society. Finally, supporters of capacity building must recognize the importance of institutions: supporting their development, being prepared to pay some part of their overhead, and sticking with them over difficult patches.

This shopping list is formidable. It is clearly expensive and long term, and it requires a great deal of judgment, confidence, patience, and resilience on the part of the donors. It requires far more than the research support budgets of the Global Development Network and the World Bank but is, I believe, very worthwhile indeed. It is a call to international donors to approach capacity building in consistent and determined ways, which we have seen in the past (see the example in SIDA 2006), but on a broader front than heretofore.

Making Efficient Use of Skilled Labor

René Descartes said, "It is not enough to have a good mind; the main thing is to use it well." So it is for countries. The previous sections deal essentially with the supply of highly skilled labor. This final section deals with demand. It urges us not to waste the skilled labor that we have.

One possible problem in the market for highly skilled labor is a lack of demand: people obtain skills but find no productive use for them. It has been a criticism of many developing countries in the past that their productive structures and methods of production generate too few skilled jobs. This can be the case particularly after periods of conflict and destruction. The problem may be manifest in brain waste (people not using the skills they have), brain drain (people leaving), or unemployment. An unemployed elite can pose serious problems for political stability as well as simple waste.

The solutions to deficient demand will vary from country to country, but they will include allowing wages to clear the market (that is, labor market flexibility) even if this discourages the acquisition of skills, ensuring the realistic pricing of tertiary education (which presumably will discourage the acquisition of at least some skills), relaxing the barriers to the creation of firms and entrepreneurship of either a bureaucratic (regulatory) or economic (for example, access to finance) nature, encouraging demand for certain services associated with externalities (for example, the provision of health

or education services), providing integrated training to meet the needs of specific industries, as the Japanese and Koreans did, and altering university courses to foster problem solving and innovation (see Bengt-Åke Lundvall's paper in this volume).

The main problem I want to address, however, is the obverse one: excessive demand for highly skilled labor for activities with low social returns (which could, of course, coexist with deficient demand in other sectors). I illustrate this with examples from two areas.

First, the aid business. Rajan and Subramanian (2005) have argued from macro data that aid flows harm growth by bidding up the price of skilled labor. I do not find their results wholly convincing, but there is quite enough direct evidence of the burden that donor engagement places on poor countries' analytical capacity to corroborate the dangers for skilled labor markets. For example, the fragmentation of aid flows, which is manifestly increasing (World Bank 2007), means that Tanzania's government prepares about 2,000 documents for donors and receives more than 1,000 donor delegations each year (World Bank 2004). In some African countries, senior policy makers spend half or more of their time dealing with donors and international financial institutions (World Bank 2000). This is compared with the interpretation of surveys conducted by private sector firms, which generally hold that managements that spend 10 percent or more of their time dealing with governments are being unduly distracted from their proper functions. Not only does aid distract government officials, but it also diverts them into tasks whose priority may seem obvious to donors, but not to anyone else. In Kenya a World Bank agricultural project paid eight local staff $3,000 to $6,000 per month, compared with the $250 per month that senior economists could earn in the civil service. Of 20 Kenyan economists receiving a master's degree from a donor-funded program over 1977–85, 15 were working for aid agencies or nongovernmental organizations by 1994 (World Bank 2004). Doubtless many did useful work, but the cost to Kenya's ability to analyze and implement policy seems very high.

The Paris Declaration of March 2005 aimed to improve the delivery of aid in many of these sorts of dimensions. To quantify its challenges and as a start toward measuring its impact, its authors (the OECD's Development Assistance Committee) undertook a baseline survey in 2006. This suggested, for example, that less than a quarter of aid missions were conducted jointly by more than one donor. It also found that donors had established 1,767 parallel implementation units (World Bank 2007). And as the wider aid community, including nongovernmental organizations and foundations, becomes ever more enamored of vertical funds (for example, for acquired immunodeficiency syndrome, tuberculosis, primary education), the situation seems likely to worsen rather than improve.

The second area in which I feel we waste scarce resources is one I know better: the trading system. Trade negotiations are very complex, but given their sensitivity domestically and the apparent power of the World Trade Organization (WTO) to impose its rules on the governments of small countries, governments take them very seriously. Thus if they do not trust their partners to respect their interests and realistically recognize that the WTO Secretariat cannot do so, they feel obliged to devote considerable resources to monitoring negotiations. A typical WTO week in Geneva has about fifty

committee meetings. At the Hong Kong Ministerial Meeting in December 2005, the delegation of the European Union was said to number 832 people, that of the United States 356, and that of Japan 229 (World Development Movement Press Release, December 14, 2005). The World Development Movement bemoaned the asymmetry of the situation, which found, say, three Burundians trying to keep track of these hoards, and I agree. But is it better to be Uganda (with a population four times that of Burundi), which sent 66 people? Is this really an optimal use of the delegates' time and attention, even if all of their other costs are paid for by donors?

Even worse, in my opinion, is the effort that goes into negotiating regional trading arrangements. Prominent at the moment is the European Union initiative to negotiate economic partnership agreements with the Africa, Caribbean, and Pacific states, but think of the effort that has gone into the Free Trade Area of the Americas. On the whole, such regional arrangements offer developing countries very little and the world trading system less, and yet they are complex and detailed.[4] I have never managed to persuade any government to estimate the direct costs of engaging in these negotiations (staff time and travel), let alone the indirect ones of political and bureaucratic distraction. Yet even a passing acquaintance with their duration and complexity suggests that the costs could be huge.

Moreover, not only do negotiations absorb skilled policy capacity, but their outcome does as well. The Uruguay Round imposed on developing countries technical and health standards administration, customs valuation requirements, and a complex intellectual property regime, plus the need for increased regulatory oversight if services were to be liberalized. The donor community and economists also urge developing countries to integrate themselves more firmly in the operation of the trading system: do more at the WTO, make more use of dispute settlement, have greater participation in international standards bodies such as Codex Alimentarius to ensure that developing-country views are represented, and so forth. All of these absorb skilled labor but are rather bureaucratic in nature. If the best use of highly skilled labor is to send it to meetings in Geneva, we ought to ask how we came to make the environment so hostile for developing countries.

In Winters (2001a) I make several suggestions to try to arrest and reverse this waste of resources. Predictably, they have had no effect. Here, with so many economists collected together, let me try another tack. As policy-focused economists, we are the principal beneficiaries of these make-work schemes: they bid up our rates. If we said "enough," we might be heard.[5] There would still be plenty of work for us to do, even if some of it were less glamorous (customs reform, say, instead of flying to Geneva), and it would probably be more useful.

Conclusion

Highly skilled labor is one of the magic ingredients of development, yet there is much we do not know about it or how to manage it. The research agenda about how to produce it and allocate it across space is large and challenging, but in the meantime, I can safely assert that we should not waste it.

Notes

1. I have a fairly broad definition of university in mind here that would include tertiary institutions such as the grand écoles in France, even though they are formally separate from that country's university system.
2. There is hardly any point in being the only nuclear physicist in Guyana.
3. This section draws on an unpublished note prepared by my colleague Bernard Hoekman on behalf of the Development Research Group in the World Bank.
4. I believe the limited value of economic partnership agreements was plain from the start. Indeed, it was implicit in the European Union's own green paper on post-Lomé trading arrangements (European Commission 1997). Winters (2001b), written in 1987–88, summarizes my views and counterproposal. History has done nothing to change my mind.
5. G. H. Hardy is reported to have said, "If the Archbishop of Canterbury declares that he believes in God, that is all in the way of business, but if he declares that he does not, we may take it that he means what he says."

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Keynote Address

Global Returns to Higher Education: Trends, Drivers, and Policy Responses

FRANÇOIS BOURGUIGNON AND F. HALSEY ROGERS

A lesson of basic economics is that understanding markets requires paying attention to both quantities and prices. Prices serve as a market signal about the costs of producing goods and services and possibly also about the relative scarcity of those goods and services. Thus analyzing the evolution of prices should reveal something about the evolution of technology and the tension between supply and demand.

The higher education market is no exception. Much of the analysis of higher education in developing countries focuses on quantity—the share of the cohort going on to tertiary education—and sometimes also on the costs to the government or consumers of expanding that share. But equally important are the returns to higher education, which represent the relative price of the skills that come with tertiary education. Their level depends on the costs of higher education, but in disequilibrium the returns also rise or fall as gaps emerge or close between the supply of and demand for highly educated workers. These prices can provide essential signals of these tensions.

This paper investigates three questions. First, do we see any common global trend (especially across the developing world) toward higher returns to higher education, as we saw in the United States in the 1970s and 1980s? If so, what is causing the trends in returns and is the trend likely to be structural or transitory? Finally, what policy issues have to be considered in responding to these trends, in particular to ensure that the supply of workers with a tertiary education can adjust upward?

Trends in Returns

This section brings together recent evidence on changes in the returns to tertiary education and reveals a widespread trend toward a widening wage premium for a university education. A word of caution is in order, however. Because of a lack of good

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Annual World Bank Conference on Development Economics 2008, Regional

trend data for a large number of countries, this conclusion is necessarily somewhat speculative. The same is true, only more so, for the answers to the other questions addressed below. The goal of this paper is to provoke discussion about trends; we do not expect full agreement on the diagnosis, let alone the prognosis.

In thinking about trends in returns, it is useful to have the following basic framework in mind:

$$\log w_i = r_P{}^*P_i + r_S{}^*S_i + r_H{}^*H_i + \text{other variables}, \tag{1}$$

On the left-hand side, this equation has the log of earnings of an individual *i* in the population of wage earners. On the right-hand side, in this very simple formulation, there are three dummy variables, *P*, *S*, and *H*, which represent primary, secondary, and higher education, respectively. The coefficients associated with the variables, r_P, r_S, and r_H, are the marginal returns to primary, secondary, and higher education. The question, then, is how earnings depend on those three levels of education, once we have controlled for other variables that influence the earnings of an individual: his or her age, the city, area, or region of a country in which he or she lives, and so on.

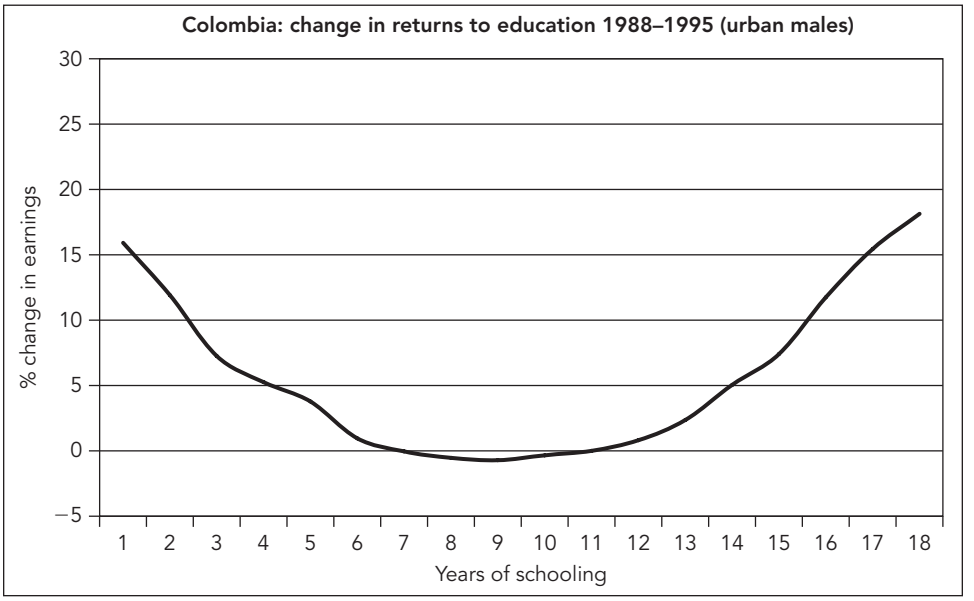
The marginal return to higher education, in this equation, is defined by r_H. That parameter represents exactly how much a university graduate earns on average (controlling for other characteristics), when compared to individuals with only a secondary school degree. This is the definition of "returns" used in this paper. (Note that it is not the usual Mincerian specification, where each year of schooling is assumed to yield the same return.) When the labor market is at equilibrium, this r_H should be high enough to compensate the student for the costs of attending university—both the opportunity costs of the forgone earnings that the student would have obtained by going directly to the labor market and, of course, all of the direct private costs of higher education.

A slightly more sophisticated specification of this equation would replace the variables *P*, *S*, and *H* with the number of years of education the worker has completed at the respective level of the educational system. In that case, the coefficients r_P, r_S, r_H would represent the rates of return corresponding to each year of study at these different levels of education.[1]

This equation allows us to better formulate the question of the trend in returns to higher education: how is this r_H coefficient changing over time? To answer this question, we draw on analyses that have been carried out in many different countries. Let us start with two examples from our own research that illustrate what we have in mind.

The first case is from Indonesia. Alatas and Bourguignon (2005) analyze the evolution of income distribution in that country, and part of the analysis relies on assessing the change in the earnings function in that country. One of the drivers of the change was the r_H coefficient. Between 1980 and 1996, during the era of very rapid growth before the financial crisis struck in 1997, the return to getting a university degree—again, compared with a secondary degree only—rose from 40 to 60 percent. As there was no clear sign in this period of an increase in the cost of tertiary education, a natural conclusion in that the rapid-growth era led to a shortage of tortiary-educated workers and increased substantially the relative return to higher education.

FIGURE 1
Returns to Education for Urban Males in Colombia, 1988–95



Source: Vélez and others (2005).

The second example, taken from the same volume, examines the case of Colombia (Vélez and others 2005; see figure 1). The interpretation here is somewhat different: rather than seeing the r_H from the Indonesian case, we instead have the change in labor market returns by years of education between 1988 and 1995. The horizontal axis gives the number of years of schooling, while the vertical axis represents the change between 1988 and 1995 in the earnings corresponding to each number of years of schooling, once we have controlled for other explanatory variables.

The U-shape of this curve means that, during this period, both primary school graduates (on the left) and higher education graduates (on the right) gained relative to secondary school graduates, who are exactly in the middle of the distribution. By comparing the right-hand part of this parabola with the middle portion, we see that the return r_H rose 15 to 20 percent between 1988 and 1995.

In these two countries, then, there has been an increase in the return to higher education in the recent period. These examples also illustrate the importance of being precise about the period we are examining. In the case of Colombia, for example, if instead of looking at the 1988–95 period, we look at the preceding decade, we would see not a U-shaped curve but a downward-sloping one. In that earlier period, in other words, the relative return to higher education declined. Thus the timing of the analysis is very important.

Does this pattern of increasing returns generalize to other countries? Table 1 summarizes the results of a number of studies that have analyzed trends in returns to higher education.

In the case of the United States, the increase in the college wage premium has been the subject of extensive research. The literature burgeoned in the 1990s, as

TABLE 1. Trends in Relative Returns to Tertiary Education in Developing Countries during the 1980s and 1990s

Region and country	Trend in relative returns to tertiary education, 1980s–90s[a]	Source
Developing and transition economies		
Latin America		
Argentina	Increase	De Ferranti and others (2003)
Bolivia	Increase	De Ferranti and others (2003)
Brazil (urban)	Increase	De Ferranti and others (2003)
Brazil	Increase	Arabsheibani, Carneiro, and Henley (2006)
Chile	Flat	De Ferranti and others (2003)
Colombia	Increase	De Ferranti and others (2003); Vélez and others (2005); Blom and Hansen (2002)
Mexico	Increase	De Ferranti and others (2003); Legovini, Bouillón, and Lustig (2005); López-Acevedo (2001)
Venezuela	Flat	Patrinos and Sakellariou (2004)
East Asia		
China	Increase	Li (2003)
China-Taipei	Increase	Bourguignon, Fournier, and Gurgand (2005)
China-Taipei	Flat	Vere (2005)
Indonesia	Increase	Alatas and Bourguignon (2005)
Eastern Europe		
Czech Rep.	Increase	Chase (1998); Munich, Svejnar, and Terrell (2005)
Russia	Increase	Gorodnichenko and Sabirianova Peter (2005)
Slovakia	Increase	Chase (1998)
Ukraine	Increase	Gorodnichenko and Sabirianova Peter (2005)
High-income economies (OECD)		
Australia	Flat	Malagen (1994)[b]; Borland and others (2000)[b]
Austria	Decrease	Brunello, Comi, and Lucifora (2000); Fersterer and Winter-Ebmer (2003)
Denmark	Increase	Brunello, Comi, and Lucifora (2000)
Finland	Flat	Brunello, Comi, and Lucifora (2000)
France	Flat	Brunello, Comi, and Lucifora (2000)
Germany	Flat	Brunello, Comi, and Lucifora (2000)
Greece	Decrease (1980s), increase (1990s)	Tsaklogou and Cholezas (2005)[b]
Italy	Increase	Brunello, Comi, and Lucifora (2000)
Netherlands	Flat	Brunello, Comi, and Lucifora (2000)
Norway (1980s)	Flat	Hoegeland, Klette, and Salvanes (1999)
Portugal	Increase	Cardoso (2004)[b]
Sweden (1980s)	Decrease	Palme and Wright (1998)
Sweden (1990s)	Increase	Gustavsson (2004)[b]
Switzerland	Increase	Brunello, Comi, and Lucifora (2000)
United Kingdom	Increase	Brunello, Comi, and Lucifora (2000)
United States	Increase	Fortin (2006)

a. Refers to tertiary returns relative to returns to secondary education.

b. As cited in Machin and McNally (2007). These works are not included in the reference list. See Machin and McNally (2007) for the full citations.

researchers tried to explain the rapid increase in the premium in the late 1970s and throughout the 1980s. Since then, the college premium has continued to rise in the United States, and several other high-income countries have shown a similar pattern. While this is a broad trend, table 1 shows that it is not universal among Organisation for Economic Co-operation and Development (OECD) countries. In Austria, both the relative and the absolute returns to higher education decreased during the 1980s and 1990s. There is some evidence that the same happened in both Greece and Sweden in the 1980s, although in Sweden the largest declines in returns apparently took place in the previous decade.[2] Below, we return to a possible explanation for these exceptions to the trend of rising relative returns.

In the case of middle-income countries, information on trends in the college wage premium is most abundant for Latin America, thanks in large part to a recent flagship publication by the World Bank's Latin America division (de Ferranti and others 2003). Table 1 shows that in several Latin American countries—Argentina, Bolivia, Brazil, Colombia, and Mexico—the relative rate of return to higher education rose in recent years. Again, this trend was not universal: in Chile and Venezuela, relative returns were stagnant, for reasons explored below.

In East Asia, the college premium appears to be rising in China, as might be expected in the wake of that country's economic transition. In an examination of trends in China-Taipei, the evidence is mixed: Bourguignon, Fournier, and Gurgand (2005) found that returns rose from the 1980s up through the mid-1990s, although a study incorporating more recent data suggests that the widening of the premium has stopped (Vere 2005). A third East Asian case is Indonesia, where, as noted, relative returns grew substantially during the 1980s and first half of the 1990s.

Finally, the relative returns to higher education have increased substantially in some countries in Eastern Europe and the former Soviet Union, probably in part because the economic transition in the region stimulated the demand for skills.

Unfortunately, we lack estimates of trends for most other developing countries, often because of the dearth of consistent time-series data on tertiary returns. Clearly there is much more to learn. We would like to know, in particular, whether returns are also increasing in low-income countries. Nevertheless, the evidence currently available suggests that in many countries the relative returns to higher education tended to increase in the 1980s and 1990s. Furthermore, based on this limited evidence, the trend appears to be even more consistent in the middle-income countries than in the OECD.

Drivers of Higher Returns

What is driving the increase in the college wage premium across many countries? There are two main possibilities. The first is that the costs of providing a tertiary education have risen relative to the costs of providing a secondary education. The second is that in many countries the demand for tertiary skills has grown faster than their supply, so their price—the relative salaries of college-educated workers—has been bid up. In this section, we argue that increasing relative costs are unlikely to be

the explanation; the remainder of the paper therefore focuses on the second possibility, the disequilibrium between demand and supply.

Whether this disequilibrium is transitory and self-equilibrating or more permanent is a crucial issue for education policy. If it is transitory, then higher college wage premiums are a signal that elicits greater investment in higher education and leads to a more productive society in the long run. But if rigidities in the education system or economy sustain the disequilibrium for an extended period of time, higher premiums will have the effect of exacerbating inequalities without inducing a beneficial supply-side response.

Do Rising Costs of Tertiary Education Explain the Increasing College Wage Premium?

Directly assessing the first possibility for a large number of countries is difficult, particularly in the case of developing and transition economies. For example, a major task force convened by the World Bank several years ago to analyze higher education in developing countries had little to say about the costs of higher education, other than to bemoan the "lack of data on education costs" at the tertiary level (World Bank 2000).

But there are reasons to doubt that the costs of higher education have increased dramatically relative to the costs of secondary education. One factor that could spur rising tertiary costs is Baumol's cost disease (Baumol 1967): if productivity in the economy as a whole is rising, relative costs will increase in any sector that does not make significant productivity gains. Because the technology of tertiary education appears at first blush to have changed little in recent decades, we might expect real costs of tertiary education to rise. However, given that secondary education suffers from sluggish productivity growth for the same reasons, this factor is unlikely to have raised the real *relative* costs of tertiary education.

Even if the relative costs of providing a tertiary education have not risen sharply, the relative costs paid by the student and his or her family could have. For this story to be correct, there would have to have been a widespread shifting of costs from the public sector onto households, either through an increase in the enrollment share of private universities or through higher tuition and fees at public universities. Data from the OECD are mixed on this question. While the private share of direct higher education expenses was stable in a majority of OECD countries between the early 1990s and 2003, several, including Australia, Canada, Italy, and Mexico, among others, saw the private share increase by more than 10 percentage points (Karkkainnen 2006). We do not know of similar estimates covering a wide sample of developing and transition countries. But a public-to-private demand shift of this order of magnitude is not large enough to explain the increases in college wage premium observed in many of the countries listed in Table 1.[3]

Consequently, it appears that the main driver is an imbalance between demand and supply, with the increase in college wage premium reflecting a growing gap between the two, as argued for the United States by Goldin and Katz (2007). Either

demand for skilled and educated workers has increased very rapidly—much more rapidly than supply, that is—or else supply has stagnated.

Why the Drivers Matter for Policy

Understanding the sources of higher returns is crucial, not only for predicting future trends, but also for designing policy. On the demand side, there is considerable evidence (discussed below) that the demand for skilled labor is rising for technical reasons, either because the skill requirements of production processes within given sectors are rising or because the economy is shifting toward sectors of production that make greater use of skilled labor. Assuming that demand will continue to shift, then any adjustment that might reduce the college wage premium will probably have to take place on the supply side of the market. This supply side is the focus of the remainder of this paper.

Depending on the dynamics of the supply response, either of two cases could hold sway. The first is the *self-equilibrating* case: in the face of imbalances between demand and supply that are raising the returns to higher education, we might expect a surge in the supply of skilled workers as students or workers try to take advantage of those higher returns. This case has several implications. First, the key features of the current disequilibrium situation—the trend toward higher returns to tertiary education and the widening inequality between skilled and unskilled workers (or highly skilled and less highly skilled workers)—should prove to be temporary. Second, if the demand is governed by increases or changes in technical factors, the rapid supply response will allow the economy as a whole to take advantage of the increase in productivity that lies behind the increase in demand for skills. Third, if highly skilled people have positive externalities that benefit less skilled people, then this case may be consistent with a rapid growth path for the economy.

The second, less encouraging, case might be called the *growth-limiting* equilibrium. Assume instead that the response by the supply side is weak—for example, because of restrictions on the growth of the tertiary sector—so that few workers are able to take advantage of the outward shift in demand by earning those higher-skill returns. In this case, the initial increase in inequality may prove permanent, and economic growth may stagnate.

Clearly, making good policy will depend on understanding which of these cases applies in a given context. Are the high college wage premiums structural or merely transitory? If the increase in returns is expected to persist only temporarily until a robust tertiary sector has time to respond by increasing supply, then no further government response may be necessary. But if the growth-limiting case applies, a more vigorous role for government may be necessary.

The Race between Demand for and Supply of Skills

What is the evidence on those drivers of higher returns? A large number of studies have been done on the OECD countries, starting with the United States. As noted,

this literature has tended to show a global trend toward rising demand for skills. But within individual countries, trends in returns to skills depend on a complex and country-specific interaction of supply and demand. On the demand side, some shifts are linked to technological change, while others are linked to changes in the central structure of those economies. To see how these shifts affect returns, of course, we have to take into account supply features that are linked to the functioning of the university system and its capacity to respond to changes in prices. This capacity is highly context specific, which may explain why the same general global trend toward rising demand for skills has different consequences in different countries.

And, of course, the functioning of the labor market itself and the country's labor market policies are important. A recent paper by Card and DiNardo (2002) challenges the widely held view that the changes in the skills gap are best explained by skills-biased technical change. Instead, they stress the effects of the drop in the relative value of the minimum wage; according to this view, the increase in returns to higher education primarily would reflect changes not at the top but at the bottom of the distribution.

Nevertheless, the preponderance of the literature suggests that if the supply of tertiary-educated people were held constant, then in most countries the relative returns to tertiary education would be rising. A recent reexamination of the evidence by Autor, Katz, and Kearney (2005) reaffirms the view that skill-biased technical change is responsible for observed shifts in wage distribution, including increases in the college wage premium.

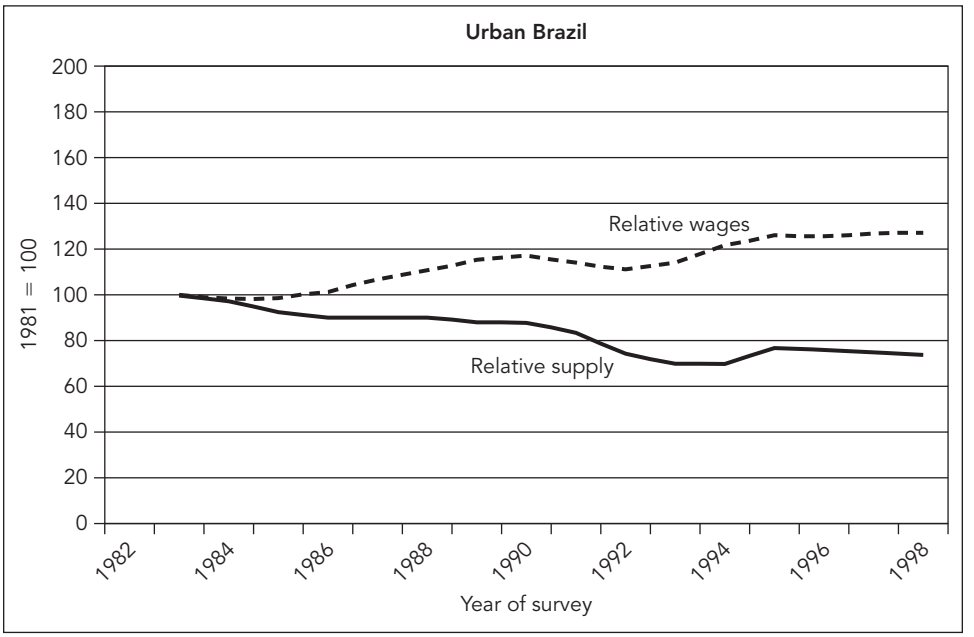
Although no such sophisticated analysis of the demand side is available for most developing countries, several good studies have focused on the supply side. Two cases from Latin America—Brazil and Chile—suffice to illustrate how diverging patterns of supply response can lead to widely different changes in wages.

Figure 2 shows the evolution of relative supply of and wages for highly skilled workers in Brazil since the 1960s. Specifically, the relative wage is the wage for workers with higher education relative to the wage for those with only secondary education, while relative supply is the number of people in the labor force with higher education versus the number of people in the labor force with only secondary education.

Relative wages of highly skilled workers rose substantially in the 1980s and 1990s in Brazil, while the relative supply of those workers declined. In Brazil, therefore, increases in the college wage premium seem to have been caused not by strong growth in demand but rather by slow growth in the relative supply of skills. As a consequence, we would expect the rise in relative wages to be accompanied by relatively low growth rates in the economy, which is exactly what occurred in Brazil. This is consistent with the view that a major constraint on the Brazilian economy over the last three or four decades has been some sluggishness in the evolution of the supply of highly educated workers.

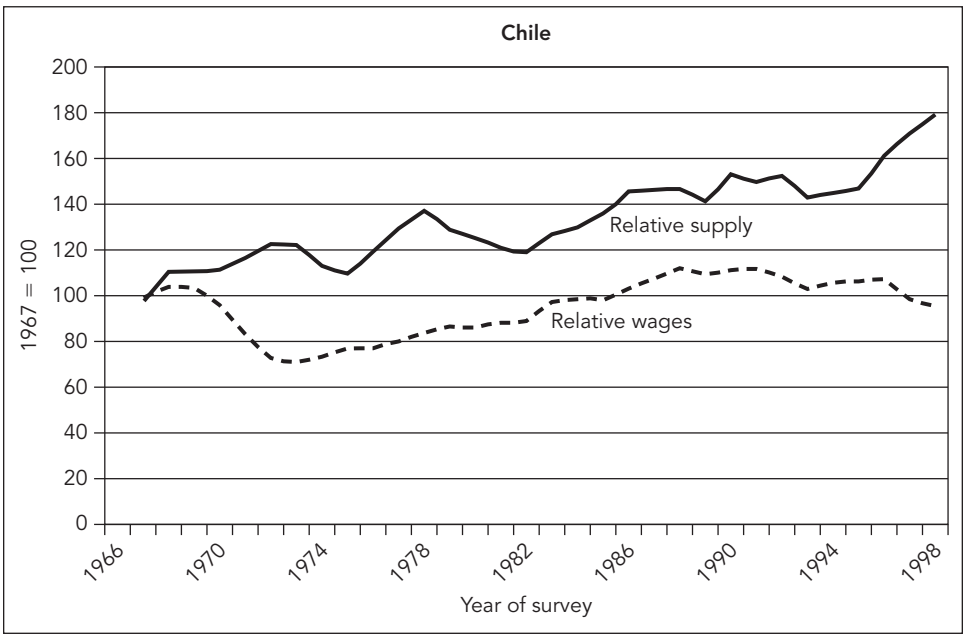
The Chilean case tells a very different story (see figure 3). As the demand for skills has grown rapidly in Chile, the relative supply of highly educated workers has also shot up. As a result, the wage of university-educated workers relative to that of secondary-educated workers has changed little over the past four decades. In Chile a strong surge in supply—whether in response to the demand for skills or as an

FIGURE 2
Relative Supply and Relative Wages of University Graduates in Urban Brazil, 1982–98



Source: De Ferranti and others (2003).

FIGURE 3
Relative Supply and Relative Wages of University Graduates in Chile, 1966–98



Source: De Ferranti and others (2003).

autonomous increase in supply—prevented a big increase in relative wages from taking place and may have permitted faster growth.[4]

What do we learn from the Brazilian and Chilean cases? First, although the global tendency has been for relative tertiary returns to increase over the past two decades, the country-specific trends are just that—very country specific. Flat or even declining premiums in a particular country do not necessarily signify that the demand-side drivers of higher returns are not operating in that country. A second point—a corollary of the first—is that the drivers of returns vary across countries, but that the supply side of the higher education market is an important determinant of returns.

Policy Issues

Given this brief analysis, how can policy makers in developing countries best respond to rising returns to tertiary education? Because of the country specificity of both diagnosis and prognosis, and the paucity of evidence on the drivers of returns in particular developing countries, we cannot lay out a concrete set of policy prescriptions. Instead, we identify several issues for governments to consider as they respond.

If we accept the hypothesis of global skill-biased technical change, then the appropriate response to increases in returns to higher education is to focus on the supply side. The policy objective of increasing the supply of skills would not be to drive down the returns to tertiary education.[5] Instead, governments should aim to respond appropriately to the forces for higher productivity and growth that lie behind this rising college premium. From an economic perspective, rising returns mean that higher education skills are becoming more productive, and so the rational response—the response that improves economic efficiency and accelerates economic growth—is to increase the supply of highly educated people. Doing so entails three steps: investing public resources for tertiary education efficiently; expanding the pipeline of qualified entrants into tertiary schools; and assuring quality of both publicly and privately provided tertiary education. Together, they constitute an agenda for ensuring that the tertiary sector can respond flexibly and efficiently to higher demand for skills.

Investing Efficiently in Tertiary Education

If the tertiary education system is functioning well and is able to expand without additional government action, then no further policy response may be necessary. In that case, over time, as the supply of tertiary graduates increases, the differential in earnings will progressively be reduced. By contrast, if the tertiary education sector is unable to train enough graduates efficiently, then other responses may be necessary. The most straightforward policy response might be to increase government funding for higher education. A recent analysis by Fortin (2006) shows that within the United States the college wage premium increased most rapidly in the 1990s in those states where public expenditures on higher education were the lowest in the 1980s. This

result supports the view that government funding for higher education is indeed both an important determinant of wage premiums and a way to take advantage of the productivity gains that lie behind rising premiums. Other OECD examples in table 1 are also suggestive of the role played by government spending in increasing supply. Austria and Sweden, which saw decreasing returns in either the 1980s or 1990s, were two of the three European Union (EU) countries with the highest public spending per student on tertiary education in 1997. According to de la Fuente and Jimeno (2005), Austria spent 42 percent of GDP per capita for each tertiary student, and Sweden spent 58 percent, compared with the EU average of 34 percent. In the case of Norway, too, Hoegeland, Klette, and Salvanes (1999) credit a "remarkable expansion of the Norwegian educational system" with having kept the college wage premium from rising in the face of growing demand for skills in the 1980s.

These OECD results are suggestive. To design policy for developing countries, however, will require not only carrying out comparable assessments for those countries but also, crucially, identifying the most efficient ways of spending government money. Developing and transition nations face much tighter resource constraints than OECD countries and so can ill afford to waste resources in an attempt to meet the growing demand for skills. Using these resources efficiently will require answering several sets of questions:

- One key issue is the *selection* challenge. How can we ensure that, in subsidizing the higher education system, we are attracting the most talented students from all strata of society, not just students who have gone through some kind of social screening process? Efficient use of public resources requires spending them on the right students.
- A second issue is *internal efficiency*. How do we provide education to any given set of students as efficiently as possible? In answering this question, it is not only the relative wage premium for tertiary graduates (relative to secondary graduates, that is) that matters. Once we begin to discuss the use of public funds, the issue of absolute returns to public spending becomes important. We have to take into account such issues as the public costs of education, the size of any externalities, and the likelihood of brain drain of highly skilled workers. We have to look at the production function for education and eliminate any inefficiencies.
- The third issue is the *structure of financing*. What is the optimal combination of tuition fees, scholarships, and loans? The answer depends, in part, on how much the social returns to tertiary education differs from the private returns for the student. But it also depends on such factors as the risk tolerance of students from low-income families. Even if expected private returns are high, the student may not be willing to bear the risk of borrowing for his education, and society may have an interest in subsidizing his enrollment for distributional reasons.

These are just a few examples of the efficiency considerations that must be taken into account when governments respond to the signal of rising returns by subsidizing tertiary education.

Expanding the Pipeline of Students

In the case of low- and middle-income countries, thinking about higher education policies should lead us inevitably back to the secondary education system. Without an increase in access to and quality of the secondary schools that produce candidates for tertiary schools, it will not be possible to take full advantage of the productivity gains signaled by the higher college wage premium.

This policy thrust may initially have results that seem counterproductive. If we start by investing more in secondary education, the university wage premium is likely to increase initially, simply because the supply of workers with secondary education will increase relative to the supply of those with a university education. Only in the second stage, when more of those secondary school graduates attain a university degree (and assuming again that access to tertiary education is meritocratic), will it be possible to exploit the productivity differential signaled by higher college premiums. To borrow an analogy from international trade, we might expect this policy to lead to an inverse J-curve in the university wage premium—an increase over the first few years, but then a decrease over the longer run.

Ensuring Quality

A final important issue concerns the regulation of tertiary education. In some countries where we have observed a large increase in the returns to higher education, we have seen a simultaneous increase in the number of private providers of higher education. Those providers have done well financially, in the sense that they have created profitable businesses. And under the right conditions, growth of the private sector may be an effective way of meeting the increased demand for skills, so opening up opportunities for that growth is an important policy response.

But liberalization of the sector must go hand in hand with effective regulation. Too often, graduates of these new tertiary institutions earn less than the graduates of more established universities do. This gap may simply reflect the lower quality of the students matriculating at the new private universities, but it may also reflect poor educational quality. If prospective students have poor information about the quality of the education or if the state provides significant financing for these private schools, then there will be good arguments for having a government role in ensuring quality or certifying higher education institutions. Note that the response is not likely to be for the state to reassert its former role as the sole provider of tertiary education, but instead for it to take on more effectively its new role as regulator of the sector. This step may be necessary to increase the likelihood that scarce resources for tertiary education are being well used.[6]

A Caveat: Coping with Brain Drain

Our discussion has implicitly assumed that the market for skills is closed. That is, we have assumed that, while the sources of increased demand could be international—for example, if greater import competition in product markets increases the efficiency of domestic firms—the domestic supply of and demand for skills are what determine the

equilibrium wage for skilled labor. But international migration could also contribute to the rising college wage premium in middle-income countries. If there is growing international mobility of highly skilled labor, then the returns to higher education within a particular country will reflect that mobility. If skilled workers in China or India can more easily get higher-paying jobs in the United States or Europe, for example, then those workers will need to be offered comparably high wages at home to persuade them not to emigrate. In that case, rising relative returns in developing countries (though not in developed countries) could be explained by a supply effect—with the brain drain, the supply of skilled labor has shifted up and is horizontal at the international wage for skilled labor.

In this case, assessing policy options is more complicated. The supply side may respond by increasing the number of skilled workers, but if the sending country is small relative to world supply and demand, then this supply response will have no effect on the wage differential. If we accept theories of the type presented in this volume by Frédéric Docquier, then it is possible that this "brain circulation" might even have some elements favorable for growth. But given the complexity of analyzing this situation, the welfare implications will be even more ambiguous than in the case of a closed labor market. This example underlines the need for careful country-specific analysis of the drivers of college premiums and the extent of the supply response.

Conclusions

The race between education and technology—to borrow the title of Goldin and Katz's (2007) analysis of U.S. education wage premiums—is a race that developing-country education systems can ill afford to lose. The processes generating changes in the returns to higher education are complex, but it is essential that we understand and respond to them. If the broad trend toward increasing earnings differentials between highly educated people and other workers is allowed to continue unabated, income and social inequalities will deepen, translating inevitably into greater inequality of opportunities for children of the current generation of workers. It is crucial that we take steps to avoid creating these fundamental inequalities in countries that are enjoying rapid growth. With the right combination of policies to expand access to tertiary education efficiently and meritocratically, we have the opportunity to increase growth while at the same time improving equity.

Notes

1. This formulation too would miss some nuances. For example, assuming implicitly that each year of education at a given level has the same labor market returns assumes away any "sheepskin effects" that give a larger return for completing the final year of education at any level (see, for example, Jaeger and Page 1996).
2. An earlier paper by Edin and Holmlund (1995) finds a slight increase in relative returns to university education in the middle to late 1980s, but concurs in finding a sharp decline through the early 1980s.

3. In the Indonesian case, making the extreme assumption that the rate of return to private education is at most double that of public education, a 10 percentage point increase in the share of the private sector would at most cause a 4 percentage point increase in the average rate of return instead of the ZQ points actually observed.
4. Figure 3 is not obviously consistent with the view that growing international mobility of labor has helped to drive the increase in returns to highly skilled workers. Careful analysis of this hypothesis would require further evidence, however.
5. Indeed, this may be impossible, to the extent that the returns are governed by the international price of skilled labor; see below for a brief discussion of the effects of migration.
6. For a discussion of quality assurance and other government roles in the tertiary sector, see World Bank (2002, chap. 4).

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Keynote Address

Higher Education Financing in East Asia: Policy Implications for China

WEIFANG MIN

In the past 40 years, East Asia has had among the most dynamic economies in the world, developing more rapidly and more consistently than any other region. In the early 1990s, the World Bank called it "the East Asian Success Story" (World Bank 1993). After suffering a severe economic crisis in the late 1990s, the region recovered quickly and resumed its impressive growth.

There are many factors and explanations for the success, including policies giving priority to industries with comparative advantages, policies promoting exports, policies supporting a free or a managed market, relatively high saving and investment rates, a strong and purposeful state, and attitudes and work ethics supportive of development. Similarly important, or perhaps more important, the values and cultural traditions of many East Asian countries attach high priority to education, which has helped to develop East Asia's human resources and enabled scientific and technological inventions to be absorbed and applied relatively easily. Confucianism is only one of the cultural traditions in the region that emphasize education in the development process. The ancient classics include sayings such as "To develop a nation-state, education should come first" and "A man without education cannot be a moral and knowledgeable man" (Min 2004). These long-standing values and beliefs have placed ever-increasing demands on education and had a significant impact on development. Confucianism has exerted an influence not only in China, Taiwan District, and Hong Kong District, but also in Japan, the Republic of Korea, and Singapore. Many studies have analyzed the strong relationship between economic development and education in East Asia (Adams 2002). As the World Bank (1991) comments, "One lesson from the past is that the economies—such as Japan and South Korea—which committed themselves to education and training made great strides in both human development and economic development."

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Annual World Bank Conference on Development Economics 2008, Regional

Along with economic growth and the move from low-technology, labor-intensive production to more technologically sophisticated and higher-value production, East Asian economies experienced a broad expansion in education, starting with primary education and moving through to secondary education and even higher education. Well-educated populations, traditions of scholarship, and a deep respect for learning are part of virtually every East Asian economy. Since the 1990s, higher education has become even more central, forming an essential part of the knowledge economy and competitiveness for the future (Altbach 2004).

Since financing is a central issue in higher education development, and the financial constraints on higher education are becoming greater in China as well as worldwide, this presentation seeks to analyze the financing of higher education in East Asia and to draw some policy implications for China. The rest of the paper is divided into two parts: the first one analyzes the financing of higher education in the East Asian region in general, while the second discusses what China might borrow from other East Asian economies.

The Financing of Higher Education in East Asia

East Asia is a highly diversified region, including the highly developed economy of Japan; the newly industrialized economies such as Korea, Taiwan District, Hong Kong District, and Singapore, followed by Malaysia and Thailand; developing economies such as the Philippines and Indonesia; and transitional economies such as China, Vietnam, Laos, and Cambodia. Different countries have different historical influences. To a certain extent, Korea, Taiwan District, and Indonesia were influenced by Japan, either from colonial times or through trade relations. Hong Kong, Singapore, and Malaysia were influenced by the United Kingdom from the colonial period. The Philippines and some other East Asian economies were influenced by the United States either through the colonial period or through the American presence in the region following World War II. China, Vietnam, and Laos were influenced by the previous Soviet model in the period of a centrally planned economy. Cultural traditions in East Asia are also diversified. Some countries are more or less influenced by Confucian thinking, some countries have an Islamic cultural tradition, and still others have Western religious influences such as Catholicism or Christianity.

Because of the diverse cultures, historical heritage, social systems, and levels of economic development, it is difficult to identify a uniform model for financing higher education that is suitable for all East Asian economies. Nevertheless, compared with some other regions in the world, East Asian economies, such as Japan, Korea, Taiwan District, the Philippines, and Indonesia, share some common patterns, as shown in table 1. In these countries, the proportion of students enrolled in higher education in the private sector is much larger, while the government expenditure on higher education is much lower, than in the European and North American countries.

Even if government allocations for higher education are low in some East Asian economies, total expenditures on and enrollment in higher education are quite high, because individual families spend more on their children's education (see table 2).

TABLE 1. Higher Education Enrollment and Finance, by Region

	Enrollment		Financing patterns	
Region	**Public**	**Private**	**Government**	**Families**
Europe	100 percent	Few	High	Low
North America	70 percent	30 percent	High	High
East Asia[a]	20 percent	80 percent	Low	High

Source: Kaneko (2006); OECD (2005).

a. For East Asia, the OECD data set only has data for Japan and Korea. Data for Taiwan District are also available.

TABLE 2. Total Higher Education Expenditure as a Percent of GDP, by Region, 2001

Regions	Governmental expenditure	Nongovernmental expenditure	Total[a]
North America			
Canada	1.5	1.0	2.5
United States	0.9	1.8	2.7
Europe			
United Kingdom	0.8	0.3	1.1
France	1.0	0.1	1.1
Germany	1.0	0.1	1.1
East Asia			
Japan	0.5	0.6	1.1
Korea, Rep. of	0.4	2.3	2.7

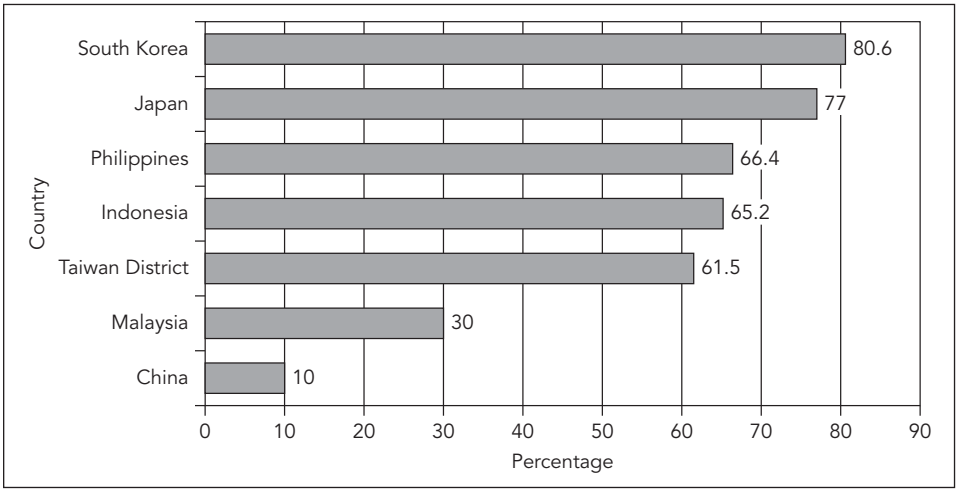
Source: OECD (2004).

a. Expenditures per student include research expenditures.

The government allocations for higher education are higher in Hong Kong District, Singapore, and Malaysia than in other East Asian economies, probably due to the colonial influence of the United Kingdom. The willingness of families to share the costs of higher education by paying tuition and fees is quite strong. This might be due to the belief that higher education is one of the best ways to achieve upward social mobility, especially intergenerational social mobility in which the family benefits by improving the economic and social status of the children.

Cost sharing in many East Asian economies takes the form of enrollment in private institutions (Altbach 1999; Umakoshi 2004). Private education has thrived because the public sector has been unable to meet the demand. Although national universities in Japan, Korea, the Philippines, and some other East Asian economies have served as the core of the higher education system, the market-oriented private sector has led the expansion of enrollment in East Asia (Umakoshi 2004). In Korea in 2004, the government only spent about 0.4 percent of GDP on higher education (compared with 1.5 percent in Canada, 0.9 percent in the United States, and about 1.0 percent in European countries), but the gross enrollment rate was above 80 percent (see figure 1). In China private institutions grew quite rapidly after the country

FIGURE 1
Private Education's Share of Total Enrollment in Higher Education Institutions in Select East Asian Economies



Source: Author's calculations, based on data synthesized from the web sites of World Bank, Asia-Pacific Economic Cooperation, UNESCO, and OECD, 2000–06.

shifted from a centrally planned economy to a dynamic market economy and officially adopted the law to promote *min-ban* (private) education in December 2002 (National People's Congress of China 2002).

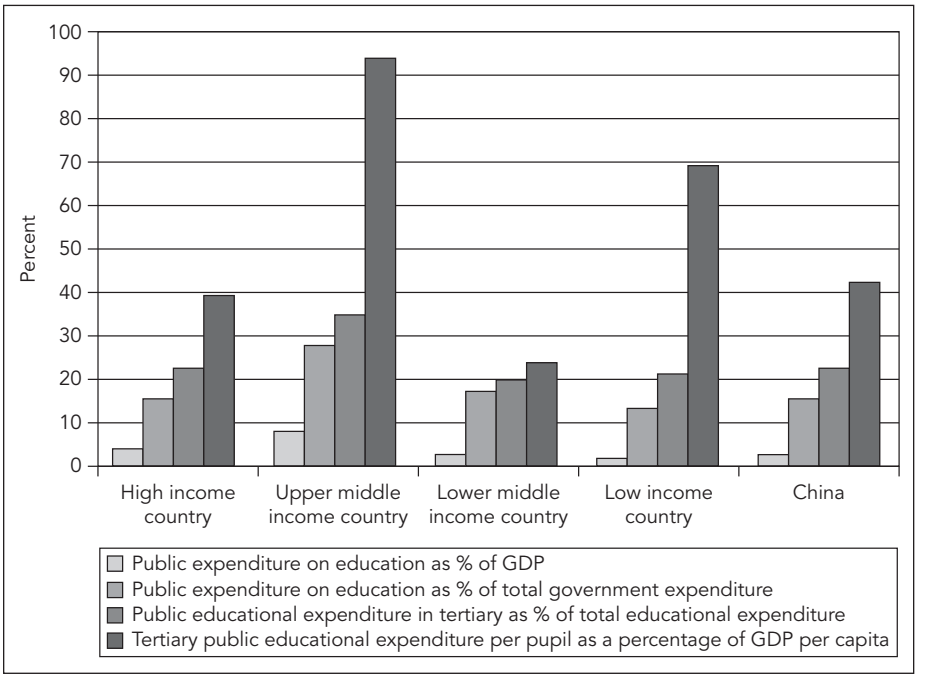
When East Asian economies are divided into four groups by income level, the level of government spending for education in every case is lower than the world average, even for the high-income economies, indicating that individual families bear the bulk of higher education costs, as shown in figure 2. The upper-middle-income group in the region only has one economy—Malaysia—with a high level of public spending on education.

In looking at three major indicators of public finance for higher education (public expenditure as a percentage of GDP, enrollment rate, and proportion of students in the private sector), the rates of China are significantly lower than those of Japan, Korea, or the Philippines, as demonstrated in figure 3.

Although China's total spending on education as a percentage of GDP is lower than both the world and regional averages, its spending on higher education as a percentage of GDP (0.6 percent in 2005) is relatively higher than that of some other East Asian economies, such as Japan (0.5 percent in 2004) and Korea (0.4 percent in 2004). China spends a relatively larger share on higher education than Japan, Korea, and the Philippines, especially since 1999, when the Chinese government decided to spend more on higher education, as shown in figure 4.

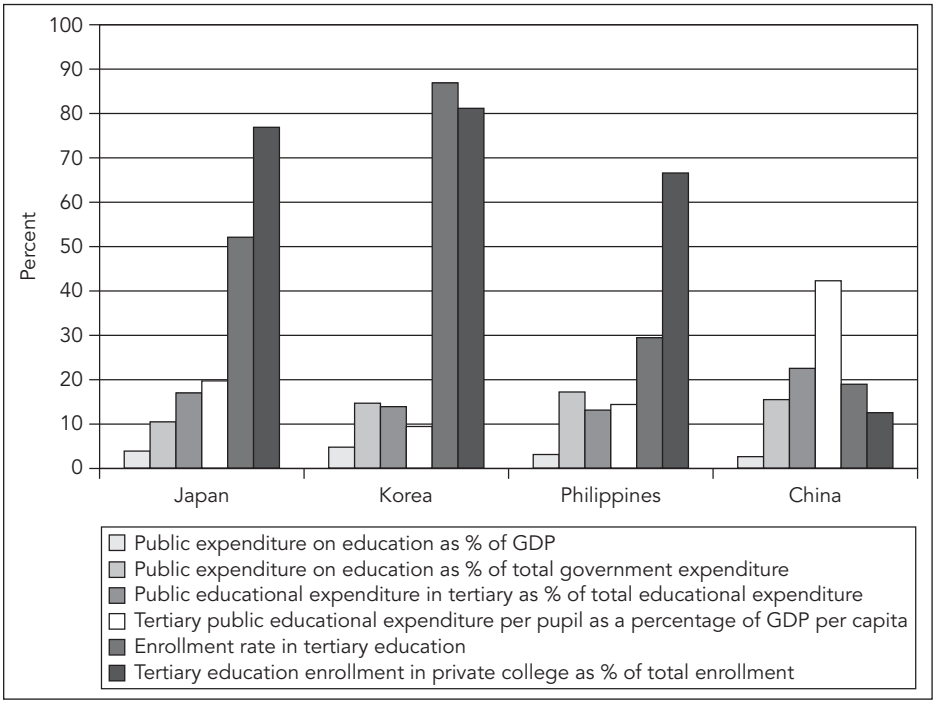
The trends in public expenditure per student on higher education as a percent of GDP per capita show that China spends a much higher share per student than the other three East Asian economies. This indicates that (a) China's GDP per capita is lower than that of the other three economies, and that (b) China's use of resources is relatively inefficient because of the legacy of the centrally planned system, and the fact that current reforms are still under way. However, spending per student declined

FIGURE 2
Higher Education Finance in East Asia, by Level of Income



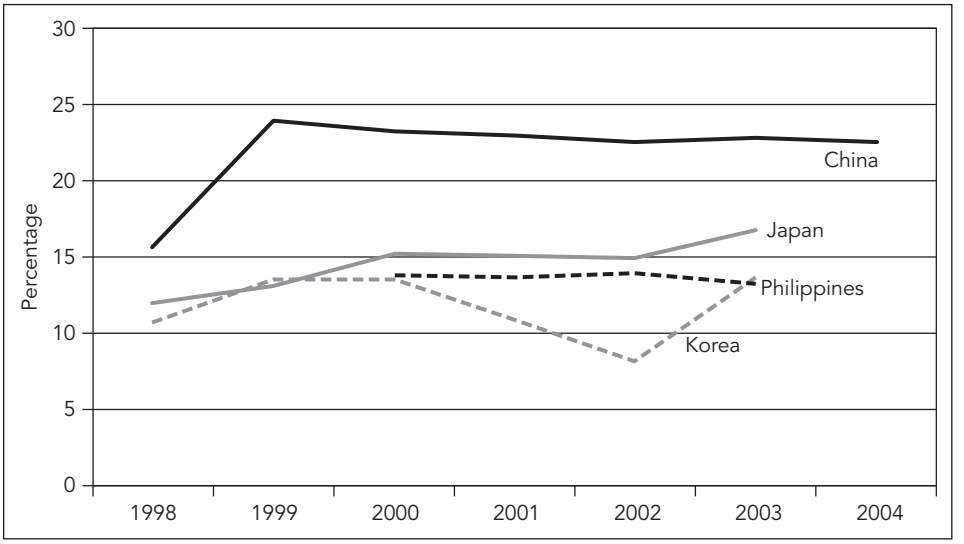
Source: Author's calculations based on data synthesized from the web sites of the World Bank, Asia-Pacific Economic Cooperation, UNESCO, and OECD, 2000–06.

FIGURE 3
Higher Education Finance in Select East Asian Countries



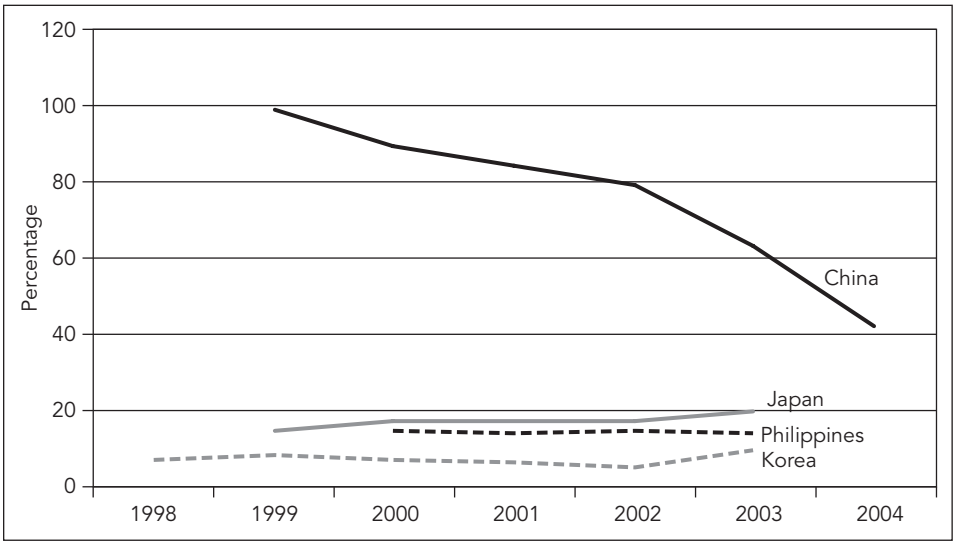
Source: Author's calculations based on data synthesized from the web sites of the World Bank, Asia-Pacific Economic Cooperation, UNESCO, and OECD, 2000–06.

FIGURE 4
Higher Education Expenditure as a Percent of Total Education Spending in Select East Asian Countries, 1998–2004



Source: Author's calculations based on data synthesized from the web sites of the World Bank, Asia-Pacific Economic Cooperation, UNESCO, and OECD, 2000–06.

FIGURE 5
Public Expenditure per Student on Higher Education as a Percent of GDP per Capita in Select East Asian Countries, 1998–2004



Source: Author's calculations based on data synthesized from the web sites of the World Bank, Asia-Pacific Economic Cooperation, UNESCO, and OECD, 2000–06.

sharply beginning in 1999, when the dramatic expansion of Chinese higher education took place. This probably occurred as a result of (a) improvements in the efficiency of resource use as the educational reforms deepened and enrollment expanded and (b) the increase in China's GDP per capita, which lowered expenditure per student as a share of GDP, as shown in figure 5.

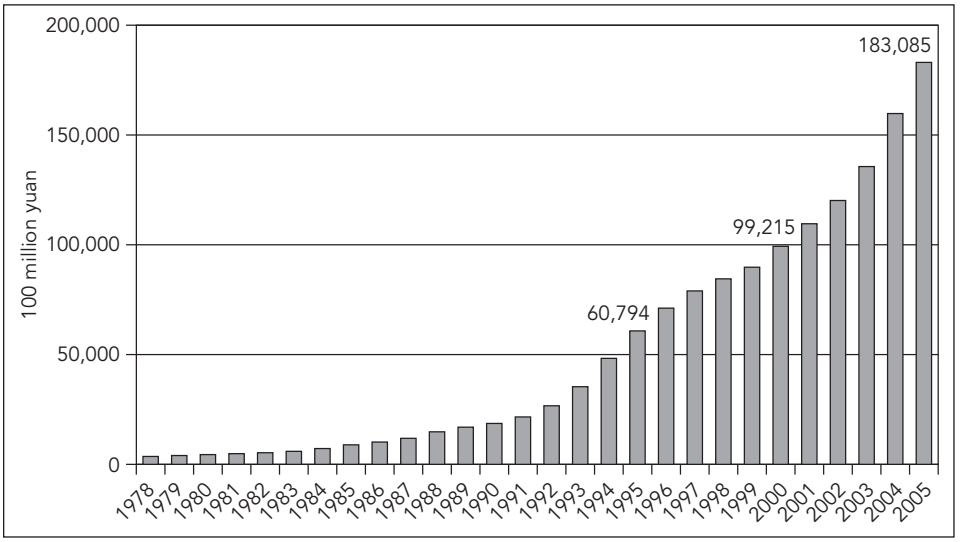
In short, financing in East Asia has many unique features. As one part of East Asia, China shares common traditions and features with other East Asian economies. However, China is still transitioning from a centrally planned to a market economy. What experiences and lessons should China borrow from other East Asian economies in financing higher education? This is the subject of the following section.

What China Might Borrow from Other East Asian Economies in Financing Higher Education

Similar to some of the other East Asian economies, along with rapid economic growth, the massive expansion of education in China moved quickly from primary to secondary and then to higher education, especially since the late 1990s. However, since China is a transitional economy, to understand current economic and social development in relation to higher education reform and development, one has to understand the economic transition that China is experiencing. All of the major changes in Chinese higher education, including curriculum and teaching, governance, and financing, are closely related to economic reform and development. On the one hand, the economic transition is creating demand for well-educated manpower and raising the level of individual income, which, in turn, is creating more demand for higher education. On the other hand, universities and colleges are producing high-level, well-educated, specialized human resources, generating the knowledge urgently needed by the new economy, and preparing people to participate in the economic and social changes. Universities thus have a vital role to play in the country's social and economic transition and development. China's economic transition is relatively successful, averaging annual GDP growth rates above 9 percent for the past 28 years, as shown in figure 6.

According to Wang Mengkui of the Development Research Center of the State Council of China (Wang 2006) and some Peking University economists such as Wen Hai (Wen 2006), the Chinese economy will continue to grow relatively quickly for the next 20 years. By 2010, the estimated GDP of China will be close to Y 30 trillion. First, China will continue to have a competitive advantage because of its large supply of low-cost labor. Currently, about 60 percent of labor is still in the rural areas. Along with the modernization of agriculture and increased agricultural productivity, the proportion of labor in farming will be reduced to 20 percent or below, which means that, in the next 20 years, 500 million people will be liberated from farming the land. They will join the labor force in the manufacturing and service sectors. Second, China potentially has a huge domestic market, and the purchasing power of its population of 1.3 billion people will keep the economy growing. Foreign

FIGURE 6
GDP in China, 1978–2005
100 million yuan



Source: State Statistics Bureau of China (various years).

trade and investment are driving China's current economic growth, but development of the domestic market will constitute an even more powerful force. Third, the reform will deepen during the next 20 years, and the structural and systemic changes will further liberate China's productive forces and raise productivity. At present, the reform of property rights has not been completed, which results in a significant loss of productivity. The potential for growth as a result of property reform is huge. Fourth, the external environment for China's growth is relatively good. Entering the World Trade Organization (WTO) allows China to make better use of the global market and global resources through mutually beneficial arrangements for economic development.

Rapid economic development and deepened reform have dramatically changed how human resources are mobilized, allocated, and used in China, which, in turn, has had a significant impact on the human resource model and operational mechanism for China's higher education system (Min 2002). Driven by the human resource needs of the labor market and higher family income, demand for higher education is soaring, leading to a rapid expansion in enrollment. Table 3 shows the annual admissions of new students, while figure 7 shows the total enrollment of regular, full-time students in higher education.

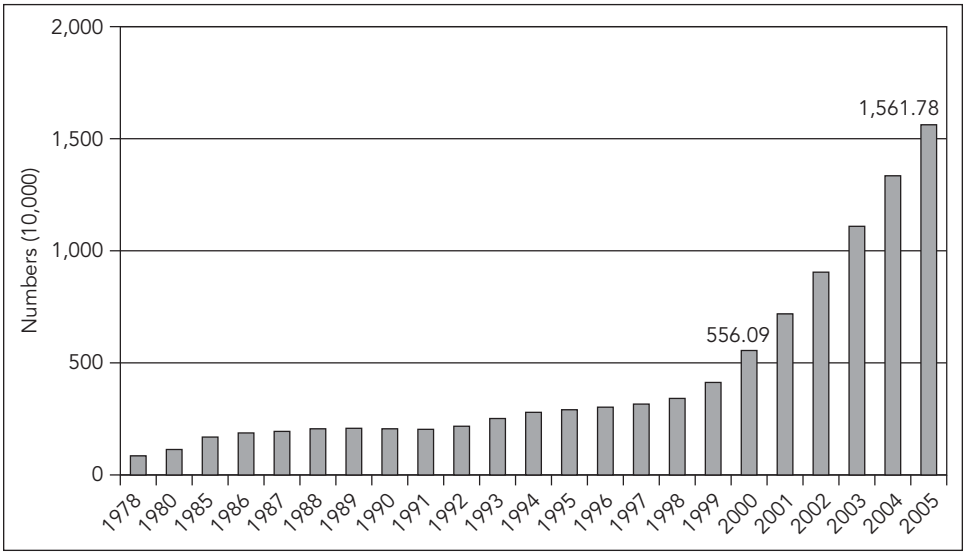
However, although the government has raised the level of spending on higher education, as shown in figure 8, the increase in state appropriations has not kept pace with the expansion in enrollment, resulting in increasing financial constraints for universities and colleges. As shown in table 4, government funding per student has been declining in recent years, both in total allocations per student and in nonsalary allocations for teaching and learning materials per student. The total allocation per

TABLE 3. Number of Annual Admissions of New Students to Higher Education Institutions in China, 1998–2006

Year	Annual new intakes
1998	1,000,000
1999	1,600,000
2000	2,200,000
2001	2,680,000
2002	3,200,000
2003	3,820,000
2004	4,300,000
2005	5,080,000
2006	5,400,000

Source: Ministry of Education, PRC (various years, 1998–2006).

FIGURE 7
Regular Full-time Enrollment in Higher Education in China, 1978–2005
numbers (10,000)

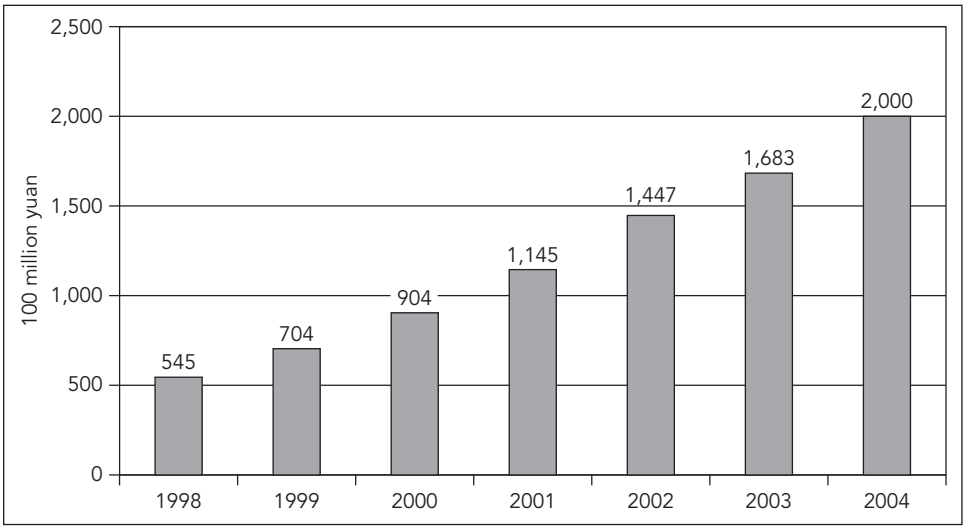


Source: State Statistics Bureau of China (various years).

student decreased from Y 6,178 in 2002 to Y 5,552 in 2004. It further decreased to Y 5,376 in 2005 (Chen 2007).

Other indicators of quality have also been declining, such as student-teacher ratios, classroom space per student, laboratory space per student, library space and books per student, and living facilities per student. On the one hand, the current financial situation of Chinese higher education institutions is very tight; on the other

FIGURE 8
Government Appropriations for Higher Education in China, 1998–2005
100 million yuan



Source: Ministry of Education, PRC (various years, 1998–2005).

TABLE 4. Budgeted Funding per Student in China, 2002–04
yuan

Year	2002	2003	2004
Total funding per student	6,178	5,773	5,552
Nonsalary funding per student	2,453	2,352	2,298

Source: Ministry of Education, PRC (2005).

hand, the social demands for higher education are strong and growing, as shown in table 5. These estimates were conducted in 2004. By 2006, total enrollment in higher education had already reached 25 million students, and it is expected to reach 30 million by 2010. Thus a systematic approach to improving higher education finance has to be developed.

Possible Strategies to Tackle the Financial Constraints in Higher Education

China has been learning from the experiences of other East Asian economies with regard to economic development and has much to learn about the financing of higher education as well.

One approach is to raise total state spending on education to the average level of East Asian economies. Recently, a national policy decision has been made to increase

TABLE 5. Estimated Enrollment in Higher Education in China, 2010 and 2020
enrollment in millions; rate in percent

Estimated growth in enrollment from base year (2004)	2010		2020	
	Number enrolled	Enrollment rate	Number enrolled	Enrollment rate
Low (3 percent)	23.88	20.6	32.09	38.3
Middle (5 percent)	26.80	23.1	43.66	52.1
High (8 percent)	31.74	27.4	68.52	81.8
Very high (10 percent)	35.43	30.6	91.90	109.7

Source: Zhang (2005).

Note: The population between the ages of 18 to 22 is estimated to be 115.82 million for 2010 and 83.75 million for 2020.

government allocation to education from less than 3 percent to 4 percent of GDP by 2010. Considering the rapid growth of GDP, the current government allocation to education will almost double.

China's system of higher education still has many inefficiencies and great opportunities to improve the use and allocation of resources. This could be achieved by giving universities and colleges more autonomy in financial management. Universities and colleges could improve their financial situation by improving the efficiency and effectiveness of resource use and cutting costs. During the centrally planned period, universities and colleges were totally reliant on state appropriations and were not allowed to mobilize resources from other sources. Now that the economic transition is well under way, wealth is being accumulated in different sectors of society, and it is possible to obtain funding from sources other than the government. Better resource mobilization strategies and more autonomy would help institutions to generate revenue by themselves. This could be done by providing training and other paid services for industries, obtaining commissioned research contracts, and pursuing fundraising activities. Recently, public universities and colleges were allowed to set up foundations to mobilize financial support from private donations, and this has constituted a major breakthrough.

Encouraging private universities and colleges to develop a dual financial system and allowing both public and private higher education are showing promise. Given the huge unmet demand and considering that the Chinese people attach high priority to the pursuit of higher education opportunities, this is a must. Some policy actions have already been taken. In 1993 the State Education Commission of China issued a document allowing the creation of *min-ban* (private) higher education institutions (State Education Commission of China 1993). In 2002 the National People's Congress of China adopted a law to promote private higher education (National People's Congress of China 2002).

The unmet demand for higher education is still growing, the capacity of the public sector is limited, and the population is increasingly able to pay a portion of the cost of higher education; thus the expansion of private higher education is feasible. According to some social survey results, the first purpose of Y 16 trillion

of individual family savings is for children's education (State Statistics Bureau of China 2006). Moreover, the gross enrollment rate in higher education is only 22 percent, leaving 78 percent of China's college-age population not attending college. As shown in figure 1, the private sector's share of higher education is still very small in China compared with some other East Asian economies, as Umakoshi (2004) correctly points out: "The private sectors in Japan, South Korea, Taiwan, and the Philippines accommodate over three-quarters of the higher education population, which is unusual in any other area of the world." Along with development of the new market economy, China should develop a more comprehensive policy framework and a more solid legal infrastructure for the development and regulation of private universities and colleges, as other East Asian economies have done.

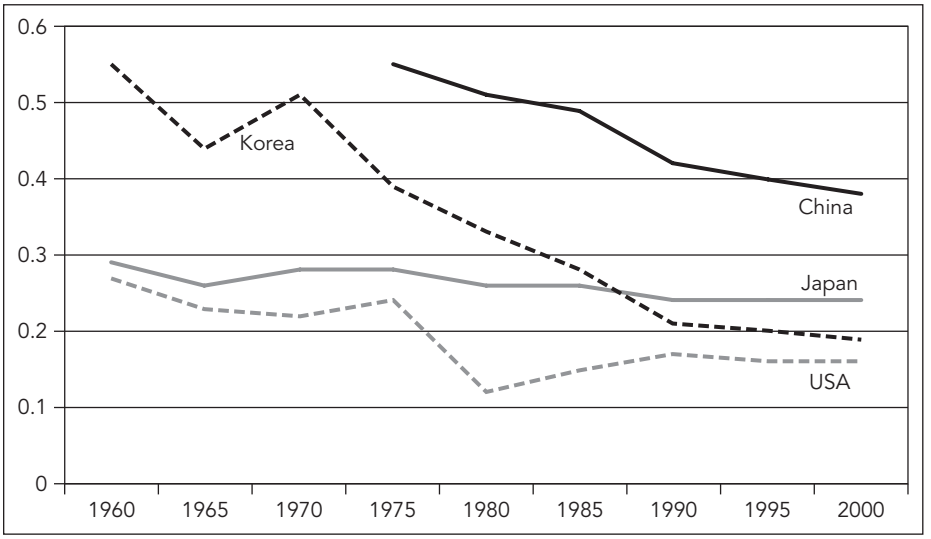
Cost sharing in higher education has been widely practiced in East Asian economies as well as in other parts of the world (Johnstone 2004, 2006; López-Segrera, Sanyal, and Tres 2006), such as in the United States. Following the lead of other East Asia economies, in 1989 China started to charge tuition and fees in universities and colleges and to offer financial aid for students from needy families. The government has regulated universities and colleges to keep an appropriate level of tuition. At the same time, various types of financial aid for students from needy families, such as scholarships, grants-in-aid, government-subsidized student loans, and work-study programs, have been implemented. As individual incomes grow, China should consider formulating and implementing cost-sharing policies: the beneficiaries of higher education who are able to pay should shoulder a reasonable proportion of the costs based on a unit cost analysis.

Finally, China needs to tackle equity issues in financing higher education. Equity has been a major issue in East Asia as well as in other parts of the world. Along with the social changes and rapid economic growth in the transitional process, some serious equity issues are evident in China, including inequality of income distribution and regional disparities. These problems are also reflected in the higher education sector. Figure 9 shows that China has more serious problems of educational inequality than some other East Asian economies, such as Japan and Korea, as indicated by Gini coefficients.

Further analysis of access to higher education by income group shows that children from higher-income families tend to enroll in more prestigious universities and to receive higher-quality education and better professional opportunities, as shown in figure 10. Although students from families with lower socioeconomic backgrounds have more access to education than before, the students from families with higher socioeconomic status are better able to attend higher-quality, prestigious universities because they generally score higher on national college entrance examinations. Better-educated parents with higher family incomes are better able to develop their children's scholastic aptitude and ability by providing better advice and additional assistance regarding their children's education.

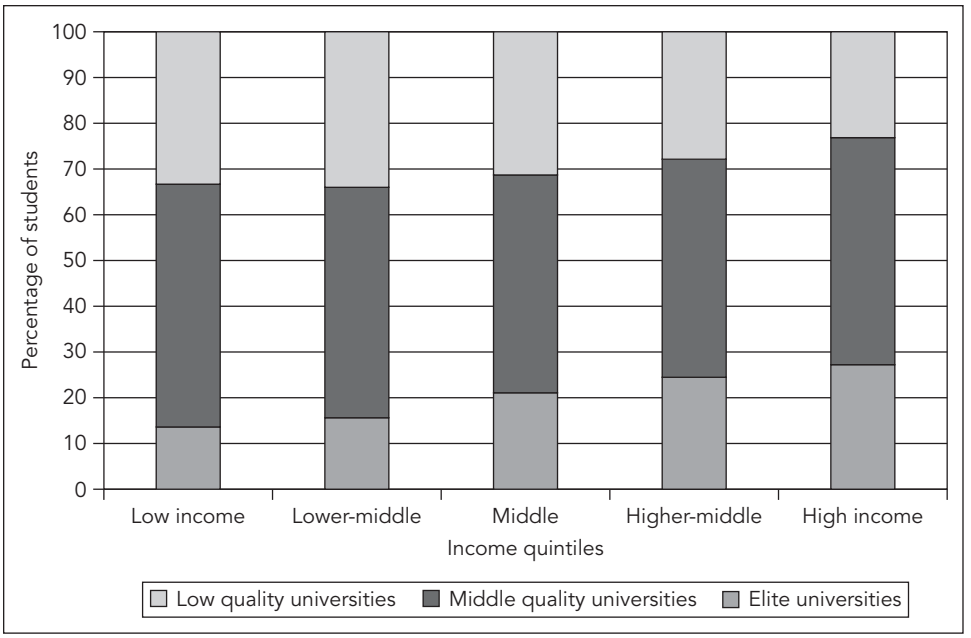
Empirical analysis of income inequality of different social groups by education level shows that the lower the level of educational attainment, the higher the level of

FIGURE 9
Education Gini Coefficient in Select Countries, 1960–2000



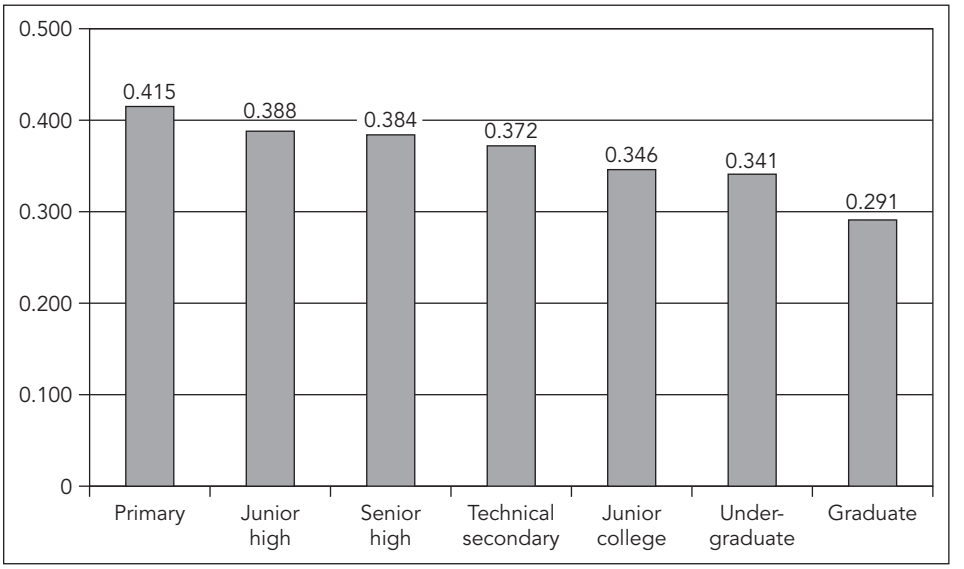
Source: Thomas, Wang, and Fan (2001).

FIGURE 10
Student Enrollment in Different Types of Higher Education Institutions in China, by Family Background



Source: Li (2006).

FIGURE 11
Gini Coefficients in China, by Level of Education



Source: Household survey conducted by State Statistics Bureau of China and Peking University, 2006.

income inequality, as shown in figure 11. Education could play an important role in improving social equity by improving income distribution.

It has been argued that a harmonious society has to be a more equitable society and that equity in education is the foundation of social equity. Higher education could play an important role in promoting intergenerational upward social mobility for low-income social groups (Guo and Min 2006, 2007). Thus, to tackle the issue of equity, the government significantly increased the amount of financial aid available to students from low-income families, from less than Y 10 billion in 2006 to Y 30.8 billion in 2008. A new student financial aid program will be implemented within three years, and the total amount available for helping students from low-income families will exceed Y 50 billion (Zhao 2007).

Another major equity issue in Chinese higher education is the striking regional disparities. The level of economic development between the east coast region and the inland, especially the western region has been widening in the past 28 years, leading to significant disparities in the financing of higher education, as shown in table 6.

The new policy direction of the Chinese state is to achieve more even development of the country, construct a harmonious society, and eliminate regional disparities in education. To further these ends, China should borrow from the experience of some other East Asian economies and increase intergovernmental transfers, meaning more educational appropriations from the central government to the poor provinces. This has begun, and China has set up special financial aid programs for students from low-income families in the underdeveloped regions. In addition, China requires universities from the better-developed regions to partner with universities in the underdeveloped areas to provide educational support.

TABLE 6. Budgeted Funding per Student in China, by Region, in 2004
yuan

Region	Total	Nonsalary
Shanghai	9,116	4,490
Tianjin	9,022	3,886
Guangdong	8,581	3,573
Hubei	2,459	841
Hunan	2,581	857
Sichuan	1,946	870

Source: Ministry of Education, PRC (various years, 2005).

In short, China shares many traditions and features with some of the other East Asian economies. China is seeking to learn from the experiences and lessons of some and to avoid the problems of others. China is paying attention to the "East Asian Success Story."

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Higher Education and Migration: Brain Drain and Sharing Skills in the Region

Higher Education and International Migration in Asia: Brain Circulation

MARK R. ROSENZWEIG

Much attention has been paid to how the emigration of skilled workers affects the returns to educational investments in low-income countries. Data recently have been put together that provide a global picture of the extent to which persons receiving their tertiary education in low-income countries end up residing in developed countries and the proportion of tertiary-educated persons from a country who are living abroad (Beine, Docquier, and Rapoport 2006). The overall rate of either measure is high, suggesting that education policies in low-income countries need to be attentive to skilled emigration, either of persons with tertiary schooling or those seeking to acquire it. These "brain drain" statistics, however, ignore the facts that many students born and residing in low-income (and high-income) countries acquired their tertiary schooling outside the country and that high-income countries are a major source of tertiary training for students from low-income countries.

The total number of international students in the world is large. The United Nations Educational, Scientific, and Cultural Organization (UNESCO) reports that in 2005 more than 2 million students were enrolled in tertiary institutions as foreign (nonresident) students; 52.4 percent of these were from Asian countries, just slightly below Asia's share of the world population (56.5 percent). Which countries are providing schooling to the world? Five countries—the United States, United Kingdom, Australia, Japan, and Germany—account for almost 80 percent of the stock of foreign students. This group of five countries also constitutes the principal destination for students from Asia, accounting for 76.3 percent of total Asian enrollment. As seen in figure 1, the United States is by far the major destination for Asian students, accounting for almost a third of the total population of Asian students acquiring tertiary education abroad.

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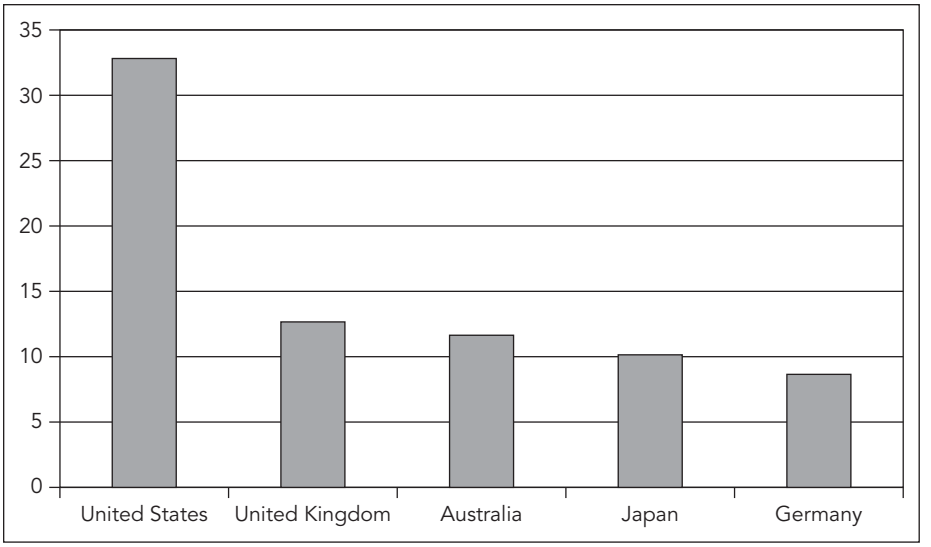
Annual World Bank Conference on Development Economics 2008, Regional

FIGURE 1
Percentage of All Asian Students Studying Abroad in Tertiary Schools in Top Five Receiving Countries, 2004 Percent Studying Abroad



Source: UNESCO data.

There is no information on the total number of tertiary-educated residents of low-income countries who acquired their higher education abroad. Thus it is not known to what extent the brain drain statistics overestimate the net loss of human capital. Nor has there been, up to now, reliable information on the proportion of foreign students who do not return to their home country. The impact of externally obtained higher education on the origin countries of foreign students can be large, however. Spilimbergo (2007) examines the educational background of the leaders of 113 countries in 1990 and finds that 57 percent of them were educated abroad, 22 percent in just three countries—the United States, the United Kingdom, and France. Three of the leaders of the 13 Asian countries in his database were educated outside their home country, two in the United States.

An older theoretical literature emphasizes the loss of human capital to low-income countries and thus the potentially negative effects of the emigration of skilled workers on economic development (for example, Bhagwati and Hamada 1974). An influential newer literature (Beine, Docquier, and Rapoport 2001, 2008; Mountford 1997; Stark, Helmenstein, and Prskawetz 1998) suggests, however, that the emigration of skilled workers can increase the educational investments of sending countries. The idea is that the prospects of emigrating to a country where skills are rewarded more generously can lead not only to more investment in skills in the home country but also to a more highly educated domestic population. The expected gains to schooling investments are thus a weighted average of the remuneration of the persons schooled in the home country and in a potential destination country, where the weights are based on the probability of emigrating.

There are two problems with the "brain gain" framework. First, for most countries, the probability that a domestically educated tertiary-educated person can permanently emigrate to a high-income country is very small, so the effect of the "risk" of emigrating on the acquisition of domestic schooling is not large. Second, the literature ignores the endogeneity of the emigration probability at the individual level. In particular, it ignores the fact that the choice of location of tertiary education significantly affects the probability that a person can emigrate permanently. Potentially, a student receiving his or her education in a high-income country has advantages in that country's marriage market[1] and labor market compared with a person who seeks a mate or a job in a high-income country while residing in a low-income country. That is, obtaining tertiary schooling abroad is an important route to emigration. Indeed, unlike for many visas, there are no country ceilings or kinship requirements for student visas. And, as we show in this paper, the probability that a foreign-trained student will remain in the host country (the United States) is on the order of 20 percent, far higher than the overall emigration probability for a domestically schooled student.

Clearly higher education policy in low-income countries must be attentive not only to emigration issues but also to the alternative of outsourcing higher education abroad. Deciding on higher education policies in a poor country thus requires answering a number of questions. Is educational outsourcing, and thus the exploitation of higher education subsidies in high-income countries, a cost-effective alternative to expensive domestic investments in higher education?[2] Indeed, do investments in higher education at home even reduce the flow of students who seek schooling abroad? Does foreign schooling reflect a lack of investments in domestic schooling or just the low rewards to schooling compared with the high-income countries where schooling is sought? How large is the permanent loss of internationally trained students? These are the questions considered in this paper.

In the first section, a simple model of the international pricing of skills and choice of schooling location is set out to clarify issues and motivate the subsequent empirical analysis. There are four key implications of the model in which students are seeking to maximize the gains from emigration: (a) More schooled persons always gain more from emigration to a country that provides higher rewards for skills. Students are more likely to choose schooling abroad (b) the larger the gap in the rewards to skills between the home country and the host country, (c) the lower the quality of domestic schools, and (d) the higher the incomes in the domestic economy. The second section is concerned with measuring the global rewards for skills—the price of skills across countries. Estimates are presented of skill prices for 19 Asian countries, showing the enormous cross-country disparities in rewards for skills. In the next two sections estimates are presented of the determinants, respectively, of the distribution of the stock of foreign students who obtain their schooling in the United States, the dominant host country for foreign students, and the determinants of the students' choice of host country in which to obtain their schooling. The fifth section is concerned with measuring the stay rates of foreign students and their determinants; it also presents the estimated stay rates for foreign students in the United States and the determinants of their return rates across sending countries.

The main empirical findings are as follows:

1. The pattern of student flows across countries is consistent with the hypothesis that students acquire schooling abroad in order to obtain jobs in the host country: there are larger per capita numbers of foreign students in the United States from lower skill-price countries than from high skill-price countries, and host countries with higher skill prices attract the most foreign students, controlling for the quality and quantity of tertiary institutions in the sending and host countries.
2. Increasing the number of colleges and universities in a sending country with a low skill price, given the quality of its higher education institutions, increases, not decreases, the number of students who seek (graduate-level) education abroad, as it increases the number of persons with higher gains from emigrating.
3. Improving the quality of domestic tertiary institutions decreases student outflows.
4. Higher-income students gain the most from foreign schooling: among countries with similar rewards to skills, those that are richer and closer to the host country send more students abroad for schooling, for a given quantity and quality of domestic education.
5. Asian students are more likely to migrate to the United States for schooling, net of differences in skill price and educational quality and quantity.
6. The proportion of foreign students who remain in the United States as permanent immigrants is approximately 20 percent, but the proportion of students from Asian countries who do so is only about 14 percent. Those students from Asia who do immigrate are highly schooled compared to students from other regions and tend to be disproportionately computer scientists, engineers, and natural scientists. There are few professionals among any of the immigrating foreign students.
7. Return rates of foreign students from the United States are higher for countries with higher skill prices, with Asian students more likely to return net of skill-price effects. However, on net, lower skill-price countries, for a given population size, have larger domestic stocks of foreign-trained persons compared with high skill-price countries. Thus, although there is a tax in the form of the loss of a fraction of highly skilled persons to host countries that supply tertiary schooling, the tax is highest for low skill-price countries, and such countries disproportionately accrue a net brain gain from the outsourcing of tertiary education.

Theoretical Framework

To understand how the economic returns to acquiring schooling in a foreign country are related to migration gains and to the returns to and quality of domestic schooling, it is useful to set out a simple theoretical framework. The simplest model is one with a single type of skill. The earnings or wage, W_{ij}, of an individual i in country j

is then the product of the country-specific price of skill ω_j—the skill price—and the number of skill units, x_{ij}, possessed by i:

$$W_{ij} = \omega_j x_{ij}. \tag{1}$$

Skill units are produced in school. The relationship between skill units and schooling, S, is given by

$$x_{ij} = \mu_{ij} e^{\beta S}, \tag{2}$$

where μ_{ij} is the baseline skill of a worker and β is a parameter that translates years of schooling into skill units—a higher β implies that a year of schooling produces more skill units, so β naturally represents the quality of schooling. Within a country, if β is high, school quality (the domestic "return" to schooling) is high, and higher-S individuals will earn proportionally more than lower-S individuals compared with a country in which β is low. Across countries, however, differences in earnings for a person with the same number of years of schooling S also will reflect differences in the price paid for a unit of skill. As we will see, prices of skill, ω_j, differ substantially more across countries than do the returns to domestic schooling, β. The gains from out-migration are dominated by cross-country differences in skill prices.

Consider the choice of schooling location for a student i residing in country j. Schooling taken abroad has two potential benefits. First, it may enhance the prospects for receiving a job abroad, at a higher skill price. Second, schools abroad may be of higher quality, so the foreign-trained student will earn more at home than if she acquires the schooling domestically. If p^A is the probability of getting a job in the destination country, u, where schooling is taken and α reflects the quality of schools there, then the expected wage if one unit of schooling is taken abroad is given by

$$E(W_{ij})^A = p^A \omega_u e^{\alpha} + (1 - p^A) \omega_j e^{\gamma\alpha}, \tag{3}$$

where γ ($0 < \gamma < 1$) measures the extent to which schooling acquired abroad is of less value in the home country than in the destination country.[3]

If the net direct cost of acquiring schooling outside the country—for example, travel costs, foreign language training, and the extra tuition—is C^A, then the expected gain from schooling broad, G^A, is

$$G_{ij}^A = p^A \omega_u e^{\alpha} + \omega_j[(1 - p^A)e^{\gamma\alpha} - e^{\beta}] - C_{ij}^A. \tag{4}$$

Equation 4 assumes that the probability of obtaining a permanent job abroad if schooling is acquired domestically is nil. What is necessary for the analysis is that p^A must be greater than the probability of getting a job without foreign schooling. In the U.S. case, the probability for a randomly selected individual depends on the probability that the person has an immediate relative abroad (an infinitesimal probability) or wins the diversity visa lottery. For a person in an eligible country, that probability is less than 0.5 percent.[4] Moreover, for an analysis of schooling choice in Asia, it is notable that six of the 16 countries not eligible for the lottery visa are in Asia (China, India, Pakistan, the Philippines, Republic of Korea, and Vietnam).[5] For persons in

these countries, there is even less opportunity to emigrate. As we will see, however, the probability that a foreign student in the United States will obtain a permanent visa is as high as 20 percent.

We assume that a student will go abroad for schooling if equation 4 is positive and will seek a destination among multiple destinations in which the net gain is highest. Thus the fraction of students who migrate from country j to acquire schooling abroad will be a function of the determinants of the average gain from doing so; that is,

$$m_j = g(G_j^A) = g(p^A, \omega_u, \omega_j, C_j^A, \gamma, \alpha, \beta). \tag{5}$$

There are a number of testable implications from the model. First, if direct costs of acquiring schooling are high, then parental resources will matter, or, at the country level, richer countries will have more students studying abroad, everything else remaining the same. In contrast, however, in origin countries with high skill prices but with the same level of income, the gains from schooling abroad are likely to be smaller. The effect on the gain and thus the magnitude of student out-migration from a rise in the domestic skill price is given by equation 6:

$$\partial G^A/\partial \omega_j = (1 - p^A)e^{\gamma\alpha} - e^{\beta}. \tag{6}$$

As can be seen, the relationship between the foreign-schooling gain and the home skill price is more likely to be negative the higher is the probability P^A of obtaining a foreign job via schooling abroad and the lower is the premium for foreign schooling at home (γ low). Indeed, if domestic and foreign schooling yield approximately the same return in the home country and students seek (higher-paying) jobs abroad, the higher skill-price countries will always have fewer students abroad:

$$\partial G^A/\partial \omega_j = -p^A e^{\beta} < 0 \text{ if } \gamma\alpha \approx \beta. \tag{7}$$

Note that if acquiring schooling in a foreign country with a higher skill price does not increase the employment prospects there ($P^A = 0$), the only reasons for acquiring schooling abroad are the lower costs or higher quality of foreign schools. If the latter is true ($\gamma\alpha > \beta$), then countries with high skill prices (and low-quality schools) will send more students abroad. The sign of the relationship between the number of students from a country studying abroad and its skill price thus reveals whether studying abroad is motivated, in part, by the desire to migrate permanently. Moreover, if job prospects abroad are a motive for foreign schooling, it will also be true that an increase in the price of skill in a destination country will increase the expected gain from acquiring schooling in that country and lead to more foreign students studying there.

$$\partial G^A/\partial \omega_u = p^A e^{\alpha} > 0. \tag{8}$$

Increasing the quality of domestic schooling β will, however, reduce the net gain from acquiring schooling abroad, whether or not schooling abroad enhances employment at the destination, and thus will reduce the outflow of students:

$$\partial G^A/\partial \beta = -\omega_j e^{\beta} < 0. \tag{9}$$

Finally, an increase in the quality of foreign schools will increase the gain from obtaining foreign schooling and thus attract more students from abroad, but that gain will be smaller, the smaller the probability of getting a foreign job and the smaller the domestic gain from foreign schooling, γ.

$$\partial G^A/\partial\alpha = p^A\,\omega_u e^{\alpha} + \gamma\omega_j\,[(1 - p^A)e^{\gamma\alpha} > 0. \tag{10}$$

Estimating World Skill Prices

Using the skill-price framework to examine the determinants of the flow of students across countries requires information on the wages of workers with the same skills across all countries of the world. With such data, it is relatively straightforward to identify skill prices. In particular, substituting equation 2 into equation 1 and taking logs yields the familiar log-linear wage equation:

$$\mathrm{Ln}(W_{ij}) = \mathrm{Ln}\omega_j + \beta_j S_{ij} + \mathrm{Ln}\mu_{ij}. \tag{11}$$

In this case, each country has its own intercept and perhaps a different return to domestic schooling.[6] The country-specific intercepts in equation 11 are the country-specific skill prices.

All prior empirical analyses of international migration have used GDP per capita or, in rare cases, GDP per worker as the relevant "wage" affecting migration gains. However, as the model makes clear, what matters is how cross-country earnings differ for a worker of given skill, which is the skill price. Per capita GDP varies across countries due to differences in age composition, labor force participation rates, and the average level of skill of the workforce, all of which are irrelevant from the perspective of a worker deciding whether and where to migrate (or acquire schooling).

The principal barrier to obtaining skill prices is the absence of comparable data on the earnings of workers by skill for many countries of the world. Two sources of data are used here. The first is the predecessor survey to the New Immigrant Survey, the New Immigrant Survey Pilot (NIS-P), which provides the home-country earnings for a sample of new legal immigrants admitted to legal permanent residence in the United States during the months of July and August 1996. The sample size for adult immigrants is 1,032. Details on the survey are given in Jasso and others (2000). Of the sampled immigrants, 332, representing 54 countries, had worked outside the United States prior to immigrating and provided earnings data for their last job there. Information on work time and pay periods were used to adjust for differences in labor supply across workers in order to convert all data on pay to full-time earnings. The advantage of this data source is that earnings were elicited in a common survey frame, and there is information on the number of years of schooling for each worker along with gender and age. Thus the cross-country wage (equation 11) can be estimated directly. The disadvantage is that the immigrants are not a random sample of workers in the home country.

The second source of information that can be used to estimate skill prices is the Occupational Wages around the World (OWW) database, compiled by Freeman and Oostendorp (2000). This source provides monthly wage data for men in 161

occupations in more than 150 countries from 1983 to 2003, derived from the International Labour Organisation's October Inquiry database. Presumably, within countries the data are representative of all workers, but not all countries are represented in all years, and fewer countries appear to have participated in more recent years. For this analysis, data from 1995 were selected, which is a year with a peak number of countries and close in time to the NIS-P information on wages. In that year, there are 4,924 observations representing 67 countries. Monthly earnings from the series expressed in U.S. dollars based on exchange rates, as estimated by Freeman and Oostendorp, are used.[7] The disadvantages of this data set are that the information across countries may not be comparable. Moreover, there is no information on the schooling or age of workers. Instead, the set of occupational indicators must be used to standardize across workers for skills. In particular, for the OWW data set, skill units are a nonparametric function of industry and occupation; that is,

$$x_{ij} = \mu_{ij} \exp(\boldsymbol{I}_{ijk}\gamma_k), \tag{12}$$

so that

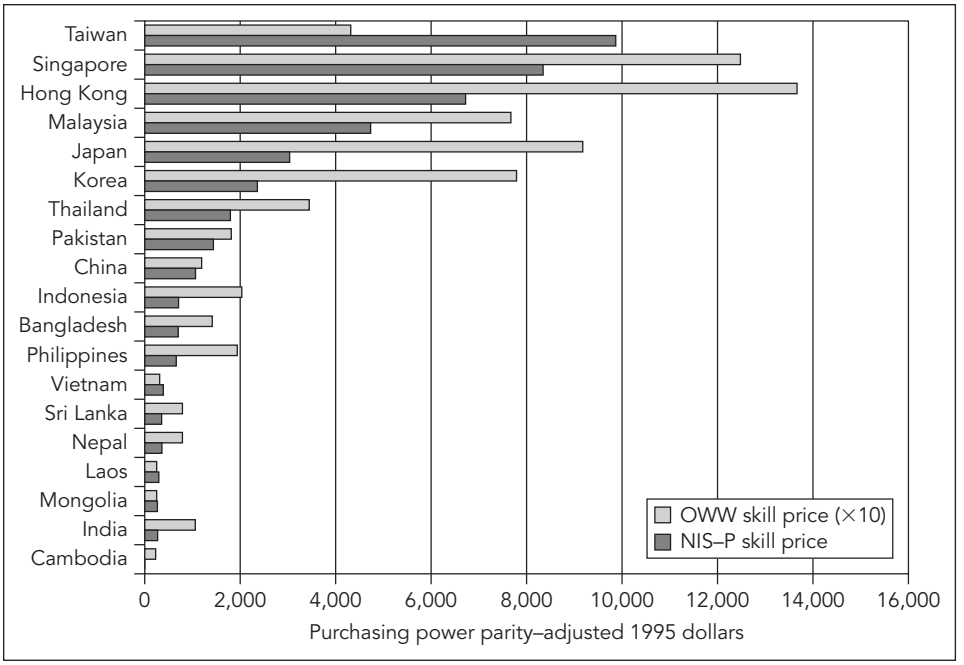
$$\mathrm{Ln}(W_{ij}) = \mathrm{Ln}\omega_j + \boldsymbol{I}_{ijk}\gamma_k + \mathrm{Ln}\mu_{ij}, \tag{13}$$

where $\boldsymbol{I}_{ijk}$ is a vector of occupation or industry dummies for worker i in country j, and γ_k is a vector of coefficients. Again, the country-specific set of intercepts provides the set of skill prices for 67 countries for 1995.[8]

Both of the data sets provide comparable information on skill prices for, at most, only 67 countries. To predict skill prices for more countries, Rosenzweig (2006) uses information on aggregate country characteristics that are available for a large number of countries to estimate the proximate determinants of skill prices from the comparable worldwide microwage data. The analysis makes use of the fact that the skill price is the marginal value product of skill and assumes that aggregate output for country j is produced according to Cobb-Douglas technology. The estimation procedure also attempts to correct for the selectivity of the NIS-P immigrant sample, that selectivity being based on the decision to immigrate. The estimates are used to predict skill prices for countries without sampled workers. One shortcoming of using the NIS-P base for predicting skill prices is that, because of the limited degrees of freedom, it is not possible to allow the return to schooling to differ across countries. Similarly, for the analysis of OWW earnings, the coefficient vector for industry and occupation is assumed to be invariant to country.

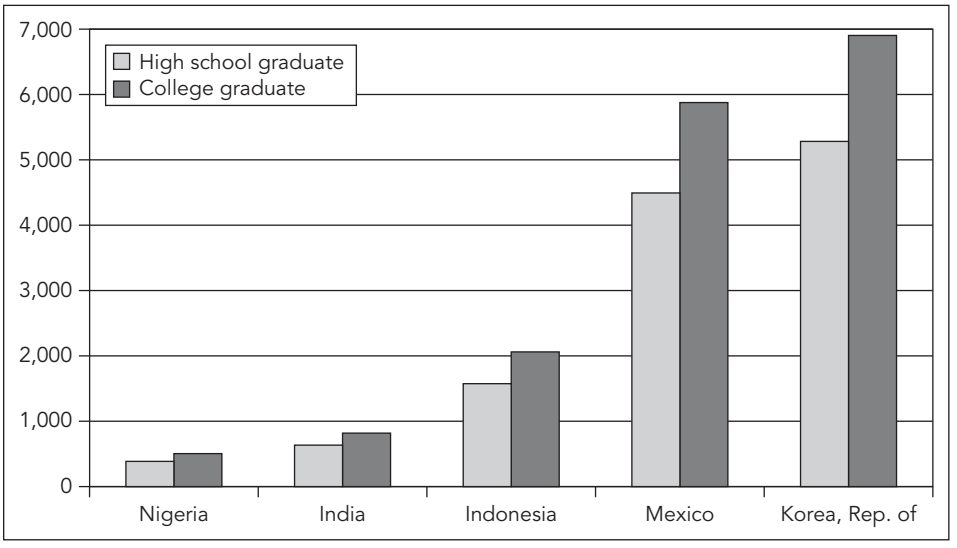
Figure 2 displays the NIS-P and OWW estimates of skill prices for 19 Asian countries. The figure shows that both sets of data yield similar, but not identical, skill-price estimates (the correlation across all countries is more than 0.66). Both sets of estimates indicate the substantial differences in skill prices across countries within Asia. For example, the skill price in Singapore is 9 to 12 times that in Bangladesh, and the skill price in Korea is 3.4 to 5.5 times the skill price in Bangladesh. To see how these differences in skill price translate into differences in earnings by level of schooling, we can compute earnings for any level of schooling and return to schooling, β, using equation 11 for any country based on its skill price. Figure 3 shows the

FIGURE 2
Estimated Skill Price for 19 Asian Countries, by NIS-P and OWW Sources



Source: Author's calculations based on OWW Database (Freeman and Oostendorp 2005); Jasso and others (2000).

FIGURE 3
Estimated Earnings of High School and College Graduates across Select Countries with a Common 7 Percent "Return" to Schooling Purchasing Power Parity–Adjusted 1996 Dollars Using NIS-P Skill Prices



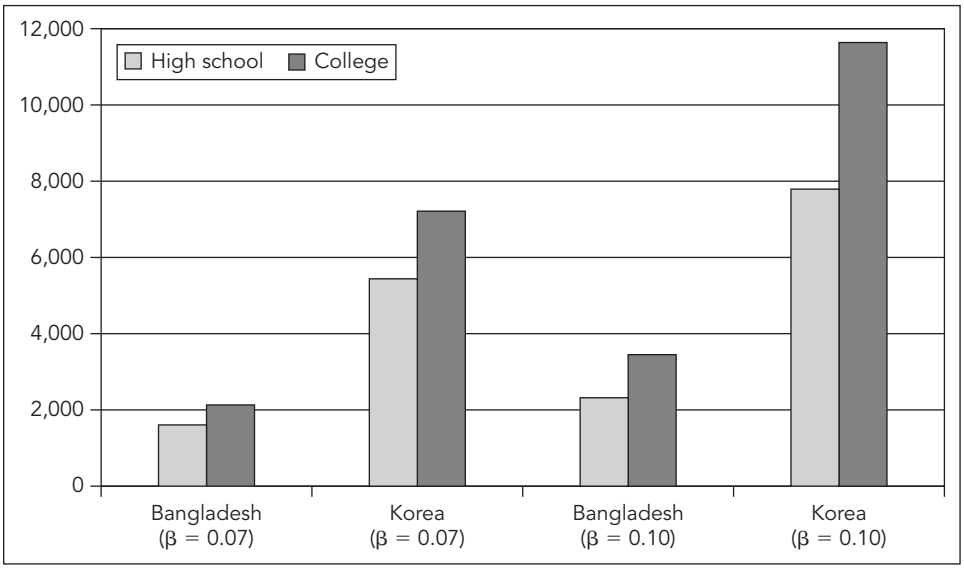
Source: OWW Database (Freeman and Oostendorp 2005); Jasso and others 2000; Rosenzweig 2006.

estimated earnings for a select number of countries, based on the NIS-P estimated skill price for each country under the assumption that the return to schooling, β, is the same in each country and is 7 percent (the estimated world return in Rosenzweig 2006). As can be seen, earnings for persons of comparable schooling differ substantially across countries.

There are two important features of figure 3. First, the gains from migration (cross-country differences in earnings) are greater the higher the level of schooling of the individual. The migration of skilled persons from low to high skill-price countries leads to greater global gains in output. Second, raising the level of schooling in each country—say, so all have a college education, even ignoring the depression of skill prices via a general-equilibrium effect—would do very little to decrease the differences in earnings across countries. Put another way, equalizing cross-country skill-price differences would have a substantially greater impact on world inequality than would equalizing education levels across countries.

How do differences in domestic returns to schooling across countries affect differences in global earnings? In figure 4, earnings for high school and college graduates are computed for Bangladesh and Korea, based on their NIS-P skill prices but assuming alternative rates of return to schooling of 7 and 10 percent. As can be seen, increasing domestic returns to schooling significantly affects earnings; if returns to schooling reflect school quality, then increasing school quality in a low skill-price country can, for a given level of schooling, reduce earnings disparities relative to high skill-price countries. Thus an increase in the return to schooling from 0.07 to 0.1 in Bangladesh, while keeping the return to schooling in Korea at 0.07, shrinks the

FIGURE 4
Estimated Annual Earnings in Bangladesh and Korea, by Level of Schooling and Return to Schooling



Source: Author's calculations based on Jasso and others 2000.

absolute differential in the earnings of college graduates across the two countries by 26 percent. However, the absolute gap remains large. Moreover, an increase in the return to schooling in both countries widens the gap even more at the college level. Of course, raising school quality, if it changes the amount of skill in the economy, would reduce the skill price (ignoring large trade effects). One question is whether increasing the quality of domestic schooling for a given domestic skill price would decrease the outflow of students to study abroad, as suggested in the migration cum schooling model. We now turn to estimates of the determinants of foreign student outflows.

Where Do U.S. Foreign Students Come From? Determinants of Student Outflows to the United States

We first estimate an approximation to the student outflow equation (5) using data on the number of students by country of origin who are studying in tertiary institutions in the United States. As we have seen, the United States is the dominant country of destination for foreign students both globally and from Asia. Data from the United States are also used because there is reasonably precise information on student enrollment in tertiary institutions by source country and because, as discussed below, there is unique information on foreign students who remain in the United States after completing their schooling. This makes it possible to estimate the loss of human capital associated with foreign study.

There are two sources of data on foreign students in the United States: counts of F-1 student visas issued each year by the State Department and the Student and Exchange Visitor Information System (SEVIS), which provides information by country on the stock of current foreign-born students. The advantage of the latter is that all foreign-born students are required to register in the system. Because Canadian citizens do not need an F-1 visa to study in the United States, they are not included in the State Department flow data. Moreover, the SEVIS data exclude family members of students, who are included in the visa flow information. And the State Department visa counts include persons who do not actually use their visa to come to the United States. We use here the SEVIS data on the current stock (2006) of students in the United States by country.[9]

Inspection of the SEVIS data indicate that all of the top five sending countries for students enrolled in U.S. schools are in Asia: in order, Korea, India, China, Japan, and Taiwan (China). Indeed, seven of the top 10 countries of origin are in Asia (Thailand and Indonesia are 9 and 10). This list obviously contains a mixture of high and low skill-price Asian countries, as well as countries of very different sizes, and thus is not very informative about how origin-country skill prices influence student flows. To carry out the analysis of how skill prices and the quantity and quality of colleges and universities affect the number of students who come to the United States to study, more information is needed than the skill prices.

To characterize the number and quality of domestic universities and colleges, we add to the database the number of universities in each country and a variable

indicating whether any of the country's universities were ranked in the top 200 of all universities in the world from the Times Higher World University Rankings for 2005.[10] We also compute the mean rank of the ranked universities, if any. If domestic quality lowers the gains from foreign study, we would expect that countries with ranked universities would, everything else remaining the same, experience smaller outflows of students. Similarly, the lower the mean rank (the higher the quality) of the universities, the greater the outflow of students. The effects on student outflows of the number of universities, for a given quality, are less clear. Approximately half of foreign students in the United States come as graduate students (IIE 2006); increasing the supply of college graduates in a country thus increases the potential supply of graduate students who study abroad. To the extent that graduate study in a foreign country improves the prospects of obtaining a foreign job and thus an immigrant visa, building domestic capacity in universities, without improving quality, could increase per capita rates of (graduate) study abroad and thus increase the risk of losing the best and brightest.

Three variables are included that are related to the cost of acquiring schooling abroad. The first is the surface distance from the capital of each country to the nearest port of entry for immigrants in the United States, which we assume to be positively correlated with the costs of migration. The second variable is whether or not English is an official language of the sending country. Presumably, given that the language of instruction in the United States is English, students from countries in which English is prevalent face lower costs of studying in the United States. Finally, financing education abroad is costly: as reported by the Institute of International Education (IIE 2006), the primary source of funding is "personal and family" for about 64 percent of foreign students (about half for graduate students and more than 82 percent for undergraduates). Thus income matters for study abroad. We add the sending country's GDP per adult-equivalent to the database, which we assume is positively related to the average capacity of individuals to finance migration. Thus, for a given skill price, a country with a higher GDP per adult-equivalent should be observed to send more migrants. Economic growth can increase out-migration, if it is not accompanied by sufficient increases in skill prices. In prior analyses of international migration, GDP is used to proxy wage rates, thus mixing together skill prices and financing constraints.

Table 1 reports descriptive statistics for the country database, and table 2 reports estimates of the origin country-specific determinants of the number of foreign students studying in the United States for two specifications: one using the NIS-P skill-price estimates and the other using the OWW-based estimates of skill prices. Both specifications include the size of the sending-country population. All variables are in log form.[11]

The estimated skill-price coefficients are consistent with the implication of the model: students obtaining schooling outside their home country are motivated, in part, by the gains from permanent migration in the country where they go for their schooling—the number of U.S. students from a country outside the United States is *negatively* and significantly related to its skill price. Recall that if all students expect to return, a rise in the domestic skill price would increase the demand for schooling

TABLE 1. Descriptive Statistics: Cross-Country Data Set

Variable	Mean	Standard deviation
Number of foreign students in the United States in 2004 (U.S. SEVIS)	3,569.9	11,060.7
Number of Asian students in host countries in 2003 (UNESCO)	5,489.6	30,673.2
Number of non-Asian students in host countries in 2003 (UNESCO)	6,834.8	27,031.3
Return rate of foreign students in the United States in 2004 (NIS and U.S. SEVIS)	0.957	0.0541
Skill price (OWW)[a]	420.7	487.4
Skill price (NIS-P)[a]	4,884.0	21,014.9
Real GDP per adult-equivalent in 1995 (Penn World Table)	9,923.3	9,526.0
Total number of universities	39.2	156.7
Any ranked universities	0.169	0.375
Average rank of ranked universities, if any ranked	118.0	35.7
English an official language of the country	0.212	0.410
Distance of country to the United States, in miles	5,063.9	2,256.3
Total country population (thousands)	33,843.7	123,050
Asian country	0.111	0.315

a. Purchasing power parity-adjusted dollars per month.

TABLE 2. Determinants of the Log Number of Foreign Students in the United States in 2004

Origin-country variable	NIS-P	OWW
Log skill price	−0.259	−0.730
	(2.17)	(2.14)
Log real GDP per adult-equivalent	0.516	1.06
	(2.85)	(2.71)
Log total number of universities	0.275	0.313
	(2.47)	(2.82)
Any ranked universities	−1.18	−1.49
	(1.66)	(2.04)
Average rank of ranked universities	0.00842	0.00983
	(1.62)	(1.87)
English an official language of the country	0.738	0.782
	(3.49)	(3.76)
Log distance of country to the United States	−0.298	−0.309
	(4.30)	(4.44)
Log of country population	0.426	0.438
	(3.90)	(4.00)
Asian country	1.44	1.44
	(4.81)	(4.81)
R^2	0.766	0.766
Number of sending countries	125	125

Source: For the dependent variable, U.S. SEVIS.

Note: Numbers in parentheses are absolute values of *t*-ratios. Specification also includes primary school and secondary school pupil-teacher ratios.

and, given the stock of available schools, increase the amount of schooling taken abroad. The skill-price point estimates are also relatively large; doubling the skill price (for example, raising the skill price of India to that of the Philippines) reduces the stock of students abroad from 26 percent (NIS-P) to 73 percent (OWW).

The costs of foreign schooling matter too. For a given skill price and (per capita) number of universities, countries with higher incomes per capita, and thus greater ability to finance education, have greater stocks of students in the United States, but distance to the United States lowers the numbers there. Moreover, if an official language of the home country is English, this facilitates study in the United States. It is interesting to compare the point estimates for income per capita (adult-equivalent) and skill price. Doubling both, without increasing the capacity of domestic schooling, results in a net increase in study abroad—from 26 to 33 percent.

What are the estimated effects of investments in tertiary education? The estimates indicate that improvements in the *quality* of higher education institutions significantly reduce the outflow of students; a country with any ranked university, at the mean average rank (118), has a 18.6 to 33 percent smaller stock of students in the United States than a country with the same number of universities per capita but no ranked universities.[12] Raising the average rank of universities by one standard deviation (lowering the rank number) further decreases student outflow by 30 to 35 percent. Improving university quality raises the return to schooling at home, evidently increasing the opportunity cost of foreign schooling and out-migration. In contrast, increasing the number of universities per capita increases study abroad: doubling the number of universities, on average, increases the number of students studying abroad from 28 to 31 percent.[13] This seemingly paradoxical result is again consistent with foreign schooling as a route to permanent out-migration. Increasing university capacity, for a given average quality, increases the number of students who are eligible for graduate training abroad and thus have enhanced prospects for obtaining a higher-paid job abroad.

Where Do Foreign Students Go? Determinants of the Host Countries for Foreign Students

To further assess the extent to which study abroad is motivated by job prospects and returns abroad, we estimate the determinants of where foreign students choose to acquire their schooling. A key implication of the schooling cum employment model is that students will flow to countries with higher skill prices, for a given availability and quality of school places, if they view schooling abroad as a means of entry into higher-priced labor markets. Indeed, the top countries attracting foreign students, shown in figure 1, have skill prices substantially above the average for the world. We use information compiled by UNESCO for 2003[14] on the stock of foreign students in tertiary institutions across countries combined with our data on skill prices and schools. In this case, the variables pertain to the host countries, not the sending countries. We use the same specification as used for the determinants of student outflows, except that we exclude distance to the United States and the host-country per capita

GDP. We also employ maximum-likelihood Tobit to estimate the coefficients. This estimation procedure is used because, for many countries, there are essentially no foreign students, so there is a large concentration of observations at zero (53 percent).[15] As we wish to explain why students go to some countries and not others for tertiary schooling, we do not want to exclude these countries from the analysis.

We also divide up the population of foreign students into students from Asian countries and students from elsewhere in the world. The estimates of the determinants of the supply of foreign students in table 2 indicate that, given skill prices, income, distance, population size, and the quality and quantity of home universities, stocks of foreign students in the United States are still 144 percent higher for Asian countries than for non-Asian countries. The question addressed here is whether the choice of destination differs across Asian and non-Asian students.

Table 3 reports the maximum-likelihood Tobit estimates of the host-country determinants of the cross-country distribution of foreign students. The estimates indicate that the capacity of host countries to absorb students matters—the number of foreign students is significantly higher where there are more universities per capita. The key finding, however, is that the stock of students, both Asian and non-Asian, is significantly larger in countries with higher skill prices, given the capacity and quality of universities. In contrast, the variables measuring university quality, for a given capacity, do not appear to affect the choice of where students attend school abroad. Job returns thus seem to dominate in the host-country choice of foreign students.[16] The

TABLE 3. Maximum-Likelihood Tobit Estimates: Determinants of the Log Number of Foreign Students in Host Countries, by Asian and non-Asian Sending Countries, 2003

	Non-Asian		Asian	
Host-country variable	**NIS-P**	**OWW**	**NIS-P**	**OWW**
Log skill price	1.36	1.73	1.95	2.32
	(2.23)	(2.31)	(3.02)	(2.96)
Log total number of universities	2.21	2.03	2.21	2.18
	(3.55)	(3.14)	(3.57)	(3.41)
Any ranked universities	−0.904	−0.895	2.41	2.49
	(0.23)	(0.23)	(0.66)	(0.68)
Average rank of ranked universities	0.0158	0.0145	−0.00639	−0.00685
	(0.55)	(0.51)	(0.24)	(0.26)
English an official language of the country	−2.41	−2.45	−3.24	−3.16
	(1.66)	(1.69)	(2.06)	(2.02)
Log of country population	−0.793	−0.639	−0.531	−0.515
	(1.33)	(1.04)	(0.90)	(0.85)
Pseudo R^2	0.174	0.174	0.211	0.209
Number of host countries	157	156	157	156

Source: For the dependent variable, UNESCO.

Note: Numbers in parentheses are absolute values of asymptotic *t*-ratios. Specification also includes primary school and secondary school pupil-teacher ratios.

set of skill-price point estimates suggests that increasing a host country's skill price by 10 percent would increase the stock of students by 14 to 17 percent for non-Asians and by 20 to 23 percent for Asian students. Asian students thus appear to be more sensitive to returns than non-Asian students, although the difference is only significant at the 10 percent level.

Finally, the set of variables appears to explain why the stock of foreign students is so much larger in the United States than in other host countries. Inclusion in the specification of a dummy variable for whether the host country is the United States (not shown) does not increase the explanatory power of the specification: the dummy variable coefficient is statistically insignificant. The estimates thus suggest that the United States is an attractive destination for international students because its labor market pays a premium for skills and because there is a large number of U.S. universities. Indeed, the United States has more universities than any other country, by a factor of 3.5 over the country with the next highest total number (Japan).[17] The U.S. dominance among foreign students is evidently not explained by university quality (which is also higher than elsewhere based on the ranking data); neither is it due to the United States being an English-speaking country. The estimates suggest that, everything else remaining the same, students avoid countries in which English is an official language. This is even more true of Asian students.

How Many U.S. Foreign Students Stay? Determinants of the Return Rates of U.S. Foreign Students

A full assessment of the effects on sending countries of students studying abroad requires information on the return rates of foreign students. On the one hand, if no students return, then the phenomenon of "external" education clearly represents a net loss of human capital, or potential human capital, for the sending country. On the other hand, if all students return, then the stock of students studying abroad represents a net gain in human capital for the sending country, subsidized by the host countries. The number of foreign-trained students who return to the home country, R_j, is

$$R_j = (1 - r_j)m_j, \tag{14}$$

where r_j is the fraction of students from j who remain in the host country and m_j is the stock of students from j in the host country. We would like to know both the magnitude of r_j and what determines its variation across countries.

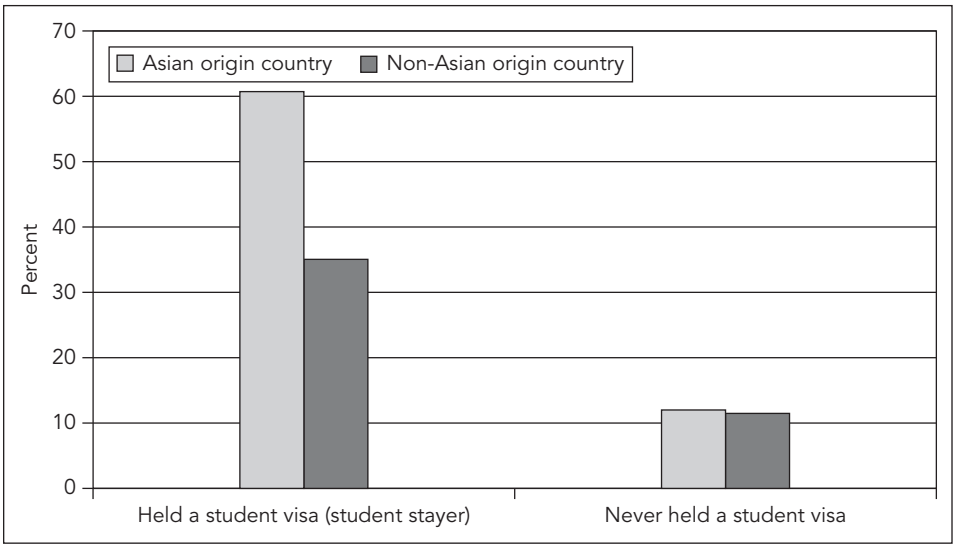
To compute return rates of foreign-trained students, we need to know how many persons who ever came as a foreign student are represented in the stock of permanent immigrants—that is, the number of student stayers. Census data provide information on the stock of foreign-born persons, but these counts contain unknown proportions of persons who are not permanent immigrants (including students). Only three countries in the world with significant inflows of immigrants provide nationally representative information on permanent immigrants: (1) the Longitudinal Survey of Immigrants to Australia (LSIA2), which sampled approximately 10 percent of primary applicants age 15 and over who became new immigrants and who entered

Australia in the one-year period from September 1999 to August 2000, (2) the Longitudinal Survey of Immigrants to Canada (LSIC), a sample of 20,000 immigrants who settled in Canada between October 2000 and September, and (3) the U.S. New Immigrant Survey (NIS), which sampled 4.3 percent of all persons 18 and over who were admitted as permanent resident aliens in the seven-month period from May through November 2003.

A major shortcoming of both the LSIA2 and the LSIC for this purpose is that both surveys only sampled *new-arrival* immigrants, meaning those who were outside of Australia or Canada prior to being admitted. These two surveys thus exclude anyone who adjusted his or her status from a student visa. Thus it is not possible to estimate the number of student stayers in either Canada or Australia. The NIS, however, sampled all immigrants who attained permanent residence status, including those who adjusted their status and thus were already residing in the United States. The NIS also includes a complete history of visits by each immigrant to the United States, including the visa held at each visit, prior to becoming a permanent resident alien. Thus it is possible for the first time to identify U.S. student stayers—those permanent immigrants who ever held an F-1 (student) visa.

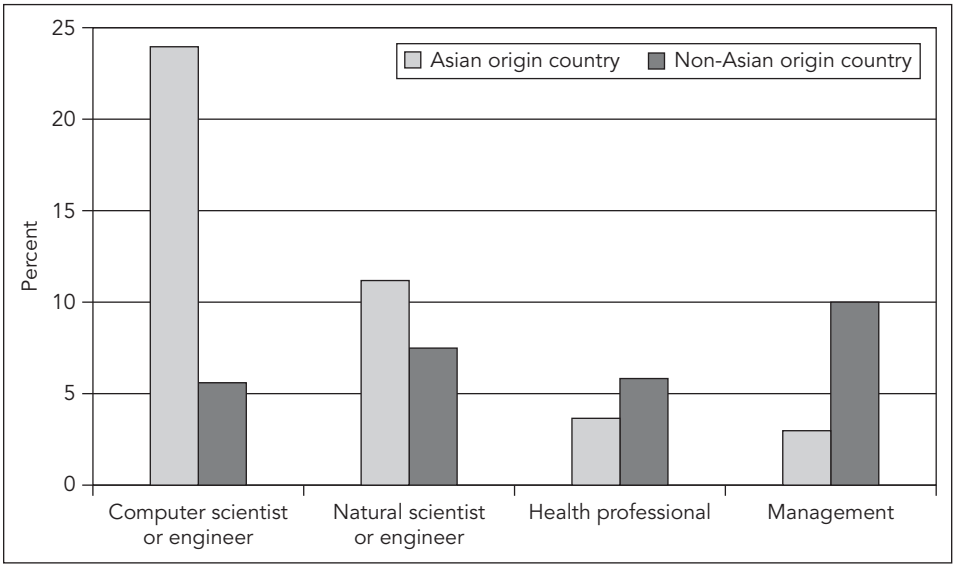
Student stayers constitute about 6 percent of the total immigrant cohort sampled by the NIS.[18] The NIS data indicate that student stayers are indeed highly educated. Figure 5 displays the proportions of Asian- and non-Asian-origin student stayers who have postgraduate schooling, with a comparison to the rest of the immigrant cohort: 63 percent of the student stayers from Asia have postgraduate training, compared with 33 percent for non-Asian student stayers and only 11 percent for all other immigrants. Student stayers from Asia are also highly concentrated in science and engineering.

FIGURE 5
Percentage of New Permanent U.S. Immigrants with Postgraduate Training in 2003, Student Stayers and All Other Immigrants, by Region of Origin



Source: Author's calculations based on NIS data.

FIGURE 6
Occupational Distribution of Student Stayers: New U.S. Permanent Immigrants in 2003 Who Had Held a Student Visa, by Region of Origin



Source: Author's calculations based on NIS data.

Figure 6 shows that 23 percent of Asian-origin student stayers are computer scientists or computer engineers and another 12 percent are natural scientists or engineers. This compares with the 6 and 8 percent of non-Asian-origin student stayers in those occupational categories. Non-Asian-origin stayers are, however, significantly more represented in the management occupational categories. The figure also shows that very few student stayers from either set of countries are health professionals.

As figures 5 and 6 clearly show, origin countries are losing some talent to the United States as a consequence of outsourcing tertiary schooling. The questions we now address are how much talent is lost, what sending-country characteristics determine who stays, and which countries lose the most talent? Only one prior study has attempted to estimate the stay rates of students for the United States (Bratsberg 1995), using published statistics on immigrant and nonimmigrant students. However, that study uses an incorrect numerator and an incorrect denominator, resulting in estimated stay rates that are too low. In particular, Bratsberg estimates student stayers by using counts of immigrants who directly adjusted their status from student to immigrant. However, according to the NIS, only 30 percent of immigrants who once held student visas adjusted directly from student to immigrant. Bratsberg's student stayer counts are thus substantially too low. For the denominator, Bratsberg uses the number of student visas issued annually by the Immigration and Naturalization Service. This set of statistics overestimates the size of student cohorts. The reported numbers are counts of border crossings by students. A student who travels home for two holidays a year is counted three times, for example. Comparing the visa counts from the Immigration and Naturalization Service and the number of student visas

issued from the State Department in recent years, one finds that the former are about double the actual number of student visas issued annually by the State Department.

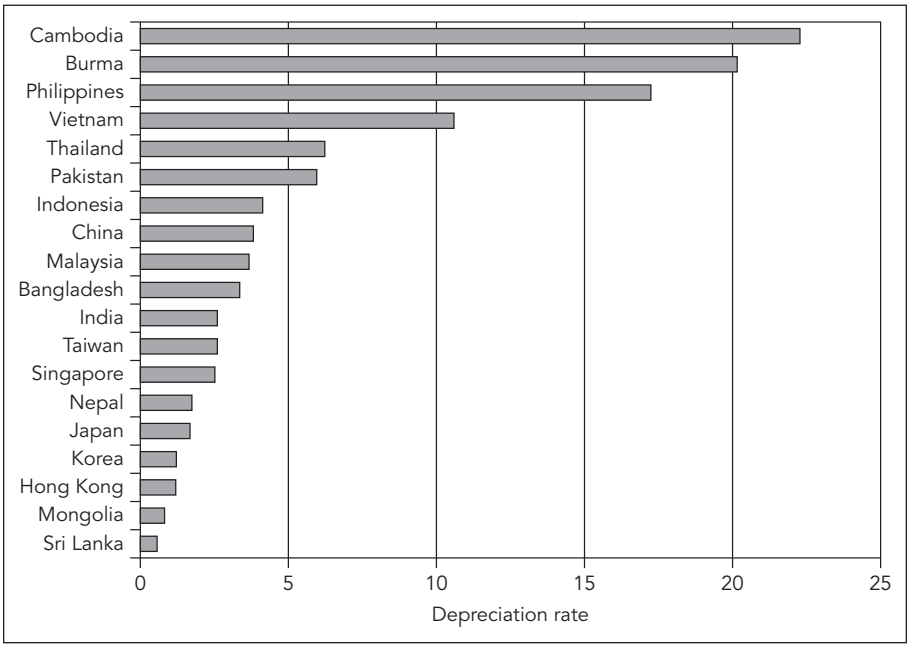
Using the (appropriate) NIS student stayer counts and the SEVIS information on country-specific stocks of students, we can construct the "depreciation" rate of the stock of students from a country j, r_j, as the ratio of student stayers to the stock of U.S. students. We use the stock data on foreign students rather than annual flow data because, as noted, the State Department flow data on student visas exclude students from Canada (a major source of U.S. foreign students and student stayers), and the stock data smooth variations across years in student flows. The combined data indicate that the average student stay or depreciation rate, r, weighted by the stock of students per country, is 4.7 percent: 2.7 percent for Asian-origin countries and 6.6 percent for students from countries outside of Asia. These rates may seem low, but they are relative to the stock of students. If, say, there are five cohorts in the population of foreign students, these rates would be multiplied by five to obtain probabilities that a student in a single entry cohort of students did not return, which would be about 20 percent (13.5 and 33 percent, for Asian and non-Asian countries, respectively). The flow of students per year to the United States is about 250,000; the (NIS) estimated count of about 50,000 student stayers from a cohort of immigrants thus suggests a stay rate of 20 percent.

As expected, this figure is higher than the lower-bound rate of 13 percent obtained by Bratsberg using a too-small numerator (only those who immediately adjusted from a student visa to a permanent visa) and an inflated denominator (student border crossings).

Although the estimated depreciation rate is lower overall for students from Asia, the rates vary widely across countries within Asia. Figure 7 displays the estimated depreciation rates for the stock of foreign students for 19 Asian countries. As can be seen, Cambodia, Burma, and the Philippines have the highest rates of stay of all of the countries: 18 to 22 percent of student stocks from these countries become U.S. permanent immigrants each year. In contrast, only about 2.5 percent of the stock of students from India, Taiwan (China), and Singapore "depreciate" each year. Although these three countries have similar stay rates, they obviously are very different in other dimensions (that is, skill prices), so it is difficult to discern from figure 7 what accounts for the country-specific patterns of stay rates.

Table 4 reports estimates of the determinants of the log of return rates, $1 - r_j$, of U.S. foreign students across 136 sending countries. The specification in columns 1 and 3 is similar to that determining the stock of U.S. foreign students, except that GDP per adult-equivalent is excluded, as financing costs should not be a significant factor for the decision to return. Indeed, as seen in the table, the distance of the United States to the home country is not a significant factor in explaining return rates, even though it evidently does significantly deter studying abroad. The key finding from table 4, however, is that student return rates are significantly higher when the net economic gain from remaining in the host country is lower. That is, return rates are higher for countries with higher skill prices. The point estimates indicate that doubling a country's skill price increases the return rate by 1.5 to 1.9 percent. Note that the return rates relative to the stock of students are, on average, more than 95 percent, so

FIGURE 7
Estimated Annual Student "Depreciation" Rates for 19 Asian Countries



Source: Author's calculation based on NIS and SEVIS data.

these effects are relatively large: doubling the skill price decreases the stay rate, relative to the stock, by 32 to 41 percent. None of the other factors included in the specification, which did affect student out-migration, appears to be a significant determinant of return rates, except perhaps whether English is an official language of the sending country, for which English-language schooling may be more relevant. However, Asian students are more likely to return than students from other countries, even net of skill prices.

To assess whether the significance of the Asian dummy variable reflects the relative openness of Asian countries, for which foreign training in English may be valuable, or the relatively high growth rates in those countries, which might affect a student's expectations of future returns to education, we also include in the specification the "openness" measure from the World Tables and the average growth rate in the prior five years, computed over the period 2000–04 (Heston, Summers, and Aten 2002). The estimates from the augmented specification are reported in columns 2 and 4 of table 4. As can be seen, including these variables increases the statistical significance and magnitude of the Asian (and the skill-price) effect, and neither variable is itself statistically significant.

The estimates of skill-price effects from tables 2 and 4 can be combined to obtain an estimate of the elasticity of the stock R_j of foreign-trained students in the home country to the country's skill price. Taking logs of both sides of equation 14, and noting that the specifications of the estimating equation are in logs, yields the following:

$$\text{(15)} \qquad \text{dlog}R_j/\text{dlog}\omega_j = \eta_m + \eta_{(1-r)},$$

TABLE 4. Determinants of the Log Return Rate of Foreign Students in the United States in 2004

	NIS-P		OWW	
Origin-country variable	**(1)**	**(2)**	**(3)**	**(4)**
Log skill price	0.0152	0.0165	0.0193	0.0219
	(2.31)	(2.01)	(3.61)	(3.76)
Log total number of universities	0.00717	−0.00225	0.00623	−0.00478
	(0.91)	(0.31)	(0.81)	(0.68)
Any ranked universities	−0.0368	−0.0156	−0.0233	−0.00429
	(1.28)	(0.45)	(0.85)	(0.14)
Average rank of ranked universities $(\times 10)^{-3}$	0.315	0.204	0.168	0.0644
	(1.75)	(1.04)	(0.98)	(0.38)
English an official language of the country	0.0424	0.0324	0.0372	0.0300
	(1.97)	(1.57)	(1.77)	(1.60)
Log distance of country to the United States	0.00163	0.00062	0.00237	0.00121
	(0.52)	(0.20)	(0.75)	(0.40)
Asian country	0.0456	0.0505	0.0458	0.0525
	(3.23)	(3.26)	(3.16)	(3.37)
Average country growth rate, 2000–04		0.00572		0.138
		(0.03)		(0.67)
Percentage of total trade to GDP		−0.00013		−0.00019
		(1.04)		(1.56)
R^2	0.183	0.214	0.202	0.236
Number of sending countries	136	136	136	136

Source: For dependent variable, U.S. SEVIS and NIS.

Note: Numbers in parentheses are absolute values of *t*-ratios. Specification also includes primary school and secondary school pupil-teacher ratios. Observations are weighted by the country-specific stocks of students.

where η_m is the estimated skill price coefficient in table 2 for the country's stock of students obtaining training in the United States and $\eta_{(1-r)}$ is the estimated effect of log skill price on log return rate. The combined estimates of equation 15 are −0.24 (NIS-P) and −0.71(OWW). These estimates imply that, on net, higher skill-price countries, even though their foreign-trained students are more likely to return, have smaller stocks of foreign-trained students (per capita) in their economies than do lower skill-price countries, because fewer of their students travel abroad for schooling. Thus, even though more foreign-trained students do not return to low skill-price countries compared with high skill-price countries, the subsidies to schooling in host countries evidently flow disproportionately to countries with low skill prices.

Conclusions

This paper has considered a neglected component of the international mobility of skilled individuals: the supply of schooling to the foreign-born in high-income countries. We have shown that much of the mobility of students can be explained by the

same factors that explain international migration in general: the search of workers for jobs at better pay. Student out-migrate more from low-income countries and select host countries with the highest skill prices. However, student outflows also respond directly to domestic investments in higher education. The results indicate that upgrading the quality of higher education reduces student outflows, but that increasing the number of colleges and universities per capita, on average, increases the outflow of students for foreign (postgraduate) training. This results from the fact that increasing the number of college graduates increases the population of workers who benefit more from migrating to high skill-price countries.

The most important feature of student mobility is that a large fraction of students schooled abroad return to their home country, and this is especially true of students from Asian countries. And while the return rates of foreign-trained students are lower for low-wage countries, such countries have larger domestic populations of foreign-trained graduates, because they export more students, compared with high-wage countries. The subsidization of foreign students in high-income countries thus goes disproportionately to students from low-wage countries.

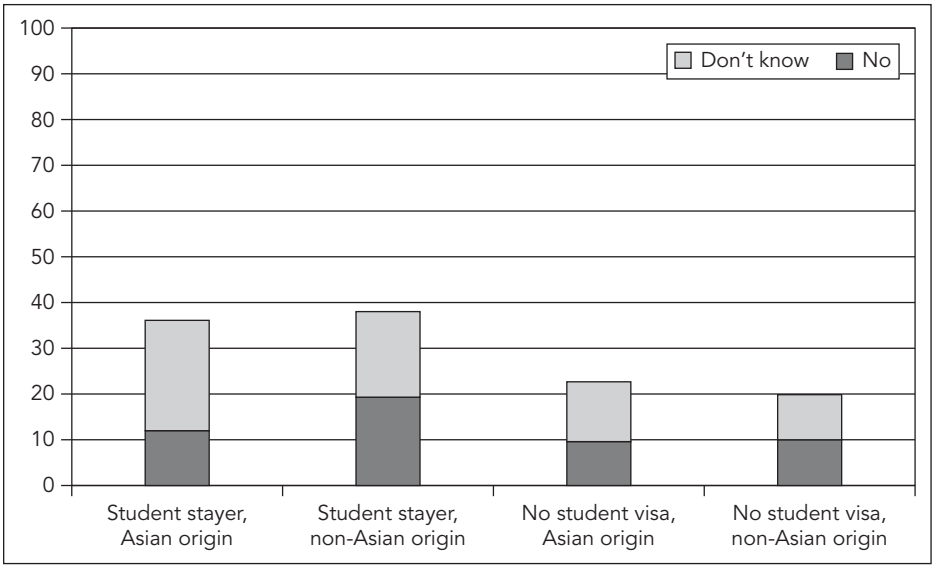
Even though low-income countries appear to be net beneficiaries of the international circulation of students, some may worry about two issues related to the international circulation of students. First, the individual beneficiaries of foreign schooling are likely to be among the high-income elite within a country. Tuition and travel costs are high for obtaining schooling abroad relative to domestically, and most foreign schooling is self-financed, although subsidized at the same rate as education for host-country students. This is consistent with the finding that richer countries that reward skills at the same rate as poorer countries send more students abroad. Given the large number of nonselective colleges and universities in host countries, it is not clear that this allocation mechanism provides education resources to a sending nation's best and brightest. A country experiencing or considering the outsourcing of higher education may wish to provide a scholarship program based on merit and need in order to maximize the returns to schooling investments.

A second problematic aspect of the outsourcing of higher education is the 20 percent elite from low-income countries who are "captured" by high-income countries. There is evidence, however, that return rates of students are higher than those indicated by examining the conversion of students to immigrants. A significant proportion of "permanent" immigrants eventually return to their home country. The NIS provides some indication of this. A random sample of the new immigrants were asked the question, "Do you intend to live in the United States for the rest of your life?" Figure 8 reports the fraction answering "no" or "not sure" for student stayers and the rest of the immigrant cohort, by area of origin (Asian and non-Asian).

More than a third of the student stayers either do not intend to stay or are not sure about staying compared with about 20 percent of the other immigrants. A higher fraction of the student stayers from Asia are uncertain about staying, no doubt reflecting the uncertain prospects (the sustainability of growth rates, for example) of the region.[19]

Finally, it is important to note that, although student stayers are very skilled, particularly those from Asia, we do not know, given existing data, how the students who

FIGURE 8
Distribution of Responses of New U.S. Immigrants in 2003 to the Question, "Do You Intend to Live in the United States for the Rest of Your Life?" by Prior Visa Status and Region of Origin



Source: NIS data.

do not return to their home country compare with the students who do. Nor do we know the number of persons in low-income countries who have received training abroad, which is needed to characterize more accurately the net brain drain from low-income countries. Most important, we know little about the contribution of externally obtained higher education compared with domestically obtained education in contributing to a country's development. Higher education policies in countries with low skill prices, however, cannot be appropriately formulated without paying attention to the causes of and returns to the out-migration of students seeking higher education and higher-paying jobs.

Notes

1. The largest proportion of permanent immigrants in the United States obtained a visa by marrying a U.S. citizen. There are no country or overall ceilings on this class of visa. We discuss below how U.S. student "stayers" become permanent immigrants.
2. U.S states spend an estimated $50 billion a year on higher education (Kahlenberg 2004). Even in a relatively poor country in Europe—Spain—80 percent of college and university budgets are funded from government sources (Calero 1996).
3. The model assumes that there is only one schooling decision: the decision to obtain a unit of schooling. Of course, schooling decisions are more complex and take place over the life cycle—opportunities for higher levels of schooling and for jobs abroad requiring high levels of schooling affect decisions about schooling prior to those associated with tertiary education.
4. There were 5.5 million applicants for the 2007 diversity lottery; there are approximately 25,000 winners (50,000 visas allocated to winners and their immediate family).

5. The "diversity" lottery is designed to provide opportunities to immigrate for persons from countries that are overrepresented in U.S. immigrant streams. A country's eligibility thus depends on the number of immigrants from that country in prior years. Populous countries are thus penalized, ceteris paribus.
6. It is possible to relax the linearity assumption for schooling, allowing β to vary by schooling level. However, given the limited sample sizes of the data used here, it is not possible to identify country-specific returns to schooling (one cannot reject, with the data, the hypothesis that returns to schooling differ by country).
7. Specifically, the wages computed using exchange rate information and country-specific calibration with lexicographic imputation are used.
8. Returns to occupations and industries are assumed here to be the same across countries. With additional rounds of the OWW data, and assumptions about the time-country invariance of payment structures, it may be possible to identify relative country-specific occupational or industrial skill effects.
9. In fact, the results reported below are similar if the State Department's information on visas is used instead of the SEVIS data.
10. www.timeshighereducation.co.uk.
11. To capture school quality for schools below the tertiary level, all specifications include variables measuring the ratio of pupils to teachers in primary and secondary schools, from Barro and Lee (1993), as well as dummy variables indicating whether these variables are missing for a country. The two school "quality" measures are not individually or jointly significant in any of the specifications.
12. For the NIS-P estimate, this is $-1.18 + 0.00842*118$; the OWW estimate is $-1.49 + 0.00983*118$.
13. This result is robust to the inclusion of a variable measuring the fraction of the country's labor force that has at least some college. That variable has no significant independent effect on student presence in the United States, and its inclusion does not alter significantly any other coefficient.
14. There appears to be more comprehensive coverage for this year than for subsequent years.
15. UNESCO truncates the numbers below 400; that is, if the total number of foreign students is less than 400, the number is not reported and is set to zero.
16. It is possible that only the rank and existence of the very top universities in host countries matter. Replacing the ranked criteria and mean rank for universities in the top 100 or top 50 rather than the top 200 does not change the results: having top-quality universities does not matter for student choice of country.
17. The United States does not rank high, however, in universities per capita worldwide. The estimates suggest that absolute numbers of universities matter, as population size, given university totals, does not have a statistically significant (negative) effect on student stocks.
18. What are the principal routes by which U.S. foreign students become permanent immigrants? Rosenzweig (2006), using the NIS, shows that 56 percent of the student stayers became permanent immigrants by marrying a U.S. citizen and another 21 percent did so by obtaining a "skilled" employment visa. These proportions are, respectively, double and seven times the proportions for immigrants who were not formerly U.S. students, more than half of whom obtained a visa based on kinship (other than marriage) with a U.S. citizen or immigrant.
19. How reliable are these data on intentions? At this stage we do not know. However, the second round of the NIS, scheduled to be in the field in summer 2007, tracks all persons from the original entry cohort. It will thus be possible to assess whether the question regarding intentions predicts actual emigration.

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Comment on "Higher Education and International Migration in Asia: Brain Circulation" by Mark R. Rosenzweig

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The new growth literature has stressed the role of human capital for economic development. Hence, the emigration of skilled workers is usually blamed for depriving developing countries of their most talented workers (see Bhagwati and Hamada 1974).[1] This view has been challenged by a new literature putting forward multiple positive feedback effects for sending countries. However, the empirical literature on the consequences of the brain drain remains quite poor. In particular, due to data limitations, existing empirical studies are based on cross-sectional regressions and suffer from the bias of omitted variables and unobserved heterogeneity, small sample size, and the difficulty of solving potential endogeneity problems. Given the rising gap in wages and the differing demographic futures in developed and developing countries, it is crucial at this stage to extend the empirical research on the causes and consequences of skilled migration.

Mark Rosenzweig's paper is an interesting and stimulating step in that direction. Using original data on U.S. immigrants and wage differentials across countries, it sheds light on the mechanism through which skilled migration affects the education decisions of natives from developing countries: migration prospects induce student migration and subsequent returns, which potentially benefit poor countries. Is this mechanism dominant? Can it cause a brain gain for sending countries? What are the policy implications? These are the questions addressed in my comments.

The Brain Drain: A Crucial Development Issue

Before turning to these issues, it is worth noting that the brain drain is quantitatively important in many developing countries. In Docquier and Marfouk (2006), we provide a comprehensive data set on international skilled emigration to the Organisation

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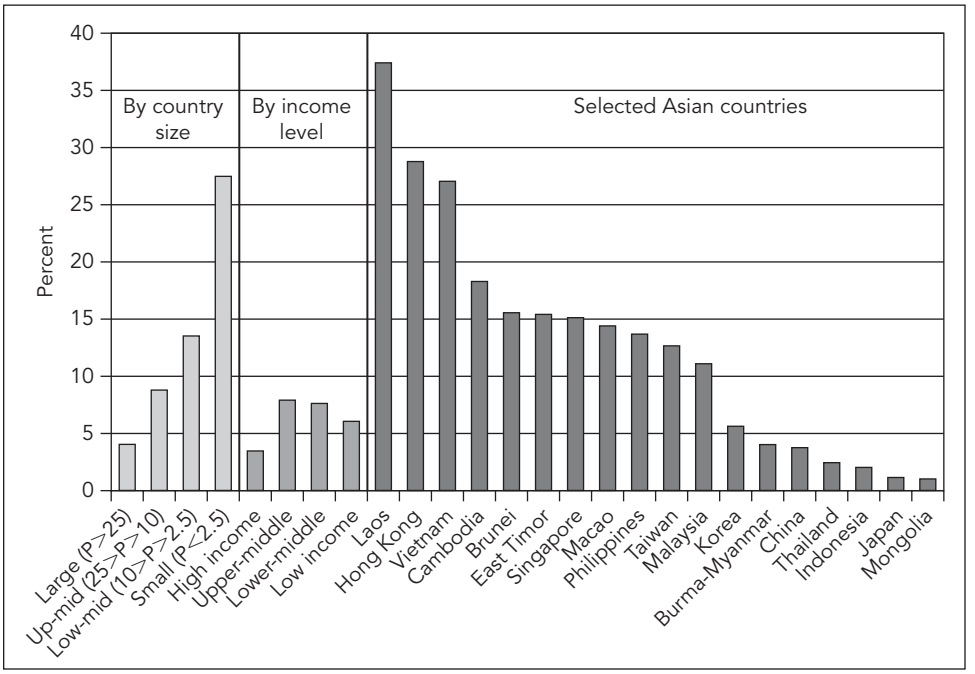
Annual World Bank Conference on Development Economics 2008, Regional

FIGURE 1
The Brain Drain, by Country Group, 2000



Source: Docquier and Marfouk (2006).

for Economic Co-operation and Development (OECD) countries. Skilled migrants are defined according to their country of birth, regardless of where they acquired their education. The loss varies strongly across countries. A brief cross-country comparison reveals that the rate of emigration of skilled workers, m, ranges from 0.5 to about 90 percent, usually far above the rate of emigration of unskilled workers. Figure 1 gives the average rate for different country groups and select Asian countries in 2000.[2]

The highest emigration rates are observed in small, middle-income countries where people have incentives to emigrate and can afford to pay moving costs. Both high-income countries (where incentives are low) and, to a lesser extent, low-income countries (where liquidity constraints are more binding) exhibit lower emigration rates. The apparent pattern is therefore that of an inverted U-shaped relationship between income levels and migration. The most affected regions are the Caribbean and Pacific Islands, Sub-Saharan Africa, and Central America. In Southeast and Eastern Asia, the brain drain ranges from about 1.5 percent in countries such as Mongolia or Japan to 37 percent in Laos. It amounts to 4 percent in China.

From Brain Drain to Brain Gain

The recent literature puts forward positive feedback effects of the brain drain on sending countries, in the form of remittances, return migration, diaspora externalities, quality of governance, and increasing returns to education. In particular, several

contributions demonstrate that skilled migration can create more human capital ex ante than the ex post loss in developing countries, turning the brain drain into a brain gain.

The number of skilled residents in a country, L^h, is equal to the number of skilled natives, N^h, minus the proportion of them who left the country, m: $L^h = N^h(1 - m)$. The visible part of the problem is $(1 - m)$. However, in poor countries where education is stimulated by migration prospects, we also have $N^h = N(m)$ with $N' > 0$. When education is a passport to emigration, the prospect of migration to high-wage countries creates additional incentives to invest in human capital. If migration is probabilistic, in that people are uncertain about their chances of future migration when they make education decisions, then the brain drain can be turned into a gain for the source country, that is, an increase in m generates ambiguous effects on L^h.

Mark Rosenzweig's paper offers an original interpretation of this incentive mechanism, stressing the role of student migration, skill-price differentials, and return migration. His analysis builds on survey data on U.S. immigrants. This data set provides information on the origin of foreign students and immigrants in the United States, including, for the latter, the place where education was acquired. His argument is that the prospect of emigration also affects the decision about where to study, which itself affects the probability of getting a job abroad. The main insights for developing countries are as follows:

- *Assumption.* Domestic education gives rise to a very low probability of emigration, while foreign education significantly increases the probability of staying in the host country.
- *Result 1.* The lower the skill price in the country of origin, the higher the incentive to study abroad. Ceteris paribus, students choose host countries with high skill prices.
- *Result 2.* Some students return with foreign certificates. Return rates to countries with low skill prices are lower.
- *Result 3.* Countries with low skill prices send more students abroad and exhibit lower return rates. Combining estimated elasticities for these two effects, the number of returnees is ceteris paribus higher for countries with low skill prices: such countries disproportionately accrue a net brain gain from the outsourcing of tertiary education.

These empirical results strongly rely on preliminary estimates of country-specific skill prices. Indeed, the magnitude of the coefficients is sensitive to the skill-price estimate, although their sign is robust. Two sources are used, the New Immigrant Survey Pilot (NIS-P) and the Occupational Wages around the World (OWW) data sets. The number of observations in the NIS-P is small (332 observations for 54 countries, that is, about six observations for each country, on average) and subject to possible selection biases. The OWW provides average wage rates by country and occupation in 1995: estimating skill prices requires assumptions such as a constant occupational wage structure across countries.[3]

Can Education Abroad Be a Source of Brain Gain?

In the recent literature, the impact of the brain drain on the country of origin is usually captured by its effect on the proportion of educated persons among all residents. This literature disregards the place where education is acquired. Natives have heterogeneous ability to become educated, and the proportion of those who opt for education depends on the return to schooling and its cost. Implicitly, it is demonstrated that the prospects of skilled emigration affect the critical agent, who is indifferent between investing or not investing in human capital. The incentive is likely to be stronger in countries with low skill prices (or higher returns to migration). However, liquidity constraints are likely to be more binding in poor countries. Hence, the effect of migration prospects on education investments can be stronger or weaker in poor countries. Mark Rosenzweig's analysis endogenizes the choice of the country of training and the probability of getting a job abroad by introducing student migration.

A necessary condition for student migration to increase the proportion of educated persons is that the possibility of being educated abroad must affect the cutoff level of ability above which education is optimal. In other words, some individuals with relatively low levels of ability must choose to emigrate as students, while they could not afford or would not have incentives to go to school in their home country. If migration costs are high and the probability of staying is not too high, such a configuration becomes highly implausible. Hence, the migration of students is likely to be observed among students with the most talent or from the wealthiest families, that is, those who would have chosen to pursue an education in their home country as a second-best option. In such a case, there is no incentive effect. Education abroad does not affect the ex ante number of students, but it increases the probability that some of them will never return. Education abroad reduces the proportion of educated residents in the country of origin.

On this point, it would be interesting to extend the simple theoretical model depicted in the paper by endogenizing the decision to educate. The model would also be clearer if the decision to return were dealt with explicitly.[4]

What happens if the quality of education is heterogeneous? Suppose the quality of education abroad is higher. Return students can thus improve the quality of human capital in their home country.[5] Suppose M is the number of student migrants, τ is the staying rate, and returnees come back with ρ percent more efficiency units of human capital than local graduates. The flow of human capital associated with return migration amounts to $M(1 - \tau)(1 + \rho)$, which is higher than the initial loss M if $\rho > \tau/(1 - \tau)$. Mark Rosenzweig reports that the average value for τ is 20 percent. Such a staying rate is surprisingly low,[6] although it does not necessarily mean that 80 percent of foreign graduates return to their country of origin. A doctorate obtained in the United States allows the graduate to find a well-paid job in another industrial country.

Is ρ sufficiently large to compensate this loss (on average, if the return rate amounted to 80 percent, we would need $\rho > 0.25$)? Using the International Adult Literacy and Skills Survey (IALSS), a recent Canadian study, shows that workers of different origins with similar certificates perform heterogeneously. For each country of origin, Coulombe and Tremblay (2006) have estimated the "schooling gap,"

a measure of the quality of education in deviation from the Canadian benchmark. The schooling gap measures the additional years of schooling that a graduate from a given country should obtain to perform at the same level as a Canadian graduate with the same certificate. The average schooling gap of Canadian immigrants amounts to three years of schooling, but country-specific gaps range from minus one to seven years. There is a strong correlation between the schooling gap and variables such as the country's level of development and whether English or French is the official language. Although the estimates based on immigrant population can be subject to selection biases, it is highly plausible that the schooling gap between local and foreign certificates exceeds 25 percent for many countries of origin. Hence, if return rates are high and if returnees are not negatively self-selected compared to stayers, it is plausible that a qualitative brain gain emerges, although the number of skilled residents does not increase at origin.

Finally, the outsourcing of tertiary education partly reduces the fiscal burden supported by the country of origin. Nevertheless, the data show that many student migrants leave with a secondary diploma or more, meaning that those who stay permanently in the host country impose an important fiscal cost on their country of origin.

Comparison with Previous Studies

A new empirical literature on the consequences of the brain drain is emerging. Many papers relying on the data set developed in Docquier and Marfouk (2006) have estimated the impact of skilled migration on economic performance. In Beine, Docquier, and Rapoport (2006a), we find evidence of a positive effect of skilled migration prospects on gross (premigration) human capital levels in a cross section of 127 developing countries. Controlling for the endogeneity of emigration rates, we obtain an elasticity of human capital growth (log change in the proportion of tertiary skilled among natives) to skilled emigration prospects in the neighborhood of 5 percent. This effect is very stable across specifications and estimation methods. Globally, within the limits of a cross-sectional analysis, our results point to a robust, positive, and sizable effect of skilled migration prospects on human capital formation in developing countries.

However, more mitigated results emerge when human capital is measured by school enrollment rates (see Beine, Docquier, and Rapoport 2006c). In that case, results depend on the specification used. Under some specifications, the effect of skilled migration becomes significant, with a negative impact on tertiary schooling and a positive impact on secondary schooling. A first explanation could be that school enrollment data raise more measurement problems than human capital stock data (as the latter result from an aggregation of flows and therefore are less subject to periodic noise and measurement errors). A second explanation is that skilled migration prospects lead more students to invest in secondary schooling at home in order to buy and then exercise the option of completing their education abroad. Such an interpretation exactly matches Mark Rosenzweig's mechanism.

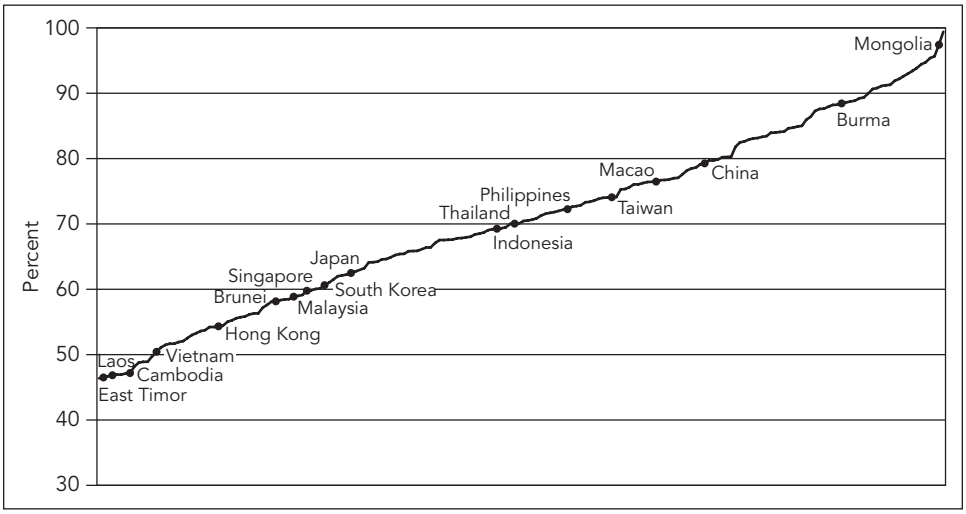
Divergence from Previous Studies

Mark Rosenzweig assumes that the quality of domestic education is not high enough to increase significantly the probability of migration. From that hypothesis, we expect that (a) many permanent U.S. skilled immigrants have U.S. certificates and (b) the migration rates of those who leave after their schooling should not affect human capital formation at home.

We address these issues in Beine, Docquier, and Rapoport (2006b), collecting census data on immigrants' age of entry as a proxy for where education has been acquired. Data on age of entry are available from a subset of receiving countries, which together represent more than 75 percent of total skilled immigration to the OECD. Using these data and a simple gravity model, we estimate the age-of-entry structure of skilled immigration to the other OECD countries. This allows us to propose alternative measures of the brain drain by defining skilled immigrants as those who left their home country after age 12, 18, or 22. Obviously, an approach based on census data is not perfect. As Rosenzweig (2005: 9) explains, "Information on entry year . . . is based on answers to an ambiguous question—in the U.S. census the question is, 'When did you first come to stay?' Immigrants might answer this question by providing the date when they received a permanent immigrant visa, not the date when they first came to the U.S., at which time they might not have intended to or been able to stay."

Focusing on skilled emigration to the OECD countries, figure 2 gives the proportion of migrants with postsecondary education who left their country after age 22. The proportion ranges from 45 to 99 percent. The proportion is quite high in large countries such as China (76 percent), India (79 percent), and Indonesia (69 percent).

FIGURE 2
Percentage of Migrants with Postsecondary Education Who Left Their Country of Origin for an OECD Country after Age 22



Source: Beine, Docquier, and Rapoport (2006b).

This suggests that a vast majority of skilled immigrants were not educated in their host country. It is worth noting that Mark Rosenzweig reports that only 6 percent of the total immigrant cohort sampled by the New Immigrant Survey are student stayers. Hence, skilled migration prospects remain important for workers with domestic certificates.

Is the incentive effect significant when student migrants are eliminated from the data set? Empirical tests of the incentive effects based on corrected emigration rates and natives' stock of human capital (eliminating those who left before age 12, 18, or 22) confirm the incentive mechanism.[7] Finally, Beine, Docquier, and Rapoport (2006b) also find a positive effect of skilled migration on youth literacy, an alternative measure of natives' human capital investment, which is based on the population ages 15–24 residing in the country of origin. Consequently, it seems unclear a priori whether the incentive effect obtained in cross-sectional studies is dominated by student migration or local education responses.

Policy Issues

Finally, it would be instructive to conclude the paper with a few policy recommendations. In the face of the brain drain, what is the optimal education policy at origin? What attitude should the local government adopt toward the outsourcing of tertiary education? Should the government encourage tertiary students to emigrate? What is the optimal allocation of public funds between secondary and tertiary education? These are some policy issues raised by Mark Rosenzweig's analysis.

Notes

1. Another negative aspect of the brain drain is that it can induce shortages of manpower in certain activities, for example, when engineers or health professionals emigrate in disproportionately large numbers, thus undermining the ability of the country of origin to adopt new technologies or deal with health crises.
2. Income groups follow the World Bank classification.
3. Averaging relative occupational wages over the 1990s (choosing one annual wage rate for the United States as numeraire) would probably increase the number of observations and smooth measurement errors.
4. From equation 3, we understand that P^A is an exogenous rate of return. Then, the same rate of return is considered as endogenous and estimated in table 4. It is implicitly due to the fact that individuals have heterogeneous migration costs.
5. Using Mark Rosenzweig's notations, it requires $\alpha\gamma > \beta$.
6. The 2003 report of the European Commission on science and technology indicators reveals that 75 percent of recent European recipients of a doctorate in science and technology who were trained in the United States stay after receiving their degree. This staying rate is increasing over time. In 1993, it amounted to 50 percent.
7. The more restrictive the concept of emigration, the lower the elasticity of human capital formation to the skilled emigration rate.

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Comment on "Higher Education and International Migration in Asia: Brain Circulation" by Mark R. Rosenzweig

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I thank the World Bank and Mr. Rosenzweig for allowing me to revisit an area of interest that, six months ago, I left for the neater, more structured world of banking. For at least 10 years, I grappled with the realities of labor migration, first as administrator of the Philippine Overseas Employment Administration and then as secretary for labor and employment. In my career as a public servant, these years stand out as among the most interesting because of the variety of issues they raised and the social and political implications for national policy. Even as we speak, the debate in my country continues relative to wages, working conditions, and the age-old problem of brain drain, among others, as they affect Filipino workers overseas.

Migration and Higher Education

Mark Rosenzweig's paper tells us a number of things:

- The permanent migration of students in developed countries temporarily hosting them for higher education proceeds from the same motivation as other kinds of migration: to take advantage of skill-price differentials.
- Student outflows may be minimized by improvements in the quality of higher education, but not necessarily by the expansion in the number of colleges and universities in the home country.
- Student migrants, particularly those from Asia, eventually return to their home country at a rate higher than the general universe of foreign students.
- Among the negative effects of foreign student stayers are the subsidization of richer (not necessarily the better and brighter) students from the lower skill-price

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Annual World Bank Conference on Development Economics 2008, Regional

countries and the capture of a portion of the educated elite from poorer countries by high-income economies.

- Scholarships should be made available on the basis of presumed academic merit, in tandem with the presumed ability of the more moneyed students in low skill-price countries to pay for their foreign education.
- Higher education policies in low skill-price countries should be formulated with attention to their effects on out-migration.

Before commenting on these observations, I provide some background on a subject with which I am more familiar: the Philippine migration experience.

Out-Migration: The Philippine Experience

The early movement of Filipinos to other countries may have begun with the galleon trade centuries ago. There are reported early settlers of Filipino origin in both Mexico and Spain. The *ilustrados* (mainly the educated and monied elite) studied in Europe in the 1800s, principally in Spain. A number of heroes and revolutionaries cemented their advocacies, ironically against the colonial power, right in the capital of the colonizers. A larger number of Filipinos went to Hawaii and the west coast of the United States in the early 1900s, mainly as fruit pickers and agricultural workers. After World War II, doctors and other professionals went to the United States for further studies and eventually stayed and became citizens.

It has been said of the Philippines that we were in a convent (Spain) for 400 years and in Hollywood (the United States) for 50, mirroring our colonial experience. It stands to reason that colonial history would become the signpost of future Philippine migration, even if more recent experience has diversified as a result of economic geography.

In the mid-1970s, the surge in income from oil opened new labor markets in the world. The Middle East, awash with petrodollars, required a massive infusion of manpower for the development programs of the various countries in the region. Labor migration became the new phenomenon, pulling in technical and professional personnel from neighboring countries at high skill prices, to use Rosenzweig's term. The Philippines, with its surplus of educated unemployed, easily matched the requirements of a fast-developing part of the globe.

Starting with demand of about 20,000 workers in 1974, this rose to 300,000 land-based workers and about 50,000 sea-based workers in 1984. In 1994 these figures went even higher to 565,000 land-based workers and 154,000 seamen. In 2004 the numbers rose to 704,000 land-based workers and 229,000 seafarers. In 2006 the figures indicated some 760,000 land-based workers and about 250,000 seamen for a grand total of more than a million workers. Of these numbers, 60 percent are rehires or people who have been contracted on a repeat basis, and 40 percent constitute new hires representing market expansion.

Of this number, professional and technical workers, including administrative and managerial staff, account for only 12.2 percent and presumably form part of the

possible universe of permanent migrants, which is the subject of our discussion today. In terms of destination, Saudi Arabia is on the top of the list, and the rest of the top 10 countries come from the Middle East, except Taiwan (China), Hong Kong (China), and Republic of Korea. The Americas and Europe as two separate regions account only for 4.7 percent of total deployment.

This temporary out-migration, also known as contract or labor migration, is the bigger subset of Philippine migration. But some part of labor migration, about 1 to 2 percent, turns into permanent migration. The smaller part of the outward movement of Filipinos is permanent migration, whose total from 1981 to the present comes to 952,604. This is less than the total for contract migration just for the year 2005. There is no record of student outflow, as this is a function of the issuance of specific visas, not passports or any other documents issued by the Philippine government.

The major countries of destination for permanent migrants (resettlement) are instructive and fit the template of Rosenzweig's model, that is, high skill-price countries. Leading the pack is the United States, followed by Canada, Australia, Japan, Italy, Germany, the United Kingdom, and New Zealand. As indicated earlier, Philippine passports do not carry specifications for their use—that is, either as contract worker or student. This is properly reflected in the visa granted by the host country. Thus Philippine statistics do not capture the intentions of the passport holder.

I maintain that Rosenzweig's findings for student migration also hold for contract migration and tourism turned permanent settlement. The shift from temporary migration (to include visas issued for work, study, and tourism) to permanent migration is a function of many factors. The skill-price differential is probably the most compelling reason. But for many Filipinos, cultural compatibility is also a major determinant. This explains why there are more Filipino permanent migrants in places like the United States, Italy, and Spain, even if temporary migration is significantly higher in a number of other places.

Students as Migrants

A United Nations study on student migration shows that foreign students in 2002 converged mostly on the United States, at almost 350,000, with almost half comprising Asian students. More than 100,000 were in Australia, about 80,000 were in the United Kingdom, and 80,000 were in Germany. The study also points out that, while Asian students mainly prefer Organization for Economic Cooperation and Development countries, more and more are getting their education in countries within the region. Linking foreign education with skilled migration, the study indicates that host countries regard foreign students as a reserve, potentially qualified migrant workforce.

A quick survey of Filipinos enrolled in Harvard and expected to finish in 1986 ($n = 17$) indicates that, as of January 2007, 15 were inside the Philippines and two were outside the country. One married a classmate from Brazil, and the other is a second-generation migrant whose parents have relocated to the United States. This would be 11 percent if both former students were counted and 5 percent if the

second-generation migrant was eliminated. This indicates a high rate of return from a universe whose marketable skills presumably would find easy acceptance in the U.S. market.

There is no local study as to the number of students turned permanent migrant in such destination countries as the United States, Canada, Australia, and possibly Japan. However, I do wish to offer a number of propositions.

- Foreign students studying in high skill-price countries come mainly from two categories: those who can afford to pay the higher tuition of foreign schools and those who have been able to pass the entry requirements and receive a scholarship, either from official development assistance or from funding provided by private donors such as foundations or organizations like religious groups, alumni associations, and others. They are the richest and the brightest.
- Some of them eventually become stayers.
- Many of these stayers eventually come home, as Rosenzweig indicates in his paper.
- Quality in local schooling may not deter migration decisions as much as the skill-price differential.
- Whether they return, stay for a while, or stay permanently, student mobility is mutually beneficial for the sending and the receiving country and for the migrant himself (or herself). In the end, given the magnitude involved, the global community benefits.

Let me make my case.

Those who are rich enough to pay higher tuition fees use essentially private funds for their academic stay. While this private investment may constitute a net loss to their home country if they become stayers, such an expense cannot be regulated unless it can be shown that the funds being used are ill-gotten or are being used for illegal purposes. Eventually, the richer students return to manage family businesses or institutions.

Those who are bright enough to receive a scholarship, usually provided by the host country, and who opt to stay, temporarily or otherwise, do not constitute a net loss for the host country either, because the skills are used for the benefit of the scholarship provider. It can be argued that the slot could have been given to somebody who would have opted to go back and who therefore would contribute to the development needs of the home country. This is a reasonable assumption, but anecdotal data in the Philippines also indicate that those who are beneficiaries of foreign education, and choose to stay, eventually come home (again, Rosenzweig says as much). Because they steadily accumulate resources while abroad, they eventually graduate to a position where they are able to set up a business which benefits their original local economy. Many of them do so, although this is not scientifically documented and relies largely on anecdotal data.

For the new host country, the benefits come from skills nurtured through early education (primary, secondary, basic college) in another country. For the original country, while this appears as a net loss, the loss of migrating skills is eventually made

up for by subsidies provided by the new migrant to local kin, who attend college at the migrant's expense. Resources from migration are also used as investments in household enterprises that can potentially improve their lives in the long run. Again, while these data are anecdotal, the subject is covered by documented studies on labor or contract migrants. If we assume that the motivations for temporary migration are the same, a shift to permanent migration may be assumed to satisfy the same intentions even if the original purposes diverge.

Let me take up Rosenzweig's observation that local higher education policies should be made with an eye to their impact on out-migration. I remember that the curriculum of a school of medicine in a Philippine university is structured so that a student can provide primary, secondary, or tertiary medical services depending on the number of years he or she is able to finish. The assumption is that fewer years will allow him or her to stay in the barrios to take care of the needs of the local population. The jury is still out on this approach, but reports indicate that the enrollment rates for this innovative program are not encouraging. My sense is that personal choices will be made notwithstanding the social engineering that policy hopes to influence. In the long run, some measure of altruism wins out and belongs to the home country, even as the host economy benefits from skills that originated elsewhere.

Research data in the United States also indicate that Asians, among other immigrant groups, have the highest incomes among migrants, demonstrate the highest propensity to save, perform well in school, and make consistent investments in housing and education. Again, these are net benefits to the host country.

There will be affiliated costs such as social security and brain loss or drain, as it is usually denominated. But career decisions are now made on the basis not just of internal needs but of global requirements, and the circulation of skills is actually in operation. This, of course, operates not just in the direction of high-income countries. In many of our capitals, consultants from high-income countries go to low-income countries because, it must be admitted, the price differential works in their favor.

My final thesis is that the world would be better if we would adopt responsible, regulated movement across countries. As long as the terms of reference are clear, brain circulation is a phenomenon that can do all of us some good.

Private-Public Provision of Higher Education

Intersectoral Interfaces in Higher Education Development: Private and Public in Sync?

DANIEL C. LEVY

Appropriate consideration of the contemporary development of higher education must include both the public and the private sector. Yet most analyses ignore or deal only perfunctorily with the latter. This paper departs from that pattern by identifying the principal characteristics of the fast-growing private sector.

One reason for the dearth of research on private higher education is that much thinking and writing about national development have assumed or argued for the primacy of the public sector. Sometimes a single sector (public) is postulated. Sometimes dual public and private sectors are assumed, but even there the national development role has often been heavily associated with the public sector. Indeed, even when market economies are judged compatible with national development, the conviction has remained strong that in social arenas the core would be the public sector.

Higher education is an outstanding example. The "continental model"—spread from its genesis in Europe (outside Great Britain) to much of the developing world through colonialism and example—is based solely on public institutions, is publicly funded, and indeed rarely encompasses significant diversification across even public institutions (Clark 1983). Higher education's chief functions are conceived of as public, including the grand mission of national development. Relatively standardized structures and policies are the rule. After independence, many countries mobilized to build "national universities." Most countries long had no formal system of private higher education. This was true even in countries with formidable private secondary and primary schooling.

Today, however, the private sector of higher education holds perhaps 30 percent of total global enrollment in higher education.[1] The share of private higher education is thus larger globally than in the United States. Moreover, it continues to grow for a variety of reasons. Most of the roles for higher education in development—access, equity, finance, management, job market fit, and role in the knowledge economy in

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Annual World Bank Conference on Development Economics 2008, Regional

which advanced skills assume increased importance (World Bank 2000)—are inadequately understood today without analysis of the private as well as the public sector.

Of course, higher education is far from unique in the movement from huge public dominance to intersectoral realities. Shifting intersectoral realities in many fields have changed the configuration confronting those who have keen concern with development. The World Bank, for example, has significantly promoted forms of privatization both within and beyond higher education (World Bank 2000). Privatization in multiple arenas itself has a large impact on privatization in higher education. In turn, the privatization of higher education can nourish broader privatization. Both to understand what transpires before our eyes and then to be prepared to consider policy in that light, we need to understand higher education's fresh intersectoral context.

Yet common assumptions about the relationship between the roles of private and public higher education clash with reality.[2] The clash does not mean that assumptions about proper roles are wrong, but proponents of the assumptions must confront a reality that is significantly at odds with their assumptions. Many of the assumptions are normative, prescriptive, and aimed at orienting policy.

One such assumption is that a "second" sector should be essentially like the first sector.[3] This assumption (at least until recently) has usually contemplated the private emulating the public. In this connection, authors often decry public policy "discrimination" between the two sectors and call for more "equitable" policies. A common example concerns government policy on subsidization. For the private sector to compete on a fair footing, it is said, it should be eligible for finance on a similar basis as the public sector. This call usually would amount to a substantial increase in public funds for the private sector and perhaps a reduction in public funds for the public sector. Yet in higher education, the long-standing and sharp empirical reality is that private higher education usually receives little or no public funds, while public higher education usually relies overwhelmingly on them (Levy 1992). Thus the prescribed change would be hefty. A corollary assumption about higher education (and beyond) appears to be that more equitably treated sectors are likely to cooperate better, an assertion rarely substantiated by either empirical or logical evidence. Another normatively favored approach is private-public partnership, a concept explored later in this paper and one much praised in terms of nonprofit-government ties beyond higher education itself.[4]

We might label such assumptions as "friendship" oriented. For the proponents, intersectoral similarity and certainly cooperation carry positive connotations, including harmony, although a type of "hypercooperation" sometimes means collusion detrimental to consumers.[5] At the same time, they often depict stark intersectoral differences in negative terms. This is certainly true regarding intersectoral conflict and often regarding intersectoral competition. Intersectoral complementarity (involving each sector doing things largely differently from the other) may also be deprecated or dismissed, again rarely with evidence. To be sure, many of these assumptions have been much weaker in the United States than in most of the world.

This paper is *not* a brief for intersectoral similarity, distinctiveness, complementarity, competition, conflict, or cooperation. It *is* an empirical overview of what the reality is and has been. Reality has no claim on what good policy would be, but it

should impose a burden of proof on advocacy of radical intersectoral change. Appreciation of how far reality is from sameness and cooperation likewise raises core questions about the feasibility of changing to favored alternatives. This paper suggests that any major policy changes ought to begin from an appreciation of reality.

To appreciate the reality, there is a special need to produce much more knowledge and understanding about the private sector in higher education. That is, there exists much more literature and information on public than on private higher education. To study intersectoral relations in higher education, priority must be placed on building the base of knowledge about private higher education.

What roles does private higher education tend to play in development? How do these parallel or differ from those in the public sector? As it tackles such questions, this paper focuses on the following. It deals with formal institutions of higher education and highlights recent trends, though in the context of established patterns. The thrust is global in scope. The paper does not, for the most part, deal with the substantial and very significant tendency to privatize parts of public higher education. It consecutively considers the following topics: the surge in private higher education, various types of private provision, key intersectoral differences, the for-profit subsector, intersectoral interfaces over time, intersectoral partnership, and conclusions.

The Global Surge in Private Higher Education

Although higher education has long been a predominantly public sector matter, several caveats are important. One is that public sector dominance has not always been the historical reality. Private precursors have included missionary education, "correspondence" education, vocational education, and the like. Moreover, much higher education was historically neither public nor private in the common senses in which we use those terms today. Often they were what we call "fused" private-public configurations (Levy 1986). Then, when the private and public sides developed strong identities and one side came to dominate, it was (outside the United States) almost always the public side. This development was often tied to the emergence of the nation-state. Herein fits the continental model and its international derivatives. It is important to appreciate, however, that the reality was not always single-sector dominance, an impression produced by the strong growth of the state in the twentieth century. As critics of that impression are fond of showing, sharp public dominance is a characteristic of the relatively recent past more than a natural, always existing, reality (Roth 1987). Still, to take a snapshot circa the midpoint or three-quarter point of the last century is to see higher education as overwhelmingly public. By far the most prominent exception was the United States, which at mid-twentieth century had relatively even enrollment in its private and public sectors, though it, too, was en route to a heavy public majority.

The revolution from small to large private enrollment is mostly a phenomenon of the developing (and transitional) world. Japan is the sole developed country with

majority private enrollment. If we consider the Republic of Korea and Taiwan (China) as now developed, then they join the short list. We proceed to flesh out reality in the various regions. Yet around that time, growth of private education was discernible in much of the world. By the 1980s it was surging. Likely to continue, the surge has been unabated to the present (Levy 2006b). Thus we arrive at the 30 percent private share of total enrollment in higher education.

Regional Variation

Western Europe continues to be the major region with only very limited private higher education. This, again, is intertwined with the state-centered continental model. Private sectors in much of the region have been appropriately described as "peripheral" (Geiger 1986). Even there, however, recent years have brought breakthroughs in dual-sector development (whereas the main public-private shift involves partial privatization of the public sector). Institutions offering a master's degree in business administration are noteworthy examples of private emergence (Franck and Opitz 2006), strongly tied to broader processes of marketization and globalization. A longer-standing exception is Portugal, the West European country with the highest private sector share, at 27 percent (Teixeira and Amaral 2001), and the least developed country within Western Europe overall. A dramatic recent development is large-scale philanthropy by very wealthy businessmen. Italy is one site. Perhaps most startling is Germany, where the International University of Bremen recently announced a gift of more than $250 million, a gift explicitly aimed at being a precedent for further private development.[6]

However, to date the largest dual-sector development in Europe has occurred in Central and Eastern Europe (Slantcheva and Levy 2007). This is a postcommunist phenomenon. It shows a change from the starkest extreme of unisectoral development.[7] Indeed, the region shows the most rapid leap to dual-sector development, concentrated mostly in a five-year period from 1989 to the mid-1990s. The largest private sectors reach 30 percent. Poland is a noteworthy example, consistent with the country's successful move to a market economy overall. Yet other countries continue to have small private shares of only a few percent, and the private sector has stagnated regionally over the last 10 years.

The newest regional sites of rapid private development from near zero to noteworthiness are the Middle East and North Africa, joined by Sub-Saharan Africa. Space for a private breakthrough is partly a by-product of the still very low cohort enrollments in higher education overall. There is much room to grow, as economies develop and the demand for higher education is strong. Morocco, Egypt, Syria, Jordan, and Oman (indeed much of the Gulf) are among the noteworthy examples, generally with government initiative and support.[8] Meanwhile, the surge in Sub-Saharan Africa (Mabizela, Levy, and Otieno forthcoming) has been a bit longer, but dramatic nonetheless, more often following the typical global development pattern of an unplanned and unanticipated private surge (Levy 2006b). Kenya and Nigeria are among the leaders, yet in most countries the share of private enrollment remains comparatively small.

Latin America has a much longer history of dual-sector development. Although private enrollments were merely about 3 percent around 1950, they had soared to nearly 40 percent three decades later, notwithstanding unprecedented public growth in absolute numbers (Levy 1986). That the private share has remained fairly steady in more recent times is a telling example in which proportional stagnation cannot disguise dynamic growth and development. Among the countries with larger private than public sectors are Brazil, Chile, Colombia, and the Dominican Republic. Only Cuba remains a single-sector case.

Finally, the world's largest region is the one with the largest private sector in higher education: Asia, in general, and East Asia, in particular. Private shares are 78 percent in Korea, 77 percent in Japan, 75 percent in the Philippines, and 72 percent in Taiwan (China). See Table 1 for data on more than 60 counties. As one would expect across such a wide region, there is great variation. In the moderate 30–40 percent private category are India and Malaysia, respectively. Notably, countries such as China, Thailand, and Vietnam, with private shares under 15 percent, are growing rapidly.

A salient point is that the East Asian model of educational development can be broadly depicted as having been based on a government priority of supporting basic over higher education for several decades. When rapid higher education growth was undertaken, it was left heavily to the private sector. This development model is repeatedly praised by the World Bank as conducive to equity and rational growth. Deprecated in contrast is a Latin American path of "premature" massification of higher education, based predominantly on public growth, publicly financed, and allegedly denying needed public funds for the lower educational levels, which serve the mass of the population (de Moura Castro and Levy 1997; World Bank 1994).

Private Types of Education (and How They Are Distinct from the Public Sector)

To understand the shifting contours of dual-sector development, we obviously must know more than overall numbers. The composition of private higher education varies tremendously over time and place. Private higher education is not one thing, and it is not a constant.[9] Similarly, the degree and nature of private distinctiveness from the public sector depend crucially on the type of private institutions under consideration, as does the nature of intersectoral relations and development. We proceed to identify the three most prominent types of private institutions.

Cultural Distinctiveness

Private higher education has often arisen as an expression of some distinct cultural group. It is typically a minority group, meaning that the group identity and pursuit do not lie at the mainstream of the existing system of higher education.

Early manifestations of a private sector in higher education have usually been religious, reflecting the reality beyond higher education alone that nonprofit sectors are initially largely religious in ownership and orientation. "Fused" private-public entities often have reflected a simultaneous dominance of the church and state

TABLE 1. Summary of Country Data, 2000–06

Country	Enrollment in private institutions as a percent of total enrollment	Enrollment in private institutions	Total enrollment	Year	Private as a percent of total number of higher education institutions	Number of private higher education institutions	Total number of higher education institutions	Year
Albania	0.2	100	43,700	2003	0.8	1	12	2003
Argentina	25.7	—	—	2001	42.9	—	—	2000
Armenia	26.6	22,600	85,100	2004	77.3	68	88	2004
Azerbaijan	14.4	17,500	121,500	2003	35.7	15	42	2003
Belarus	15.2	58,300	383,400	2005	21.8	12	55	2005
Brazil	73.2	—	—	2005	89.3	—	—	2005
Bulgaria	16.4	39,099	237,909	2004	30.2	16	53	2004
Burundi	—	—	—	—	4.0	—	—	2002
Chile	71.0	320,744	451,872	2000	93.3	224	240	2000
China	8.9	—	—	2002	39.1	—	—	2002
Congo	—	—	—	—	4.0	—	—	2000
Croatia	2.7	—	—	2003	14.2	15	106	2004
Czech Rep.	8.9	29,201	327,955	2004	40.1	95	237	2004
Cyprus	70.3	14,615	20,795	2003–04	74.2	23	31	2003–04
Estonia	21.2	14,370	67,760	2004	53.2	24	46	2004
Ethiopia	24.0	—	—	2003	60.0	—	—	2003
Georgia	19.2	29,400	153,300	2003	85.2	150	176	2003
Germany	3.7	—	—	2003	29.5	—	—	2003
Ghana	5.8	2,500	43,245	2000–01	58.3	7	12	2000–01
Hungary	13.7	57,559	421,520	2004	55.1	38	69	2004
Iceland	—	—	—	—	37.5	3	8	2003–04
India	30.7	3,219,000	10,481,000	2005–06	42.9	7,720	17,973	2005–06
Indonesia	71.4	2,114,060	2,959,170	2001	96.0	1,931	2,012	2001
Israel	13.1	26,860	205,149	2005–06	13.1	8	61	2005–06
Japan	77.1	2,900,961	3,761,725	2000	86.3	4,173	4,834	2000
Kazakhstan	46.5	347,100	747,100	2004	71.8	130	181	2004

Kenya	9.1	—	—	2000	34.2	—	—	2000
Kyrgyz Rep.	7.2	15,800	218,300	2004	32.7	16	49	2004
Korea, Rep. of	78.3	—	—	1994	87.0			2002
Latvia	26.6	32,315	121,595	2004–05	35.7	20	56	2004–05
Lithuania	7.5	14,379	190,701	2004	35.4	17	48	2004
Lesotho	—	—	—	—	72.7	16	22	2000
Macedonia, FYR	8.3	3,928	47,221	2004	62.5	5	8	2004
Malaysia	39.1	232,069	593,574	2000	92.2	642	696	2000
Mexico	33.1	—	—	2003	69.1	—	—	2002
Moldova	20.0	26,500	110,200	2003	44.5	48	108	2003
Mongolia	26.0	—	—	2003	64.2	—	—	2003
New Zealand	8.9	23,208	260,048	2005	82.8	164	198	2005
Nicaragua	47.5	65,000	136,960	2005	52.3	23	44	2005
Pakistan	23.1	61,108	263,979	2003–04	48.6	54	111	2005–06
Philippines	75.0	—	—	1999	81.0	—	—	1999
Poland	30.3	580,242	1,917,293	2004	70.5	301	427	2004
Portugal	25.9	98,664	380,937	2004–05	66.7	110	165	2004–05
Romania	23.2	143,904	620,785	2003–04	54.9	67	122	2003–04
Russian Federation	14.9	1,024,000	6,884,000	2004	38.2	409	1,071	2004
Senegal	—	—	—	—	3.0			2000
Slovak Rep.	4.6	8,208	177,714	2004	17.9	5	28	2004
Slovenia	2.9	—	—	2003	21.5	—	—	2003
South Africa	9.0	—	—	2001	—	—	—	—
Taiwan (China)	71.9	—	—	2004	65.8	—	—	2004
Tanzania	—	—	—	—	11.0	—	—	2000
Thailand	13.7	253,605	1,850,864	2003	45.0	54	120	2003
Uganda	—	—	—	—	10.0	—	—	2000
Ukraine	12.0	237,100	2,264,767	2003	17.6	175	997	2003
Uruguay	10.0	9,103	90,644	2000	42.9	9	21	2000
United States	23.2	3,559,503	15,312,289	2000	59.4	2,484	4,182	2000
Venezuela	41.3	—	—	2005	56.6	—	—	2004
Vietnam	10.4	137,760	1,319,754	2005	12.6	29	230	2005

Source: PROPHE Country Data Summary (May 2007), from http://www.albany.edu/dept/eaps/prophe/data/international.html.

— Not available.

hierarchy. With the widespread triumph of secularism in the higher education mainstream, even a country's majority religion could be marginalized, spurring it to create its own private institutions. Most of the clearest, most prominent, examples involve Catholic universities in Latin America, abundantly from 1917 to the end of the 1960s. In much of the contemporary world, a secular-religious split has marked a fundamental clash over the appropriate nature of higher education development. The secular side is quite public in orientation, with public, often national, missions, public funding, and public direction. The religious side then obviously must often be private, with more particular visions about serving segments of the population and their goals.[10] This targeted, more than national, orientation is one reason that states often have proscribed religious higher education or at least confined it to subordinate, marginal, or dependent status.

Sometimes Catholicism has been a minority religion, and its institutions have emerged as alternatives to either secularism or larger national religions. The United States is the major example of the growth of Catholicism within a predominantly Protestant society. But we now witness many global examples where Catholic minorities carve out a niche within higher education.

Indeed, a noteworthy global shift involves the dramatic recent emergence and growth of non-Catholic religious higher education. On the one hand, there is an evangelical or Pentecostal surge on the Protestant side. This is clearest in regions where there is a broad surge in the evangelical population, notably in Africa and Latin America. This evangelical surge means not just something additional but something that confronts both the Catholic and the secular traditions. The evangelical vision is more keenly about capitalist development, pursuit of particular self-interests, and favorable orientation to the West. On the other hand, there is a rise of Islamic higher education. Sometimes the Islamic thrust resides within public higher education, a contemporary example of fused private-public reality. In cases in which the society is not overwhelmingly Muslim, however, Islamic private higher education is growing, something that has been the subject of too little study, including differences with development roles pursued elsewhere in higher education. Africa increasingly witnesses a mix of Catholic, evangelical, and Islamic subsectors, as in Kenya.

Overlapping the religious orientation is often a gender emphasis. That is, there is a particular concentration of women in religious higher education and in private higher education more generally.[11] One factor is parental concern about conflict within the public sector or a sense of public disorder. Another is the strong association between women and certain fields of study—generally "softer" fields that predominate within private higher education. In Japan, for example, this association remains strong as part of a keen belief that higher education should prepare "good wives" (Amano 1997; Fujimura-Fanselow 1985; Nagasawa 2006), though now also more informed wives and mothers. At root, then, we are dealing with an approach that still sees largely distinctive roles for women and men—one more oriented to tradition and family, the other more oriented to leadership in society, the economy, and politics. Predictably, such contrasts are thinning, but it is important to note that they remain. Furthermore, women's colleges have been prominent in a number of Asian countries as well as in the United States (Purcell, Helms, and Rumbley 2005).

Overlapping the religious orientation is often an ethnic concentration. Compared to a more ethnically homogeneous population such as that in Latin America or China, the phenomenon of ethnically based higher education is more notable in Central and Eastern Europe.[12] Russian, German, or other minority groups, feeling discriminated against in public higher education or simply wishing to preserve their ethnic identity and traditions, sometimes form their own private institutions. Countries from East to South Asia have ethnically based institutions (for example, Malaysia).

Whether the private thrust is religiously, ethnically, or gender based, it tends to promote a distinctive development approach as compared to that in the public sector. The public sector approach (though arguably stronger in rationale and myth than in practice) emphasizes national unity, common purpose, and a strong, centralized, identifiable public pursuit. The private approach emphasizes particular group pursuits involving distinctive roles and places within a varied, pluralistic, development context. The private approach is thus much more compatible with intersectoral higher education relations that involve complementary or competitive roles, though not precluding elements of commonality or cooperation.

Elite Private Higher Education

Much less common than religious or other culturally based institutions is another type of private higher education: elite private higher education. Where it emerges, it often results from a deterioration, or perceived deterioration, in the public sector regarding quality, status, job prospects, and political order. Another elite alternative to such public sectors is, of course, study abroad; this is often deprecated as negative for national development. Meanwhile, private higher education is often deprecated as elitist, serving privileged groups, while robbing the more representative public sector of resources (human and material) essential to development, all of which contributes to inequitable development. Naturally, defenders of private higher education often credit high-quality private higher education with playing a role in avoiding a national brain drain. The main positive view regarding elite private higher education is that development requires leaders and that the public sector often fails in this respect. The same holds for faculty, facilities, and efficiency and effectiveness overall.

Whichever side one inclines to regarding the role of elite private higher education in development, an overarching empirical reality is crucial: elite private higher education is a rarity. This reality is missed in large part because of attention to the quite aberrant U.S. case. There, of course, Harvard, Princeton, Stanford, and other well-known private universities dominate the "top 10," with a wide private-public gap at the top of colleges with less graduate education and research (for example, Dartmouth, Amherst, Williams). The Shanghai identification of the world's 200 leading universities includes only six private universities outside the United States.[13] These are mostly in Western Europe and, by most criteria, including funding, are public institutions more than private ones. Yet it is not a stretch to label as elite a few private universities

in a few countries. Japan's Kyoto, Waseda, and Sofia universities are examples. Perhaps the most striking non-U.S. case in which private shares the peak with public is Korea, where eight of the top 10 universities, as judged by research funding, are private, led by Yonsei University (Kim 2006).

So if private higher education supports development, it cannot be said to help it much; if it hurts development, it cannot be said to hurt much. If elite higher education uniquely serves national development, it is basically through public institutions. This is the case, for example, in almost all of Asia and Central and Eastern Europe.

Formidable forces make private ascendancy to the peak difficult and rare. There is the well-known Matthew effect as the institutions with the best are best equipped to keep getting the best (Trow 1987). This holds for students, faculty, competitive grants, and private philanthropy. Tradition has weight, and so do alumni with loyalty to the alma mater. National academic bodies, including the proliferating accreditation bodies, are composed mostly of public university academics, often champions of existing academic modes. Offsetting such forces may require the emergence of significant problems within the public universities. Political disorder is one of these problems. Afflicted regions have included Latin America and increasingly Africa and South Asia, but not Central and Eastern Europe, the developed world, or most of East Asia (China, Korea, Taiwan).

Latin America has been and probably remains the only non-U.S. region in which the best prepared and most privileged secondary school graduates disproportionately choose private higher education (just as the privileged entrants to secondary education disproportionately choose private schools at that level). Exceptions persevere in the lead public universities in countries of the Southern Cone, most notably Brazil. Interrelatedly, exceptions persevere in certain fields of study, including medicine and science. In any event the elite status of leading private universities (including several Catholic ones) is much more about socioeconomic status, first-class education, and jobs than it is about academic breadth, full-time teaching, graduate education, and research. Weaknesses on these counts suggest a seriously limited role for private higher education in serving national development. However, these weaknesses are increasingly being overcome at leading private institutions.

More common, increasingly, are what we can call semielite private universities. These institutions ascend to an intermediate standing, below the peak public universities, but well above the mass of private and public institutions. Typically, then, the most privileged secondary school graduates apply to the public University of Tokyo, the University of São Paulo, Seoul National University, Charles University in the Czech Republic, the University of the Philippines, the University of Nairobi, and Chulalongkorn University in Thailand, but if they fail, then they may well consider private as well as public second-choice alternatives. This choice dynamic is particularly potent in certain fields. By far the most prominent ones are business related, including at the master's level, sometimes laying claim to elite status. A tendency worth ongoing attention involves initially rather modest private universities reinvesting their financial gains from fields with heavy demand (yielding substantial income) into more costly fields, facilities, and faculties.

Non-Elite Demand Absorbers

Much more common are nonelite private institutions—and "nonelite" is often a charitable term. Commonness obviously does not make this type of private higher education the most important. Nonelite private higher education stands out for size, access, and perhaps aspects of equity, but it is often the weakest type of private education in other roles crucial to national development.

Hand in hand with the numerical dominance of the nonelite institutions within private higher education is their concentration among "nonuniversities." Whatever a country's private share of higher education overall, it is usually disproportionately high among the nonuniversities. Examples are Malaysia and Poland, where nonuniversities dominate the private sector, with shares of enrollment constituting even more than 90 percent of the total enrollment in private higher education.[14] Private nonelite growth, accelerated in recent decades, stems fundamentally from the excess of demand over supply. This demand-supply gap increases especially where the middle class grows and, worldwide, where the state is no longer able or willing to finance the great bulk of higher education. In East Asia all of this is true of China, India, and Thailand, among others. Also facilitative has been a lax regulatory environment, at least for some initial period of proliferation (Levy 2006b), although this factor has been stronger for Africa and Latin America than for East Asia and the Middle East.

A major aspect of the university versus nonuniversity divide concerns technical and vocational institutions. These are often private (Atchoarena and Esquieu 2002). Indeed, they are often for-profit. Whether the technical and vocational institutions are considered part of tertiary education is variable.

A key though not always clear divide within the nonelite subsector lies between two types of institutions. One is serious, responsible, and job oriented. It has much upside for growth and improvement. The other, often termed "garage" institutions, is serious mostly in its pursuit of financial reward, dubiously profiting from the large demand-supply gap and vulnerable where countries build viable licensing or accreditation systems.[15] The garage institutions tend to be quite small, and many of their activities in finance, management, and teaching are shrouded in mystery. Transparency is woefully limited. So is their role in national development. But the main development role of the serious nonelite institutions can be powerful: to bring comparatively unprivileged groups into the development process—a major "access" role within often highly stratified societies—and in so doing to serve the evolving and globalizing job market.

Key Intersectoral Differences

Numerous core differences between public and private higher education have been identified in the course of laying out the different types of private institutions. Clearly, the configurations of private-public differences vary according to the type of private subsector in question.

The main finding from a wide intersectoral comparison is that the two sectors tend to be quite different in significant respects. This is not to overlook important aspects of overlap (Levy 1999, 2006a).[16] Implications for intersectoral roles and relations then follow.

In finance, the core picture remains clear: private higher education is overwhelmingly financed by private funds (mostly tuition and fees), whereas public higher education is overwhelmingly financed by public funds. To allow for exceptions to both rules, especially and increasingly as public universities partly privatize, is not to invalidate the powerful generalization.[17] Similarly (though less readily quantifiable), the private-public contrast in regulation and governance remains powerful. Private institutions tend to have considerably more autonomy from government, more ample ties with and more dependence on business or churches, more hierarchical internal self-governance, and more priority placed on political order.

Contrasting development perspectives also emerge starkly when we compare private and public missions. Of course, both sectors claim to pursue the public good, but the claim is vague. Quite rare in contemporary public sectors, religious missions remain important within the private sector. Bringing students successfully to the job market is often a more pointed mission for the private than for the public sector. The private sector tends to hold and promote more conservative political-economic-social perspectives. Critics can deprecate the private sector as oriented to the status quo, whereas the sector's promoters can claim that it enhances human resources and thuis accelerates pragmatic development.

Conceptualizing Intersectoral Differences

Moving from the empirically based intersectoral contrasts, we can endeavor to assert further contrasts about service to development. The private role in regard to a knowledge economy comes basically through a dissemination function, in teaching and even (as expressed in deprecatory tones by critics) in training. A discovery function, most commonly associated with research, is much less prevalent. The public higher education sector fervently claims to pursue both of these knowledge roles, although performance is spottier than claims.

Private higher education preferentially promotes particular interests, often unrelated to one another. In effect, this means a kind of pluralist model of development, with little overarching vision. A market orientation is also common. In contrast, the public higher education sector typically makes a grand claim to pursuing a national development vision—a unified vision, often planned and implying a certain degree of standardization and quality. This is more of a "holistic," "harmonious," or "corporatist" vision of development, and it places the state at the core (Wiarda 2004). Accountability then logically refers to the state or the public overall, whereas for private higher education accountability is more about directly serving the particular interests that are prominent at a given institution.

Some more specific and concrete, some more general and conceptual, contrasts between private and public higher education sectors remain large. If there are to be cooperative intersectoral relations, they will not be derived fundamentally or easily from commonalities.

The For-Profit Subsector: An Illustration

The bulk of this assessment of private-public differences has concerned nonprofit institutions. Yet the differences are starker still if we focus on for-profit versus public institutions. For-profits are very private and usually contrast very sharply with public higher education.[18]

Even the for-profit subsector may comprise a mix of quite different types of institutions. Many could be among the garage institutions, whereas others would be serious educational or training institutions. Most of the for-profits would fit the demand-absorbing type, but others could be semielite. One large contrast to note is between the bulk of for-profits and the rising set of publicly listed enterprises. The former, notably including "propriety" institutions, are typically quite small and lacking in transparency. The latter may be much larger and more professionally managed, with accountability to shareholders. The proprietary institutions are overwhelmingly domestic, whereas the publicly listed enterprises are sometimes quite international, as with Laureate Education (thus far particularly prominent in Latin America).[19]

For-profit higher education rests almost solely on private finance, overwhelmingly tuition and fees. Students and families are "buying" in the marketplace. Putting aside the unusual U.S. case, in which government student aid flows to any accredited institution, government funding is rare indeed. Regarding governance too, the characteristics of private higher education are sharpened. Government regulations are weaker than for other higher education sectors. A prime challenge to the for-profits comes with the blossoming of accreditation agencies, which vary in the stringency of their policies. Internal rule is hierarchical, faculty power is minimal, and students exert power through the choices they make. In some cases there is centralization across units; the massive publicly owned University of Phoenix is the lead case, operating on common policies and command structures (Kinser 2006b). In regard to mission, one shared trait between the for-profit and the public sectors is, at least to date, a secular face. But heavily on the side of for-profit similarity to much nonprofit higher education is the job market mission, with the for-profit sector orientation being sharper.

For-profits may well have less of a national mission than public universities do. This view is strong where, for example, global actors like Laureate Education penetrate. But the salient mission characteristic of for-profits, again like the nonprofit privates but more sharply, is that it aims at self-interested private actors. "Development" is essentially whatever these individual pursuits add up to in their vague aggregate. Development in this sense is highly decentralized, little planned.

Where Are the For-Profit Sectors?

Determination of where for-profit higher education exists depends greatly on definition. Many officially nonprofit institutions appear to be basically for-profit. Many observers falsely construe generation of income as evidence that an institution is for-profit. The perception is especially deprecating when the institutions are seen as

poor in quality. But it is legitimate for nonprofit organizations in any field to generate income and use it to cross-subsidize needy or targeted units that themselves may not be generators. Trickier is to determine identifying status, where institutions that are legally nonprofit pass on large sums to family members and others officially on the staff or spend money on lavish facilities. Additionally, higher education laws often do not even mention the idea of a for-profit sector and thus do not define it. In some countries for-profit institutions are classified as part of the higher education system; in others they may be classified under business law. Additionally, the borderline is blurry between "higher education" and advanced training, and businesses often own their "corporate universities" (Kinser 2007).

Whereas reliable data on nonprofit private higher education is often elusive, data are even more sparse and scattered when it comes to the for-profit subsector. This owes to several reasons, including both lack of transparency and the small average size of for-profit institutions.[20] The United States is the exception in having rather reliable data (Kinser 2006a). They show a rapidly expanding subsector. Encompassing more than a third of all higher education institutions, for-profits still hold only 5 percent of enrollment, yet this amounts to about one-fourth of enrollment in private higher education.

At an extreme, most of a country's private higher education may be for-profit, as in South Africa. As noted, it is Latin America where the presence of Laureate Education is strongest. Additionally, in the 1990s, Brazil and Peru legalized for-profit higher education. A major perspective was that so many legally nonprofit institutions were functionally for-profit, why not tax them as businesses?[21]

Intersectoral Interfaces over Time

If, then, private and public sectors are often significantly different from one another, often with largely contrasting missions, how do the sectors relate to one another? Obviously, stark differences operate against the normative and policy notion that the sectors should be mostly alike and treated alike. But this still leaves a wide array of alternatives, including conflict, complementarity, and cooperation. It is worth taking a brief look at how intersectoral relations have evolved over time. In so doing, however, we must keep in mind that private-public relations depend to a large degree on the private subsector in question.

Initial Confrontations

Hostile relations sometimes characterize the early years of private sector life. For one thing, private emergence often owes much to a view that the public sector is partly failing. This is particularly true when we consider elite private education. However, intersectoral belittling is more often a tale of public belittling of private. In fact, the public sector stance has sometimes involved frank opposition. Argentina in the 1950s is a documented example, to the point of violence.

Surrender of monopoly is a dramatic change. Fear of a threat to public sector self-interest is understandable. The threat can be important even where the new sector cannot aspire early on to compete for most enrollments or for a high-status position. Competition for average students may be real, and the private sector can threaten the public sector by offering options particularly attractive to students. Common examples have been night courses, greater provision for part-time students, fewer years of study, and greater assurances of finishing on time, without the attendant delays from political disruption. A potent challenge comes from new private institutions concentrating on fields aimed directly at the job market and thus in great demand by students. The public sector often feels pressured to accommodate by undertaking pursuits it may prefer not to.

At the same time, the public sector also has reasons of genuine conviction, aside from mere self-interest. It often regards the private undertakings as unbecoming for university education. Or it finds undertakings performed at very low levels of quality in the private sector. A central challenge for young private sectors is legitimacy.[22] Regardless of policy field, the idea of privateness that is nonprofit is usually not embedded in history or political culture. New private institutions are seen as businesses, a perception that is often accurate. At the same time, as in Russia, the notion of "nonstate" activity, even in the economic sphere, is disagreeable to many. The use of terms like "nonstate" and "nonpublic" in many countries is itself a reflection of wariness about private activity in the social field. Higher education becomes a striking arena in which a state-centered, state-steered, and unisectoral model of development clashes with a dual-sector model of development that is much more decentralized and diffuse. The first development model assumes considerable planning and standardization, whereas the second rests more on uncoordinated initiatives, markets, and competition.

Diminished Intersectoral Clashes

Even at the outset of private sectors, however, outright intersectoral clashes may be avoided. In East Asia and the Middle East a common reality is that authoritarian government backs or even creates the private sector, leaving little reason or room for public university protest. In other cases, the public university stance is more dismissive than defensive or hostile. That is, the new sector appears trivial, not terribly menacing. It is largely ignored by both public sector and state alike. This is conducive to laissez faire or anarchic private sector development. A strong negative response, along with regulation, often arises only in delayed fashion (Levy 2006b). The private proliferation and the eventual public hostility both signal intersectoral tensions.

However, other tendencies may come to make intersectoral tensions less raw. One is that the delayed regulations manage to weed out the worst, flimsiest, or most illegitimate of the private institutions. Accreditation initiatives compel the private institutions to follow public norms in certain respects. Additionally, with the passage of time, the idea of privateness becomes less jolting. While some of the worst visions about private higher education are widely confirmed, others appear at odds with

what some private institutions accomplish. Students' choice of private higher education gains credibility.

Realization may set in that private institutions to one extent or another emulate the public institutions. Partly they are forced to by regulations, but partly they mimic practices, structures, and professional practices that are legitimate (Levy 2006a). This seems the safest route to adequate acceptance in the system. Where student demand exceeds institutional supply, many private institutions are happy simply to get a piece of the pie. Put another way, these conditions are conducive to intersectoral *parallel play.* Intersectoral relations thus are not fundamentally confrontational, even as they are not fundamentally cooperative. De facto tolerance is salient.

Although a degree of intersectoral similarity may be evident from the outset, private-public blurring often develops or intensifies over time. It would be of interest to determine how higher education compares to other intersectoral arenas in this respect. As noted, public sectors today partly privatize financially, private sectors sometimes lobby successfully for public funding even if not in the form of annual general subsidies, regulation of private higher education may increase while there is a deregulatory thrust for the public sector, emerging accreditation systems have isomorphic effects, private zeal to insert something radically different abates, private higher education gains acceptance in business, while business gains acceptance in national development visions, and so forth. In the United States and elsewhere, diminishing private-public distinctiveness and contentiousness may be countered by the emergence of for-profit alongside the preexisting nonprofit private sector; so far, however, the for-profit sector usually remains small (at least in legal terms).[23]

An additional point is that looking only at formal or institutional relations risks obscuring a vital reality: individuals may be moving easily between sectors. They may act simultaneously in both. This is the case for some students and is common for part-time faculty and even for the public sector's ostensibly full-time faculty.[24]

Private-Public Partnership

Interinstitutional partnership is also a reality that is becoming more common. It would merit greater attention in this paper, except that its history is limited, documentation is also limited, and generally it is not a common feature of private-public higher education relationships. At least that is the case if we restrict ourselves to formal relationships between institutions. We are not then ranging into relationships between public universities and private industry, for example. But private-public partnership has further potential, and it, too, is an example of where broad development options are also higher education options.

A variety of partnerships appears between higher education institutions in the developing world and the developed world. On the former end, the actors are colleges or universities; on the latter end, they are generally universities. The relationships we have in mind, the most common, are asymmetrical. That is, the developing-country institution is clearly the junior partner in status and role. What it mainly provides are

enrollment and tuition. The senior partner may provide advanced academic content and quality, often in the form of participating faculty. These faculty may take term appointments in the developing countries, although the dominant form of partnership continues to be through developing-country students going abroad; where study abroad is through institution-to-institution programs, it may fit our notion of partnership.

Yet only when one institution is private and the partner is public does the relationship fundamentally fit our subject matter; in fact, it only fits if the developing-country partner is private.[25] For traditional study abroad programs, the developing-country institution is often public. For institution-to-institution programs, however, developing-country partners are often private as well. The juridical status of the foreign institution matters much less: U.S. institutions are both private and public, whereas most U.K., Australian, and other institutions are public. Activity is greatest in Asia.

But the activity that best fits our concerns is intranational: a country's private institution partners with a country's public institution. In this relationship, too, asymmetry is the norm. The private partner is usually de jure or de facto a college; the public partner is a university. The public partner is much more formidable academically. It typically is also much more formidable in status and resources.

What the public partner gets are enrollment and income. Or only the income is sure, for arrangements vary as to how students are enrolled and counted, and formal labeling does not always match reality on the ground. What the private partner gets are quality in instruction and curriculum and access to high-level resources, both faculty and physical (although real access is often a subject of contention, with private partners and students complaining of severe limitations, as in South Africa). Additionally, the private partner gains legitimacy. It becomes difficult—and self-defeating—for public higher education to denounce and oppose private higher education. Critics charge that public universities are therein co-opted into the marketplace. As partners, private institutions enhance their chances of accreditation approval. But another problem for private higher education arises where the public partner charges what the private partner regards as excessive fees. In China, along with private higher education's long-standing complaints about government overregulation and capriciousness come complaints about public universities' hefty "management fees."[26]

Ideally, private-public partnerships produce results not only for the private and public institutions but also for national development. This hope is partly that they provide increased access for somewhat less-privileged populations, yet do not much threaten the academic quality of nation's top universities. With the expanded access comes additional income for the higher education system. As there has been no serious study of private-public institutional partnerships in more than a single country, we are left for now with the nebulous, though important, tentative conclusion that extant partnerships fall far short of an ideal but provide much promise. The reality and surely the future involve not one fixed form of partnership. Instead, the partnerships may change swiftly from one form to another, and even initial partnerships may take quite different forms in different countries.

In the absence of any systematic cross-national database, it is possible only to identify certain types and examples. The extremes come in two African cases. The great majority of South African private higher education institutions are partnered with public universities (Mabizela, Levy, and Otieno forthcoming; Slantcheva and Levy 2007). Ghana requires each private institution to be partnered with a public institution. Yet this requirement has precedents of sorts in other countries. Chile's opening of its higher education system to "new privates" in the 1980s entailed supervision by basically public universities for a period of time before autonomy was achieved (Bernasconi 2004).

India has a private college–public university history dating to national independence in 1947. However, after a time, the colleges came to be state financed and regulated to the point that they, in effect, became public institutions. Today neighboring China shows a vibrant and fluid private-public partnership. Its junior partners are markedly private, whereas many of the public partners are academically quite advanced. The recently rapid growth of these partnerships has had a serious and negative nonpartnership impact on private higher education: the "independent" private colleges have been marginalized, and many are at risk of closing. We should expect that the sprouting of varied private-public partnerships will produce unanticipated as well as anticipated impacts on private higher education and higher education development overall.

Conclusions

Private higher education has stormed onto the scene and grown rapidly in much of the world. Serious scholarship and policy making on higher education must take note of this. Conceptions of national development must consider two sectors. Higher education rarely remains a single-sector phenomenon.

As we would expect, private higher education is varied. Indeed, it is highly varied. Variation includes great change over time, differences among regions and across countries within regions, and contrasting characteristics of different types of institutions. To all of this we add the fact that private higher education has rarely developed according to a national plan laying out a dominant blueprint for forms, structures, pursuits, and policies. Diligent observers have their hands full trying to track realities. Nobody can safely predict the shape or size of private higher education in the future. It is reasonable, however, to look to continued variation, continued growth, continued debate, and further surprises.

Variation also characterizes and will continue to characterize intersectoral relations. Beyond conflict, competition, complementarity, and cooperation, we can expect various mixes of these within given countries. Between bitter intersectoral conflict and harmonious partnership lies not just a spectrum but multiple spectra. In any of the intersectoral configurations, we must recognize the strong empirical reality that there is more weight in private-public differences than in private-public similarities. Sometimes sharpening, but often blurring, the differences are fundamental

in several key aspects of finance, governance, and functions. A startling example of sharpening intersectoral differences occurs with the rise of for-profit institutions, which carry the privateness in the private sector to new heights. The for-profit rise and, more generally, other striking and heftier qualities of privateness also hold potential for new private-public partnerships, which may boost intersectoral complementarity and forms of cooperation.

Overall, in both its size and its privateness, private higher education has shaken up higher education. Higher education is increasingly a two-sector enterprise, with the interrelationship between the two, as well as the interrelationship between each and national development, in a state of rapid flux.

Notes

1. United Nations Educational, Scientific, and Cultural Organization (UNESCO) has estimated the private share of global enrollment at 31.5 percent, as Kemal Guruz reports (Guruz 2004–05). The figure seems reasonable, although perhaps a bit high.
2. Of course, assumptions about dual sectors arise only when a second sector is acknowledged.
3. Even when policies do not directly advocate dual-sector similarity, they often emphasize "good practice" policies for higher education without drawing thematic distinctions between the sectors (World Bank 2002).
4. Most partnership literature deals with government and nonprofit organizations, including government support for these organizations, government agencies partnering with private nonprofit organizations, and different forms of government-nonprofit collaboration. Higher education is among the social services in which there is considerable support from, and partnership with, the U.S. government. As in other social services, government provides funding for privately managed activities deemed to be in the public interest. Yet literature has much less to say about partnership at the institutional level, in our case, private and public institutions of higher education. Leading sources on the general government-nonprofit collaborations include Boris and Steuerle (2006); Rosenau (2000); Salamon (1995); Salamon and Anheier (1998).
5. Similarity between sectors may breed intersectoral tensions as the sectors compete on the same turf. Certainly the shift from unequal to equal treatment is often contentious, as when public sectors strongly oppose having to share public funds. One exploration of private-public relations in U.S. higher education is Gardner, Atwell, and Berdahl (1985).
6. See Landler (2006); Rocca (2006). Greece remains an outlier in that it does not allow a private sector as part of the official higher education system. Even such law, however, does not prevent kinds of private higher education that lack state recognition but may attract demand and produce job market success.
7. Exceptions were a few marginal quasiprivate institutions, including Catholic universities in Poland and Hungary.
8. See *PROPHE Global News Reports,* including examples such as "Nigerian Private Universities Contribute to Their Society," "Roles of the Private Sector in Egyptian Higher Education," and "Saudi Government Promotion of Private Higher Education." Available from http://www.albany.edu/dept/eaps/prophe/publication/NewsArticle.html.
9. Public sectors also vary one to another and over time, but less so.

10. Private higher education, especially long-standing religious private higher education, nonetheless often claims a national orientation and purpose; there is variation in how much the claim is genuinely advanced or basically is a defensive stretch against charges of illegitimacy.
11. Countries usually show higher percentages of female enrollment in private than in public sectors. Examples include most of the PROPHE countries on which an ample database has been developed, including Bulgaria (59 percent private versus 56 percent public); Georgia (55 percent versus 47 percent); Japan (45 percent versus 39 percent); Mexico (52 percent versus 47 percent); New Zealand (63 percent versus 59 percent); Poland (62 percent versus 55 percent); Portugal (62 percent versus 54 percent); Russia (62 percent versus 56 percent); and Tanzania (38 percent versus 24 percent). PROPHE National Data on Private Higher Education, from http://www.albany.edu/dept/eaps/prophe/data/national.html.
12. Although Latin America is comparatively homogeneous, indigenous or darker-skin mestizo and mulatto populations have much less representation in higher education, especially in the more privileged institutions of higher education. A contemporary twist is the creation of indigenous public universities in Mexico. New Zealand also has an indigenous university (Maori). Canada has had indigenous community colleges, and, of course, the United States has a long tradition of colleges for African-Americans.
13. For the developing world, even public universities are sparsely represented among the world's leading universities, partly as a result of the measures used, but undeniably also because of yawning gaps in quality.
14. See PROPHE, National Data on Private Higher Education, http://www.albany.edu/dept/eaps/prophe/data/national.html.
15. Low-status institutions that are serious or become serious, even some widely thought of as rip-off institutions, may become broader, higher-quality operations over time.
16. Among the many empirical works and those that review them are Levy (1986, 1992, 2006a, 2006b); Mabizela, Levy, and Otieno (forthcoming); Maldonado-Maldonado and others (2004); Slantcheva and Levy (2007).
17. There are important examples of public funding for private higher education, but they are limited. In the United States, much federal government money goes to research and student assistance, mostly regardless of private-public status. The Netherlands and India show public funding of private sectors, but these sectors long ago ceased to be private in much more than legal identity. Various Catholic universities, especially those with venerable traditions, have received public monies.
18. For an international overview, see Kinser and Levy (2005). For a strong (and favorable) recent view on U.S. for-profit higher education, see Breneman, Pusser, and Turner (2006).
19. Further complicating the picture is that even when international chains like Laureate Education are for-profit, the institutions they own may be compelled by national law to maintain nonprofit status.
20. This, too, varies greatly, and, with some 300,000 students, the University of Phoenix is the largest university in the United States. It is typically the proprietary institutions that are small.
21. A common claim of for-profit champions is that the key difference between nonprofit and for-profit higher education amounts to the fact that only the latter institutions pay full taxes (Sperling 2000).
22. A new volume takes legitimacy for new private sectors as its theme (Slantcheva and Levy 2007).
23. Like others, for-profits may lobby for public policies that would make them more like public institutions in some ways, but less in other ways. For example, U.S. for-profits ask for more government funding *and* less government regulation (see Breneman, Pusser, and Turner 2006).

24. A conceptual parallel, from a quite different field, lies in how U.S.-Mexican relations, gauged by the intensive interaction among people, is far more positive than the picture painted by analysts who treat bilateral relations as a government-to-government matter.
25. A variety of other private-public higher education partnerships could be cited, including where government finances students who attend private colleges and universities, as in the United States. But such partnerships go beyond our subject matter.
26. Both complaints have ample grounds but should be measured against a bottom line that private higher education keeps expanding rapidly. Often Chinese private owners cry all the way to the bank.

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Comment on "Intersectoral Interfaces in Higher Education Development: Private and Public in Sync?" by Daniel C. Levy

KAI-MING CHENG

Levy's paper provides good food for thought. The interface between the public and private sector is an interesting dimension that is sensitive to policy. The following thoughts are inspired by Levy's paper.

Policy Issue 1: Expansion of Higher Education, but Why?

Very few jurisdictions in the world are not thinking of expanding higher education. However, one has to address the fundamental question, Why should we expand higher education? Is it only a fashion? Is it a vanity? The following attempts to address this question.

Industrial Society: The Pyramid

Education, as an institution, reflects the needs, and indeed the paradigms, of industrial societies. Because of the intention to fully exploit divisions of labor, the workplace and the society are necessarily pyramids, with layers and departments.[1] People who work in such a society are therefore classified and ranked.

Education in the industrial era understandably follows a manpower configuration. Education as an institution helps to classify and rank people. It provides people with signals, meaning credentials, so that jobs and individuals can be matched appropriately. In particular, higher education in the industrial era seeks to prepare personnel for the apex of the social pyramid. It is meant only for the select few. Higher education is a public institution to prepare the elite.

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Annual World Bank Conference on Development Economics 2008, Regional

Contemporary Workplace: The Changes

However, society has changed. Take Hong Kong (China) as an example. In September 2006, among the 300,000 or so registered companies, 99.3 percent are what we call small and medium enterprises, with less than 100 people in each company. This may not come as a surprise, but the following may: 94.3 percent have less than 20 people, and 87 percent have less than 10 people (Hong Kong, China, Census and Statistics Department 2006). The total number of employees is 2.2 million, which does not capture the large number of freelancers, who are estimated at 220,000.

The shrinking size of workplace units is only the tip of the iceberg. On the one hand, small sizes reflect the trend of changes from mass production to customized products and services. On the other hand, small sizes mean fundamental changes in the mode of work in the contemporary workplace.

Pertinent to this discussion is the change in the nature and role of frontline workers. In industrial society, frontline workers are at the bottom of the hierarchy. They are members of a specialized department who use specific skills in order to implement specific procedures, which are part of the design handed down from above. In large factories and firms, frontline workers undertake routine, repetitive activities. They follow set procedures and abide by rules and regulations. They are appraised by their degree of compliance.

In the contemporary or postindustrial workplace, organizations are flat, loose, and fluid. The frontline workers work in small teams (which may be small companies, project groups, production teams, deal teams, or task forces). They have to face clients, deal with problems, and design solutions or products. Most of the actions are improvised and tailored to the circumstances. They are appraised according to their independent abilities.

In the contemporary workplace, frontline workers have to be able to work in teams and be good in communications, strong in human relations, able to innovate, willing to take risks, and able to provide solutions customized to fit the needs of the clients. Meanwhile, because of the rapidly changing environment, markets, clients, and technologies and the high likelihood of changing jobs and careers, they have to be able to learn continuously on demand, just in time. They have to be self-confident, good at self-management, and prepared to assume personal responsibilities. Moreover, because of the loosening of set procedures and rules and because of the intensive human interactions, frontline workers face ethical dilemmas and moral challenges. In other words, they work as if they were leaders in an industrial society.

The implications are that the frontline and grassroots workers are no longer those we saw in large factories or large firms in the past. They are no longer doing repetitive, routine, manual tasks. They are no longer blue-collar workers. They are the new breed of workers whom Peter Drucker has called knowledge workers.

The direct implication is that secondary education is simply inadequate for an individual to lead a healthy working life. This is the fundamental reason for the

expansion of higher education in any jurisdiction. This is even more so in the longer run and is true at all stages of economic development. That is, higher education should be, and will be, spread to a much larger segment of the population.

Policy Issue 2: Resource Strategies

I would argue that the participation of the private sector is a matter of resource strategies. Higher education is expensive. It is impossible to rely totally on government appropriation to support developments in higher education. That is, given the totality of resources in the society, how do we mobilize resources so that higher education can be financed appropriately?

Resources for Higher Education

There are four possible sources of resources for higher education:

- *Government sources*. This includes (a) money allocated to higher education institutions as government appropriations; (b) funding for research, consultancy, or development projects on the government's agenda; (c) subsidies to needy students, including grants, scholarships, and loans; (d) land and capital grants for physical infrastructure.
- *Learners' fees*. These are basically tuition fees.
- *Institutional income*. This includes income generated by the institutions by way of investment of their own endowment funds, income due to patents, and income due to services and other commercial activities.
- *Other private sources*. Private sources of funding include private donations, corporate donations, as well as projects supported by private or corporate foundations.

Private Participation

When education is only preparing for the elite, government appropriation is usually adequate to support all expenditures of higher education institutions. Or, conversely, enrollment in higher education is comfortably capped by the availability of government resources. In many systems, even today, higher education is free, or tuitions are minimal. In many jurisdictions, until very recently, institutions were not allowed to generate their own income, let alone receive donations. This has been pretty much the situation in most systems of public higher education. In these systems, higher education is financed basically through the public purse by taxpayers' money.

If higher education has to grow, its growth will be supported by private resources. This is very much demonstrated by more mature systems of higher education such as that in the United States. However, private contributions are not a substitute for

public funding; rather, private contributions are an essential element in the development of higher education beyond basic expenditures.

There are intrinsic reasons why a mature system cannot be supported by public funding alone. A large proportion of donations to higher education are in the realm of research, and research is about exploring the unknown, with unpredictable processes and results. Such research may have a very powerful impact on human knowledge and people's lives in the long run, but it is difficult to subject such research to public accountability, which often measures only immediate impacts.

A second significant argument for private sources of finance is the inevitable expectation of equality in the allocation of public funding. In many systems, there has been a general tendency to distribute funding equally to institutions across the board. One typical approach is to provide funding according to the number of full-time-equivalent students. This could well be a political necessity, but it does not breed excellence or innovations that require resources beyond the ordinary. Although many systems are gradually moving toward merit-based or competition-based funding in order to overcome mediocrity, such funding necessarily abides by uniform criteria. Institutions and academics have to convince a single authority, rather than convince funding agencies or donors who have special interests in a particular area. Yet particularity and individuality are essential for the development of academic excellence.

Hence, the contribution of private resources to higher education should not be limited to private institutions. It should be a general "resources strategy" of society to mobilize resources from different sources in order to meet specific needs.

Philanthropy in Higher Education

Among all of the private sources of resources, special attention should be paid to private donations, which are an emerging issue on the agenda, particularly in Asia. Singapore, for example, took the lead in 2000 to set up a government matching fund in order to encourage private donations to higher education. There has also been a series of sizable government matching funds in Hong Kong (China), which have given rise to a new level of philanthropy toward higher education.[2] The U.K. government is in the process of launching its matching fund.[3] In Japan, the "corporatization" of the public institutions of higher education has opened unprecedented space for fundraising. Private donations are no longer seen as a dispensable option.

There is a marked paradigm shift in people's thinking when private donations enter the funding formula for higher education. First, the "pie" is much larger, and institutions could expand it further. This gives room for institutions and academics to develop their vision in a way that would not be possible if public funding dictated the level of activities. Second, by the same token, institutions and academics now have the space to undertake long-term developments. Impacts due to fluctuations in public funding are minimized. Third, the space created by private funding allows institutions and individuals to pursue excellence and innovations. In a way, private donations are a cure for the complacency, stagnancy, and mediocrity that are inevitable under pure public funding.

Nonetheless, private resources are not a replacement for public funding. Even in societies with a mature culture of philanthropy, as in the United States, public funding still provides the bread and butter to many institutions. Even in major private universities in the United States, for example, a large percentage of expenditures is supported by publicly funded projects.[4]

Hence, fundraising in higher education is now included more widely under the notion of institutional advancement. It is a matter of forward-looking, visionary development in higher education.

Policy Issue 3: Learning to Dance with Private Participation

Private participation in higher education has emerged not so much as a matter of government policy, but rather as a response to the needs of society and the aspirations of thoughtful individuals. The partnership with the private sector, which includes private institutions as well as private funding sources, may create unease and discomfort for government agencies.

The Blurring Boundaries

As hinted at in the discussions above, the boundary between public and private sectors in higher education is becoming blurred. Nowadays, purely public institutions are rare. Even public institutions have a degree of income from self-financing programs, competitive grants, commercial activities, and private donations.

In recent years, many public institutions have developed private lifelong learning or distance learning components. Many offer summer programs that generate income. There is also a rush to set up offshore campuses on other people's lands, very much due to accession to the World Trade Organization, and many of these are initiated by public institutions.

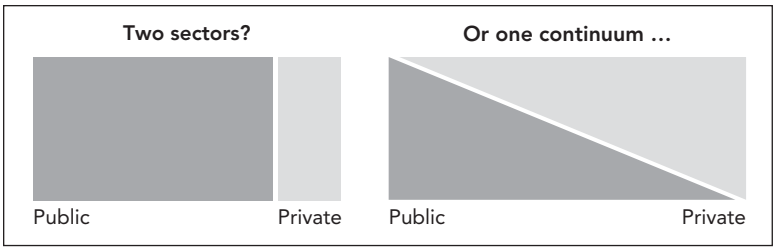
At the same time, private institutions, established by individuals or foundations, receive public money either directly from special programs, through competition in the public arena, or indirectly from students and their families.

It has become increasingly difficult to draw a clear line between the public and the private sectors. It is perhaps more enlightening to regard the interface between them as a continuum, as shown in figure 1.

Dancing with Private Participation

Governments do not always feel comfortable with private money. Government could easily slip into a tendency to treat private institutions and private money as if they were public. There is already frequent outcry over government's managerial and bureaucratic control of higher education. In the name of public accountability, all kinds of indicators, quality assurance schemes, evaluation systems, and "league

FIGURE 1
Interface between the Public and Private Sectors



tables" prevail. Such measures might be technically justifiable, but the overall effect is to create the kind of climate that is appropriate only for the bygone industrial era.

Apart from very mature systems, few governments have yet to create an alternative framework of higher education governance that could accommodate private participation. There is no shortage of examples in which efficient approaches in the private sector are seen as low-quality practices because of the expenditure standard. There are also examples where the strategic integration of public and private money is forbidden, under the excuse of avoiding cross-subsidies. There are further examples where creative and innovative activities are subject to threshold measurements, resulting in mediocrity.

It is time for governments to embrace private participation in higher education. A sincere recognition of private contribution is fundamental. There is a need for the public sector to learn to live with the market, which is difficult to control but efficient. There is a need to move away from the civil service ideologies and create an alternative framework of accountability. There is a need to return to the basics and focus on student learning, so that genuine concerns about education can prevail over administrative procedures.

A Paradigm Shift

I would like to end these comments with an observation of the contrast between paradigms. In the industrial era, people favored thinking that is analytic, regulated, structured, clear-cut, uniform, convergent, normative, neat, assertive, and reducible to parameters. Today people favor thinking that tends to be holistic, flexible, loose, fuzzy, plural, divergent, liberal, complex, speculative, and tolerant of multiple concepts.

Notes

1. This is very much Max Weber's concept of a bureaucracy, which is taken in a positive way to reflect "rational-legality," which distinguishes the industrial society from a traditional agricultural society (see Weber 1947).
2. In 2003–06, the Hong Kong government launched three rounds, each of HK$1 billion ($128 million), to match private donations. The total of HK$3 billion government money has attracted HK$7.4 billion in private donations.

3. The U.K. government announced in early July 2007 that it will offer £200 million for three years to match "voluntary giving."
4. At Harvard, for example, an average of 60 percent of expenditures is supported by a levy on project money, much of which is from government sources.

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Comment on "Intersectoral Interfaces in Higher Education Development: Private and Public in Sync?" by Daniel C. Levy

NORMAN LAROCQUE

It doesn't matter if a cat is black or white, as long as it catches mice.
—*Deng Xiaoping*

Higher education is increasingly being seen as an important contributor to economic growth and a critical input into the development of a knowledge economy. It can contribute to economic growth directly by making individual workers more productive and indirectly by leading to the creation of knowledge, ideas, and technological innovation. The role of higher education as a driver of innovation and economic growth is increasing as jobs become more knowledge intensive and the links between labor productivity and economic growth become closer.

At the same time, the environment facing the higher education sector is changing rapidly. Completion of basic education is no longer enough. Lifetime jobs are out, and lifelong learning is the norm. Workers must be more highly skilled than their counterparts of earlier generations and must master a broader range of skills to succeed. Technologies that were once confined to specific occupations are now widespread. The student body is becoming more diverse. High school graduates seeking full-time, full-year programs are no longer necessarily the norm. Advances in technology have created an ongoing demand for new skills and opened up new delivery mechanisms. The rise of China and India as economic powers and the increasing integration of the world economy—through improved transport, rapid technological advancement, and the opening up of trade—are all placing new demands on countries' higher education systems.

In response to this changing environment, many developed and developing countries have experienced a significant diversification of their higher education sectors, through the emergence of a range of new forms of provision, including universities of technology, technical institutes, polytechnics, virtual universities, franchise universities, and a growing sector of private higher education (World Bank 2002). As

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Levy's paper documents, the private sector represents 25–30 percent of global higher education enrollment, although there is considerable variation across regions. Private higher education represents the bulk of enrollment in several Asian and Latin American countries, including the Republic of Korea (78.3 percent), the Philippines (75 percent), Indonesia (71.4 percent), Chile (71 percent), and Brazil (70.8 percent). It represents a smaller, yet significant, proportion of enrollment in Kazakhstan (46.5 percent), Malaysia (39.1 percent), Mexico (33.1 percent), India (30.7 percent), and Poland (30.3 percent). Private sector penetration is lowest in Western Europe.

Levy's paper explodes the myth that the private provision of higher education serves only—or even primarily—elite groups by documenting the reality that elite private higher education is a rarity outside the United States. The paper also documents the significant expansion of enrollment in private higher education, noting for example, significant growth in the Middle East and North Africa, in Asian countries such as China, Thailand, and Vietnam, in several Eastern European countries, and in Latin America. Other sources confirm this. For example,

- The number of private higher education institutions in Pakistan grew from six in 1994–95 to 54 in 2005–06, while enrollment grew around 40 percent between 2001–02 and 2003–04.
- Between 1990 and 2000, enrollment in private Polish and Romanian business schools rose from zero to almost 300,000 and 53,000, respectively (Kraft and Vodopoviec 2003).
- A mid-1990s report by the United Nations Educational, Scientific, and Cultural Organization (UNESCO) characterized the increase in the number of nongovernmental institutions in Arab countries as the most significant development in Arab higher education systems in the 1990s (Qasem 1998, pp. 18–20).
- Private sector enrollment in the Czech Republic, Hungary, Poland, and Romania grew by an average of 60 percent a year between 1990 and 1997, with enrollment in private institutions of higher education reaching more than 320,000 by the end of that period (Giesecke 1999).

Growth in private higher education is being driven by a number of demand and supply factors, including the inability of the public sector to meet the demand for postsecondary education and training, pressures on government budgets and the need to prioritize spending, growing recognition of the value of individual investments in higher education, rising per capita income, the desire among students and employers for a more job-relevant curriculum, the advent of lifelong learning, technological innovation, and favorable changes in regulatory and funding policy.

One of the defining characteristics of private higher education is its diversity. As Professor Levy notes, the private higher education sector in both developing and developed countries covers the full range of institutions—from degree mills to fully fledged research universities, religious versus lay institutions, for-profit and not-for-profit institutions, upstarts, and long-established universities. Furthermore, the degree of regulatory oversight of the private sector differs widely across countries.

One of the implications of this diversity is that quality can vary widely in the private higher education sector (Altbach 1998), which poses new and complex challenges for regulators, as they seek to maintain standards, while encouraging the entry of new institutions.

In order to address quality challenges posed by the rapid expansion of public enrollment and the growth of both private and cross-border higher education, a number of governments have moved to shore up their quality assurance systems. Several countries have established or strengthened accreditation and evaluation procedures. Accreditation agencies operate in several developing countries, including Argentina, Colombia, Ghana, India, Indonesia, Malaysia, Mongolia, Pakistan, the Philippines, Thailand, and Vietnam. The nature of quality assurance processes differs across countries and can be program- or institution-based, be publicly or privately operated, and involve audits or institutional accreditation, although the bulk of countries operate the latter. Other strategies have been adopted as well, including requiring new institutions to affiliate with established institutions (for example, Ghana and Pakistan) and publishing the rankings of institutional performance (for example, New Zealand, Pakistan, and the United Kingdom).

In addition, quality assurance measures have been linked to funding and regulatory policies, so that institutions that meet requirements are eligible for additional government funding or face less regulation (such as the ability to make changes to the curriculum without government approval). For example, private higher education institutions in the Philippines enjoy various benefits as a result of accreditation, including academic and administrative deregulation as well as eligibility for government subsidies and other financial incentives. Accreditation also provides institutions with a means of differentiating themselves in terms of quality. Several Latin American countries have instituted competitive funding programs linked to quality assurance mechanisms.

The private sector also plays an important role in maintaining and improving the quality of private higher education. For example, several countries operate private accreditation schemes, including the Philippines and the United States, and international accreditation systems operate in a number of fields (for example, EQUIS business school accreditation and International Maritime Organization standards for the training of mariners). The Seventh Day Adventist Church operates an accreditation system for schools and higher education institutions in its network. Other private mechanisms for assuring quality include the implementation of quality certification programs such as ISO 9000, the establishment of independent quality assurance cells within private institutions, internationally recognized certification by companies such as Microsoft, and the use of foreign curricula and programs (for example, University of Southern Queensland degrees offered in Pakistan). Until recently, Oman operated an innovative quality assurance system, which required private colleges to affiliate with foreign higher education institutions as a condition of operation.

A key difference between the public and private higher education sectors is in the area of funding. As Levy's paper notes, few countries provide funding for the private higher education sector, while the bulk of funding goes to the public sector. There is

no policy justification for this dichotomy. The typical arguments put forward in favor of government intervention in higher education usually relate to the need to overcome market failures such as the existence of externalities, capital market imperfections, or information asymmetries. While such arguments may justify government intervention, they do not justify government *delivery*, only government *funding,* of higher education or the provision of information to students. The debate is not about whether government should be involved in higher education, but what its appropriate role should be.

The distinction between government funding and delivery in higher education is a key principle that should guide the development of policy in this important area. Restricting access to educational subsidies to students in public institutions can have several adverse effects, including limiting access, adversely affecting the equity of government spending, limiting private entry into the higher education market, and insulating public institutions from private sector competition. Some governments have moved to provide assistance to students attending higher education institutions in the private sector. Such assistance can take a variety of forms, including the provision of institutional subsidies, vouchers, and student loans. For example, New Zealand introduced government funding for private training establishments in the early 1990s, and, by the end of the decade, students attending private institutions were eligible for almost the same level of subsidy as students attending public institutions. Although some of this has been reversed in recent years, assistance to private training establishments remains high in New Zealand, approximately $NZ 120 million now versus only $NZ 2 million in 1992, when subsidies were introduced.

Some recent examples of assistance to private higher education include the provision of vouchers to students in both the public and private higher education sectors in the U.S. state of Colorado, the extension of loans to students in the private sector in Australia, Brazil's University for All (ProUni) Program, which provides full and partial scholarships to low-income students to attend private universities (which receive tax breaks in return), and the introduction of incentives for private providers in Pakistan, including free land, tax incentives, and matching grants for hiring academic staff. These governments have recognized the important point that Deng Xiaoping made: the color of the cat really is unimportant.

There is an extensive literature on the importance of institutions and policies for good economic outcomes (Rodrik, Subramanian, and Trebbi 2004). It is hard to believe that the same would not be true in the education sector: good policies matter in higher education, as they do in other sectors. Regulation of higher education must ensure high-quality provision, while at the same time encouraging private sector investment, particularly in developing countries where the need is so great and resources are limited. Too often, government regulation appears to be designed to discourage private sector investment without any commensurate gain in quality. For example, many countries

- Limit the ability of private higher education institutions to set tuition fees, which reduces the resources available to deliver quality education and wards off potential investors;

- Impose cumbersome and complex establishment processes for private higher education institutions that frustrate the entry of new institutions and increase the scope for corruption;
- Impose cumbersome and lengthy curriculum approval processes that lengthen the time to market for new courses and programs; and
- Impose establishment guidelines such as land requirements that are patently unrealistic and unrelated to improving either institutional teaching or research.

While such measures may be well intentioned, they do little to create an enabling operating environment and, over the longer term, are likely to reduce both the quality and sustainability of the private higher education sector. This is not to say that there should be no regulation. Well-designed regulations are critical, particularly in countries with recently established private higher education sectors, where the actions of a small number of private institutions can lead to policy reversals that apply across the sector—a form of sectoral contagion.

A number of countries have effected changes to their regulatory frameworks to improve the environment for private higher education, although much remains to be done. These include Australia (introduction of student loans), Pakistan (relaxation of establishment guidelines for private institutions), and China (passage of a series of laws beginning with the Education Law of 1995 and culminating in the 2002 Law on Promoting Private Education). While there is little rigorous evidence, regulatory reform appears to encourage private sector growth. The 1996 extension of eligibility for student aid to students at private for-profit institutions saw the number of institutions and enrollment in the United States grow significantly. The extension of student loans to the private sector saw private enrollment in Australia grow from 20,000 to more than 50,000 between 1999 and 2005, while changes in subsidies saw enrollment in private training establishments in New Zealand grow from 28,000 to more than 70,000 between 1997 and 2003.

The delivery of higher education by private institutions, which is the focus of Professor Levy's paper, is but one form of private participation in higher education. There are many others, including the provision of information (university rankings such as the Australian Good Universities Guide and the Maclean's Guide to Canadian Universities), the regulation of quality (as discussed above), and private finance initiatives. Private finance initiatives are an increasingly common form of procurement for large infrastructure projects in many sectors, including education. These arrangements can be structured in a variety of ways, although they have a number of common characteristics:

- The government retains responsibility for the delivery of core services such as teaching.
- Private sector partners invest in school infrastructure and provide related noncore services such as building maintenance.
- Arrangements between the government and the private sector are governed by long-term contracts, usually 25–30 years.

- Contracts are often bundled, with the private sector taking on several functions such as design, building, maintenance, and employment of noncore staff.
- Contract payments are contingent on the private operator delivering services to an agreed standard of performance (Department of the Parliamentary Library 2002).

Infrastructure public-private partnerships differ from traditional procurement methods in several ways. First, the private sector provides the capital required to finance the project. Second, the government specifies the contract in terms of "outputs" or service-level requirements, rather than in terms of "inputs" such as the number and size of classrooms. Third, the newly constructed facility is not turned over to the government on completion. Instead, it is operated by the private sector until the end of the contract period.

There are several examples of infrastructure public-private partnerships in the education sector. The Private Finance Initiative in the United Kingdom is the largest public-private partnership program, with 121 education deals signed, with a value of £2.9 billion. Around 25 percent of these, with a value of £630 million, have been in higher and continuing education. Private finance initiatives have also been used in the higher education sector in the Australian states of Victoria and Queensland. Among developing countries, Mexico and South Africa are using infrastructure public-private partnerships in education. Under the Mexican model—*Proyectos para Prestación de Servicios* (PPS)—the government contracts with private providers to design, finance, build, operate, and maintain assets and services in health, education, and transport. In these three sectors, 28 projects are being developed, including five polytechnic colleges. Currently, the Mexican government is piloting a PPS to build a new campus for the University of San Luis Potosí, with an expected $30 million investment. The project is expected to expand the capacity of the university from its current enrollment of 1,500 students to 5,000 students by 2010 (García 2005).

Professor Levy has provided a useful and comprehensive overview of private higher education and its growth in recent decades. Given its size, growth, and potential contribution to development, the private higher education sector cannot be ignored. Despite this, private higher education appears to receive comparatively little attention in donor-funded projects. A World Bank study shows that, between 1995 and 1997, only 11 out of 70 education projects included a private sector component (Sosale 2000). Of these, only two were higher education projects, while three involved vocational and technical training. However, it must be recognized that the World Bank and others do provide technical assistance in the area of private higher education.

There are some exceptions. The most notable is the World Bank's commercial arm, the International Finance Corporation (IFC). In early 2006 the IFC's education portfolio included 13 active private higher education projects, with a value of $135 million (71 percent of the education portfolio). The German aid agency GTZ provides considerable capacity-building assistance to private vocational institutions in Uganda. Other isolated examples exist, such as the Asian Development Bank's assistance (with the IFC) to help establish the Royal Melbourne Institute of Technology International University in Vietnam.

What does the future hold for private higher education? In an earlier paper, Professor Levy made the point that growth in the private higher education sector has

been largely unanticipated, surprise has been common, and central policy had not created, designed, or even anticipated the emerging role of the private sector (Levy 2002). The message I draw is that predicting the future of private higher education is difficult and pointless. There is much potential upside for the private higher education sector. The factors that are driving growth in private higher education are unlikely to disappear overnight. At the same time, there are good reasons to be wary of predicting the future of private higher education given the potential downside risks, including populist antiprivate politics, economic crisis, or policy changes in the public sector that have flow-on effects for the private sector.

Experience with predictions in other areas suggests that there are good reasons to be humble when it comes to forecasting the future of private higher education. I recall seeing an article that was apparently from a 1950 edition of *Popular Mechanics* in which the author made a number of predictions about life at the turn of the twenty-first century. Among the predictions were that forecasters would be able to accurately predict the weather and that highways would have no curves. Were the author to visit New Zealand today, he would realize just how wrong he was. Rather than attempting to predict the future shape of private higher education, policy makers would gain more from focusing on the less sexy, but more important, task of designing and implementing policies that strengthen the private sector's potential to contribute to educational, social, and economic outcomes in developing countries.

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Financing Higher Education

Financing Higher Education: Lessons from Developed Economies, Options for Developing Economies

NICHOLAS BARR

Technological advance is driving up the demand for skills and hence the need in all countries to invest more in human capital. Thus, in contrast with earlier years, higher education matters both for national economic performance and for individual economic and political opportunities.

But the rising demand for skills faces countries with a difficult tradeoff among the size of the system, its quality, the extent of access for students from poor backgrounds, and the cost of the system. A large, high-quality system with good access is possible, but beyond the fiscal resources of most countries; one solution is to sacrifice access, providing high-quality education to an elite; another is to sacrifice quality, but at risk of weakening national economic performance. Easing the tradeoff requires that public finance be supplemented on a significant scale by private finance and that the extra resources be used effectively. Thus higher education finance, though only instrumental, is important.

In tackling these issues, this paper works outward from economic theory. The first section seeks to establish three core propositions that underpin the analysis of higher education finance in developed economies and offers principles on which developing countries keep their eye in the medium term, as fiscal and institutional capacity grows. The second section discusses lessons for policy design as they apply in developed countries, and the third offers some cautionary tales explaining how easily things can go badly wrong if implementation does not receive equal billing with policy design. The fourth section considers policy options in developing countries where fiscal and institutional capacity constrains what is feasible. A final section offers some conclusions.

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A number of caveats are necessary. The economic center of gravity in no way denies that higher education matters for other reasons: to promote cultural values, to protect the freedom of ideas, and to pursue new knowledge for its own sake. So far as methodology is concerned, although it is rooted in economic theory and discusses country examples, the paper is neither quantitative nor comparative.

The coverage of topics is deliberately limited. The paper is about how to finance teaching, setting aside the difficult question of funding for research. Within teaching, the paper focuses on two strategic areas: the role and design of student loans in mobilizing resources and the usefulness of market forces in higher education as a way of allocating resources. There is less discussion of other sources of finance (for example, families) and other ways of allocating resources, partly for reasons of space and partly because economic theory has less clear-cut lessons in these areas, there being a range of different approaches.

Lessons from Economic Theory

In most countries, the core objectives for tertiary education are to expand quantity, to improve quality, and to widen access, all subject to a fiscal constraint.

In developed economies, economic theory, drawing largely on the economics of information, suggests three core propositions that underpin policies to achieve those objectives:

- Competition in higher education is beneficial.
- Graduates should contribute to the cost of their degree.
- Well-designed student loans have core characteristics, notably income-contingent repayments and an interest rate not lower than the government's cost of borrowing.

The Benefits of Competition

The literature on the communist system (see Kornai 1992: chap. 9) distinguishes extensive and intensive growth. The former refers to an era when surplus inputs, notably agricultural labor, could be brought into the industrial sector, characterized by rapid growth in the Soviet Union in the 1930s. Intensive growth, when surplus inputs had been used up, depends on technological advances and more efficient use of inputs. Central planning was not able to cope with the more complex problems that arose when inputs became scarce and technology became more advanced, as manifested by declining, and in some countries negative, growth rates in the 1980s and 1990s.

The analogy with higher education is instructive and suggests that central planning of higher education is no longer feasible or desirable. Fifty years ago, richer countries generally had small university systems offering degrees in a limited range of subjects. In that world it was possible, as a polite myth, to assume that all universities were equally good and hence to fund them broadly equally. Today there are more universities, more students, and much greater diversity of subjects. As a result, the

characteristics and the costs of different degrees at different institutions vary widely, so that institutions need to be funded differentially. In principle this could be done by an all-knowing central planner. In practice, the problem is too complex. A mass system in an increasingly complex world needs a funding mechanism that allows institutions to charge differential prices to reflect different costs and missions. Central planning is no longer feasible.

Neither is central planning desirable. It is a standard proposition in economic theory that competition benefits consumers provided that they are well informed. Students are generally well informed and can and should be made better informed. The process is assisted because going to university can be anticipated (unlike finding a doctor to deal with injury after a road accident) so that the student has time to acquire the information she needs and time to seek advice. Thus it can be argued that students are well informed, or potentially well informed, and hence better able than planners to make choices that conform with their own interests and those of the economy. To maintain otherwise is to argue that even with extensive regulation, students (the best and the brightest by assumption) are unable to choose sensibly.

The argument of well-informed choice is central. It implies that price signals will be useful and hence that competition will improve welfare by making universities more responsive to the preferences of students and the needs of employers. Thus competition is beneficial and, given the growing importance of human capital to national productivity, the supply response of tertiary education is an increasingly central element in national economic performance (see François Bourguignon's keynote address in this volume). Although that proposition is robust, there is an important exception: people from disadvantaged backgrounds might not be fully informed, emphasizing the need for action to promote access. Thus economic theory does not suggest that competition should be maximized; rather, the issue is one of optimal deregulation.

Two points are noteworthy about this line of argument. The same analytical approach leads to very different conclusions for school education: attendance is compulsory, so that education is consumed by all young people; small children are not well informed; for younger children, the range of choice about content is constrained; and a case can be made for providing all children with a similar educational experience. These arguments and others provide a compelling case for publicly funded and largely publicly organized schools. A second noteworthy point, emphasized by the first, is that the argument for regulated market forces in tertiary education is not primarily ideological, but rooted in the economics of information.

Contributions of Graduates to the Cost of Their Qualification

A second—and separate—lesson from economic theory is that graduates should contribute to the cost of their qualification. Tertiary education creates benefits beyond those to the individual: benefits in terms of growth, social cohesion, and the transmission of values. Thus taxpayer subsidies are rightly part of the landscape. However, graduates also receive private benefits. Measuring how much of the benefit of higher

education is public and how much is private is problematic for the reasons set out below, but there is good evidence that the private benefits are substantial. Thus it is both efficient and fair that graduates (not students) should bear some of the costs. The view of higher education as mainly publicly financed goes back to an earlier era when the sector was small, absorbed relatively few resources, and was not fundamental to national economic performance. The world has changed in ways that require a different division of finance between taxpayers and graduates.

However, most students cannot afford to pay for tertiary education, leading to the third set of lessons from economic theory regarding the design of student loans.

Core Features of Well-Designed Student Loans

At least in richer countries, loans should have three core features: they should have income-contingent repayments, be large enough to cover tuition fees and, if possible, at least part of the costs of living, and charge an interest rate related to the government's cost of borrowing.

Income-contingent repayments—repayments calculated as x percent of the borrower's subsequent earnings, preferably collected alongside income tax or social security contributions—have major theoretical advantages. The point was first made by Milton Friedman, whose starting point was the capital market imperfection that arose because borrowing to finance investment in human capital has no physical security (Friedman 1955: 137):

> In a non-slave state, the individual embodying the investment cannot be bought and sold. But even if he could, the security would not be comparable. The productivity of . . . physical capital does not . . . depend on the co-operativeness of the original borrower. The productivity of the human capital quite obviously does. . . . A loan to finance the training of an individual who has no security to offer other than his future earnings is therefore a much less attractive proposition than a loan to finance, say, the erection of a building. . . . A further complication is . . . the inappropriateness of fixed money loans to finance investment in training. Such an investment necessarily involves much risk. The average expected return may be high, but there is wide variation about the average.

But in accepting the problem he also proposed a solution (Freeman 1955: 138):

> The device adopted to meet the corresponding problem for other risky investments is equity investment plus limited liability on the part of shareholders. The counterpart for education would be to "buy" a share in an individual's earning prospects: to advance him the funds needed to finance his training on condition that he agree to pay the lender a specified fraction of his future earnings.

On that basis he advocated loans from government (Freeman 1955: 140):

> The individual would agree in return to pay to the government in each future year x percent of his earnings in excess of y dollars for each $1,000 that he gets in this way. This payment could easily be combined with payment of income tax and so involve a minimum of additional administrative expense.

Friedman's key conclusion is that, for technical reasons, bank lending, though the right model for home loans, is the wrong model for loans to finance investment in human capital. The core of the argument is that because of capital market

imperfections, notably the fact that human capital cannot act as collateral, borrowing will be inefficiently low: on the supply side, not enough will be offered, and risk aversion on the demand side means that, even if conventional loans were offered, demand would be inefficiently low. Basing the repayment schedule on the borrower's subsequent earnings spreads the risk from the individual to a larger group such as the cohort of borrowers (if the loan includes a cohort risk premium) or the taxpayer (if losses in a loan system are made up from public revenues). Income-contingent repayments are not the only possible approach: there are private schemes with conventional repayments, and there are state schemes with conventional repayments but an interest rate that is reduced by the existence of government guarantees, as in the United States.[1] The argument here is that these other approaches are based on an inappropriate model and are therefore suboptimal.

A second feature of well-designed loans is that the loan should be large enough to cover fees and, at least in richer countries, living expenses, resolving student poverty and promoting access by making tertiary education largely free at the point of use. The argument is straightforward: loans should allow individuals to borrow against their future earnings to finance investment in their own human capital. If loans are too small, they are unable to fulfill their efficiency function.

Finally, loans should attract an interest rate broadly equal to the government's cost of borrowing. The question of interest rates bears examination. Many countries, including Australia and the United Kingdom, offer loans at a zero real interest rate, that is, there is a blanket interest subsidy. In a system with income-contingent repayments, this policy achieves not a single desirable objective. The subsidy is enormously expensive in fiscal terms. Because of the resulting fiscal pressures, loans are too small, harming access. The subsidies also crowd out university income, harming quality. Finally, the subsidies are deeply regressive.

The regressivity point merits attention.

- The subsidies do not help students (graduates make repayments, not students).
- In a well-designed system, they give relatively little help to low-earning graduates, since unpaid debt is eventually forgiven.
- They do not help high-earning graduates early in their career: with income-contingent loans, monthly repayments depend only on earnings; thus interest rates *have no effect on monthly repayments*, only on the duration of the loan.
- Thus the major beneficiaries are successful professionals in mid-career, whose loan repayments are switched off earlier because of the subsidy than would otherwise be the case. This is not the target group that policy makers had in mind.

In sum, income-contingent repayments improve efficiency by protecting borrowers and lenders from the uncertainty of a loan that is not secured by physical collateral: borrowers are protected because monthly repayments are calibrated to subsequent earnings, and lenders are protected from the risk of an unsecured loan, not least because repayments are collected alongside income tax. Income-contingent repayments also protect access because the loan has built-in insurance against inability to repay. Note that what is being discussed is not a tax, which goes on forever, but a genuine

loan, where repayments cease once principal plus interest have been repaid. Income-contingent repayments have a profound effect that is insufficiently understood (for fuller discussion, see Barr 2001: chap. 12).

Policy Design: Lessons from Developed Countries

Developed countries offer both positive and negative lessons.

Positive Lessons

Three sets of lessons are noteworthy: the importance of mass tertiary education, lessons about tuition fees, and lessons about student loans.

Importance of Mass Tertiary Education

Policy makers, especially in ministries of finance, are keen to know the answers to two questions:

- What is the efficient level of spending on education?
- What is the efficient level of taxpayer subsidy?

These questions, though central, can be answered only indicatively. The conclusion of a very different literature (Barr 1999; Sen 1999) is that it is not possible to quantify a value-free definition of poverty. Instead, the decision about where to pitch the level of poverty relief depends on a social choice constrained by fiscal realities. This does not mean that there should be no poverty studies; it does mean that judgment is needed in interpreting evidence. Analogously, problems—both of concept and of measurement—mean that the benefits to education cannot be quantified in any definitive way. Of course, a conceptual impasse cannot be allowed to interfere with operational imperatives. Equally, however, one of the scarcest of all scarce resources is high-grade brain power, which should not be wasted in the search for a Holy Grail.

In principle, the efficient volume of resources to devote to tertiary education is that whose marginal social value equals the marginal social costs of the resources involved. Although it is possible to approximate the costs of education, there are two sets of reasons why there is no definitive quantitative measure of its social benefits: measuring outputs and inputs faces major problems, and, even were these to be solved, causality is problematic. The arguments are summarized briefly below; for fuller discussion, see Barr (2000).

The first problem is that output cannot be measured, not least because there is no single definition of a "good" education. Test scores are imperfect measures even of output defined narrowly as technical achievement, they fail to capture broader benefits of education to the individual, and they take no account of a range of external benefits, including shared values. That the broader benefits are largely unmeasurable does not make them unreal.

Even if output could be measured, connecting that output to educational inputs faces further problems. Measuring inputs is not easy. It is possible to measure some,

such as the quantity of teachers' and pupils' time, buildings, equipment, and so forth. But it is much harder to measure critically important factors such as the quality of teachers, natural ability, and the quantity and quality of parenting. A second problem is establishing the production function that connects inputs and outputs. Studies tend to assume (since no other assumption is available) that schools have a single, simple objective: maximizing their pupils' test scores. Although that model is analytically tractable and seems plausible, it is fundamentally flawed: it implies, for example, that a school should stop teaching children who are not capable of passing tests.

Establishing causality creates a further set of problems. The discussion implicitly assumes that education increases individual productivity. The "screening hypothesis" questions the causal link, at least for postprimary education, arguing that education is associated with higher productivity but does not cause it.[2] The argument has two elements.

- Just as good health may be due more to a naturally strong constitution than to medical care, individual productivity may be the result of natural ability rather than postprimary education.
- Firms seek high-ability workers but, prior to employing them, cannot distinguish high-ability workers from low-ability workers, just as insurance companies may not be able to distinguish high from low risks.

The two elements together suggest that there is no social benefit from postprimary education, but there is a private benefit, since individuals have an incentive to make themselves stand out. The screening hypothesis argues that postprimary education does exactly that: it gives a signal to prospective employers that is in the individual's interest to acquire: it signals that he or she is a high-productivity worker.

There are various reasons why the strong form of the hypothesis does not hold. It fails where education includes professional training, for example, medicine. It also fails where there is more than one type of job: since skills and job characteristics are heterogeneous, it is necessary to match workers and jobs, so education has a social benefit as a matching device. Whether the hypothesis has *some* validity is an empirical matter. The verdict is undecided and likely will remain so, since individual productivity is partly determined by unmeasurable factors such as natural ability and family background.

Despite these difficulties in quantifying the efficient level of spending on education, it is possible to make progress with qualitative arguments. The starting point (due to Thurow 1996) is that human capital is a more important determinant of differential national economic performance today than in the past. The simplest way to make the point starts from a conventional production function:

$$Q = f(K, L, M), \tag{1}$$

where output, Q, is related to inputs of capital, K, labor, L, and raw materials, M, through the production function, f. Considering each of these in turn:

- In the nineteenth century, access to raw materials was critical. A century ago, almost all of the largest U.S. firms were involved with raw materials. Today value

added comes increasingly from other sources: the material component of computers is a trivial part of their cost; the steel used in modern cars costs less than the electronics.

- Historically, countries with a larger capital stock would typically be richer and so, through higher savings, could invest more than poorer countries, further increasing their capital stock. With today's global capital markets, domestic investment is less constrained by domestic savings: investment by an entrepreneur in Thailand is no longer wholly constrained by domestic savings.
- Technology (the function, f) remains a critical determinant of relative economic performance. Historically, technology tended to be tied to specific countries. Today, not least because information flows are instant, technological advance moves across countries more quickly than hitherto.

Thus f, K, and M are less important explanations of differential economic performance today than in the past. The remaining variable, L, thus assumes increasing importance. In short, a combination of technological advance and international competition makes education a more important source of economic performance than ever before.

There are several sets of reasons why this might be so. Technological advance is a key driver. Although technological change reduces the need for some skills (for example, computers are increasingly user-friendly), it mostly increases the demand for skilled workers. Furthermore, skills become dated quickly and need to be replenished. The "information age" can be taken to mean a need for education and training that is larger than previously, more diverse, and repeated, given the need for periodic retraining.

Demographic change offers a second reason for higher investment in education. The rising proportion of older people foreshadows higher spending on pensions, medical care, and long-term care. Part of the solution is to increase output sufficiently to meet the combined expectations of workers and pensioners (on the analytics, see Barr and Diamond 2006, 2008). If workers are becoming relatively scarce, the efficient response is to make labor more productive. The point is reinforced because some countries also face a decline in the school-age population. Demographic change—both increasing longevity and declining fertility—is thus an argument for additional spending on investment both in physical and in human capital.

For these reasons, the case for expanding tertiary education is strong, although quantification is problematic. Thus is it not surprising that the demand for higher education is growing, usually rapidly, in advanced and in many developing countries. The underlying drivers can be muted or strengthened by country-specific factors. Participation has grown particularly rapidly in countries where supply-side constraints have been relaxed, for example, in the United Kingdom after 1990 and, for very different reasons, in the former-communist European countries. Participation has also grown rapidly in countries with rapid economic growth, China being a case in point.

Lessons about Tuition Fees

Three lessons should be pondered: fees relax the supply-side constraint, big-bang liberalization is politically destabilizing, but no liberalization is also a mistake.

The first lesson is that fees relax the supply-side constraint. The funding of higher education faces a paradox. Large taxpayer subsidies can create supply-side constraints because of the desire to contain public spending. Where qualified students have no automatic entitlement to a place, the constraint takes the form of a view (typically by the ministry of finance) about student numbers. The result can be a high-quality system that turns away qualified applicants. In countries where students have a right to a place, cost containment has an impact mainly on quality. In contrast, in countries that offer less public funding per student (for example, the United States and Republic of Korea), there are no externally imposed supply-side constraints. Unless limited taxpayer funding is sufficiently redistributive, however, students from lower-income backgrounds will be deterred from applying. Thus the presence of high subsidies can harm access on the supply side, but their absence can harm it on the demand side.

Table 1 shows public and private spending on higher education and participation rates in Organisation for Economic Co-operation and Development (OECD) countries. Given the differences in country systems and in definitions, comparisons should not be pushed too far. However, in a range of countries (Australia, New Zealand, Korea, and, from other data sources, Canada and the United States), high private spending goes along with high participation rates. A few countries combine high participation with little private spending, notably Finland and Sweden, but those are the two countries with the highest public spending on higher education—levels that might be unsustainable given other budgetary demands and international competitive pressures.

What matters is not only the total amount of spending, but also how it is determined. With flat fees, government controls total funding. If fees go up and public spending on higher education declines, all that happens is a change in balance between public and private finance. In 1989 Australia introduced centrally set tuition fees to address a funding crisis. Over the years, fee income increased, but tax funding declined. By 2000 the system was back in crisis, leading to reform, announced in 2003, that partially liberalized fees.

Variable fees—that is, fees set by universities—have two strategic advantages: by addressing the problem described in the previous paragraph, they make funding open ended and thus increase the resources going to higher education, and by strengthening competition, they create incentives to improve the efficiency with which those additional resources are used, not least the responsiveness of the system to changing patterns of demand. Although the economic argument is clear, the topic is highly contested in political terms. Fees are not controversial in the United States, in Japan and many other countries in Asia, and in many of the former-communist countries of Central and Eastern Europe. In contrast, fees are highly controversial in Western and Northern Europe.

The second lesson is that big-bang liberalization can be politically destabilizing. In 1992 New Zealand introduced twin reforms: fees set by universities, with no

TABLE 1. Spending on Tertiary Education and Participation Rates in OECD Countries

Country	Spending as a percent of GDP, 2003			Net entry rate, 2001[a]
	Public	Private	Total	
Australia	0.8	0.8	1.5	65
Austria	1.1	0.1	1.1	34
Belgium	1.2	0.1	1.3	32
Canada	1.3	1.0	2.4	—
Czech Rep.	0.9	0.2	1.1	30
Denmark	1.7	0.1	1.8	44
Finland	1.7	0.1	1.8	72
France	1.1	0.2	1.4	37
Germany	1.0	0.1	1.1	32
Greece	1.2	..	1.3	—
Hungary	1.0	0.3	1.3	56
Iceland	1.1	0.1	1.2	61
Ireland	1.0	0.1	1.2	38
Italy	0.7	0.2	0.9	44
Japan	0.5	0.8	1.3	41
Korea, Rep. of	0.6	2.0	2.6	49
Mexico	0.9	0.4	1.3	25
Netherlands	1.1	0.3	1.3	54
New Zealand	0.9	0.6	1.5	76
Norway	1.5	0.1	1.5	62
Poland	1.0	0.5	1.5	67
Portugal	1.0	0.1	1.1	—
Slovak Rep.	0.8	0.1	0.9	40
Spain	0.9	0.3	1.2	48
Sweden	1.6	0.2	1.8	69
Switzerland	1.6	—	—	33
Turkey	1.1	0.1	1.1	20
United Kingdom	0.8	0.3	1.1	45
United States	1.2	1.6	2.9	42
OECD average	1.1	0.4	1.4	47

Source: OECD (2003, 2006).

— Not available.

.. Negligible.

Note: Numbers do not always add, due to rounding.

a. The net entry rate is based on the probability of a 17-year-old entering higher education for the first time by the age of 30.

constraint on fee levels, and student loans that (a) had income-contingent repayments, (b) charged a positive real interest rate related to the government's cost of borrowing, and (c) covered all fees and realistic living expenses.

Although the design of the system had much in common with the strategy set out below, mistakes were made. First, reform was to some extent big bang. Student loans

were new, and fees, though not new, were fully liberalized. Second, although the system included targeted interest subsidies for low earners, more could have been done. In addition, active measures to promote access were not strongly emphasized. Fourth, and equally important, the politics were handled poorly: the government failed to continue to explain the reforms and, in particular, to explain to students and parents the considerable advantages of income-contingent repayments. As a result, when nominal student debt rose over the years, worried middle-class parents created political pressures. The scheme was diluted in 2000, with further dilution since.

The third lesson is that without liberalization quality and access suffer. The opposite policy direction—no liberalization—is equally a mistake. "Free" higher education or low fixed fees create two problems. Quality suffers because the education budget has to compete with other budgetary imperatives, and within the education budget, universities compete with preschool education, school education, and vocational training. As a result, real funding per student declines.

Access also suffers. If places are scarce, middle-class students tend to get them; if places are not scarce, the need to finance a mass system typically means that resources for the proaccess strategy are limited.

Lessons about Loans

Discussion focuses on four lessons: income-contingent loans do not harm access, interest subsidies are expensive, positive real interest rates are politically feasible, and the design of the student loan contract matters.

The first lesson is that income-contingent loans do not harm access. Australia introduced a system of income-contingent loans in 1989 to cover a newly introduced tuition charge and thus offers the longest historical record. Chapman (1997; see also Chapman and Ryan 2003) notes the increase in overall participation since 1989 and finds, superimposed on that trend, that women's participation grew more strongly than men's and that the system did not discourage participation by people in the lowest socioeconomic groups.

There are two sets of reasons why we should expect these results. First, the income-contingent mechanism is designed explicitly to reduce the risks borrowers face. Second, fees supported by loans free up resources to promote access.

The second lesson is that interest subsidies are expensive. In the United Kingdom, student loans charge a rate of interest equal to the inflation rate, that is, a zero rate of interest. In contrast, when the government borrows, it has to pay a positive real interest rate. The interest subsidy on student loans is expensive: for every £100 the government lends, between £30 and £35 are never repaid simply because of the interest subsidy (Barr 2002: paras. 33–37). In other words, the interest subsidy converts nearly one-third of the loan into a grant.

New Zealand offers parallel evidence. A government elected in 1999 acted early on a manifesto commitment. The administration introduced an interest subsidy in the form of a zero *nominal* interest rate while a student was still at university (previously a real interest rate was charged from the time the student took out the loan). In addition, the real interest rate charged after graduation was frozen at somewhat below its previous rate. The impact of these changes was startling. Previously,

according to official estimates, for every $NZ 100 that was lent, $NZ 90 would be repaid. As a result of the changes, it was estimated that only $NZ 77 out of every $NZ 100 would be repaid (New Zealand, Ministry of Education 2002: 7). The change was so expensive precisely because the subsidy to students while still at university applied to *all* students. A key message is that seemingly small adjustments can be very expensive.

Not least for these reasons, an official inquiry concluded (New Zealand, Tertiary Education Advisory Commission 2001: 14):

> Participation goals should continue to be supported through a Student Loan Scheme with income-contingent repayments as at present. The Commission believes, however, that the current policy of writing off interest on loans for . . . students while they are studying is not an effective use of the government's resources. While this policy has decreased the length of time taken to repay loans after graduation, it has also led to an increase in the number of students taking out loans and in the overall level of student debt. To compound matters, the policy has made it possible for learners to borrow money and invest it for private gain (arbitrage). Consequently, the Commission believes that this policy should be discontinued or that, as a minimum, the incentives for arbitrage should be removed. Any savings . . . should be reinvested in the tertiary education system and be used for the benefit of students.

The third lesson is that positive real interest rates are feasible. In the Netherlands, Norway, and Sweden, and more recently also in Hungary, a real interest rate is charged from the moment the student takes out the loan, both matters that are taken for granted. As noted earlier, with income-contingent loans a higher interest rate does not increase a graduate's monthly repayments, only the duration of the loan.

A fourth lesson is that contract design is important. International labor mobility is high and likely to increase, raising questions about potential default if a person emigrates. In Australia, loan repayments are part of a person's tax liability, so someone outside the Australian tax net has no liability to make repayments. With interest subsidies, this is a costly error. In the United Kingdom, in contrast, an explicit loan contract includes the collection of repayments through the tax system but does not exempt a person outside the United Kingdom from making repayments. Although default and administrative costs are higher for people working abroad, the effect is not large. Certainly there is no question of emigration causing a repayment black hole.

Negative Lessons

Alongside these positive lessons are a number of myths.

Myth 1: tax finance promotes quality and access. Excessive reliance on taxation creates three sets of problems. First, it fails to promote access. The United Kingdom illustrates the point. In 2002, 81 percent of children from professional backgrounds went to university; the comparable figure for children from manual backgrounds was 15 percent (U.K. Education and Skills Select Committee 2002: 19).

Second, excessive reliance on tax finance can reduce quality. There are two sets of drivers.

- If resources are static, rising student numbers lead to a decline in funding per student.
- Systems that rely mainly on tax finance are typically controlled by government, hence universities are not competitive, attenuating incentives to improve quality.

European countries that display such problems include France, Germany, and the United Kingdom; precisely for those reasons, in 2006 the United Kingdom introduced a system with stronger competitive incentives. Several Scandinavian countries have managed to combine expansion with quality, but these are countries with high tax rates; the Scandinavian political economy may be difficult to replicate elsewhere and may face increasing international competitive pressures. In any case, the approach is not affordable in developing economies.

Third, tax finance is generally regressive, since participating in higher education is disproportionately an activity of the better-off.

Myth 2: Graduates pay for their higher education through their subsequent higher taxes. Some people argue that higher education should be financed from taxation because graduates earn more than nongraduates and therefore pay for their higher education because of their larger total income tax payments. This argument is superficially plausible—hence its regular reappearance—but it is wrong. There are three counterarguments.

First, income tax raises only part of government revenue. The tax is paid by many more nongraduates than graduates: in 2000, 82 percent of working-age adults in the United Kingdom did not have a degree (OECD 2002: table A3.1a).

The second argument is best shown by example. Consider three individuals: A is a graduate with average graduate lifetime earnings, B is a nongraduate with average nongraduate lifetime earnings, and C is a nongraduate with the same lifetime earnings as A. Suppose that A pays $200,000 more in income tax over his working life than B and that $40,000 of A's total tax payment is deemed to pay for his higher education.

- Comparing A and C: $40,000 of A's total tax payment pays for his higher education; by implication, therefore, the remaining $160,000 goes toward the national health service, school education, and so forth, less than the $200,000 contributed to those services by C. It follows that C is paying part of the contribution A should be making to the national health and other public services. This is horizontally inequitable.
- Comparing A and B: one of the following arguments must hold. *Either* B's taxes pay for A's higher education (the argument here), which is regressive, that is, vertically inequitable, *or* A's taxes pay for his own higher education, in which case poorer B is paying part of the contribution that A should be making to the national health and other public services. This is both horizontally and vertically inequitable.

Third, if the argument is that the taxpayer gets a "good deal" by paying for people's investment in higher education, the same logic says that the U.S. taxpayer should pay all of Microsoft's development costs.

Myth 3: It is immoral to charge for education. It is immoral if people with the aptitude and desire are denied access to higher education because they cannot afford it; it is also immoral if underresourced earlier education means that these people never even aspire to higher education. Similarly, it is immoral if someone is malnourished because he cannot afford a healthy diet. That, however, does not mean that it is immoral to charge for food, meaning that food would be free for everyone, including the rich; rather, it is an argument for income transfers to allow everyone to afford a healthy diet.

Making something free for everyone can be justified in efficiency terms where market failures make consumer sovereignty problematic and in equity terms where consumption is not largely by the better-off. School education is an example. Higher education conforms with neither criterion: as argued earlier, consumer sovereignty is useful, and there is a steep socioeconomic gradient in consumption. As a result, taxpayer subsidies are regressive: the taxes of truck drivers pay for the degrees of old Etonians. That is, indeed, immoral.

Myth 4: Higher education is a basic right and should therefore be free. It is sometimes argued that tertiary education is a basic right and should be financed out of taxation. There is a range of counterarguments. First, the fact that something is regarded as a right does not mean that it should be financed with taxes. Access to nutrition is a basic right, yet nobody argues that it is wrong to charge for food. The moral imperative is not about *instruments* (for example, prices) but about *outcomes* (for example, a bright person should be able to go to the best school or university irrespective of his or her financial circumstances). Second, the worldwide collision between expanding tertiary education and fiscal pressures means that exclusive reliance on tax finance creates downward pressure on quality. Third, the historical record in many countries shows that tax finance has done little to widen access. Finally, as noted, tax finance is deeply regressive. If it is unfair to ask graduates to pay more of the cost of tertiary education, it is even more unfair to ask nongraduate taxpayers to do so.

Myth 5: Elitism has no place in higher education. Two separate elements are often conflated. Most people agree with the value judgment that social elitism is wrong: access to the best universities should not be influenced by a person's socioeconomic background. In contrast, intellectual elitism is both proper and desirable. The best musicians and athletes are chosen precisely because of their abilities, irrespective of whether their background is poor (Pele) or middle class (Tiger Woods). There is nothing inequitable about intellectually elite universities. The equity objective should be a system in which the brightest students are able to study at the most intellectually demanding universities and in which their ability to do so is determined by their ability and wishes, not their socioeconomic background.

A General Strategy

This section sets out a general strategy for efficiency and equity with three elements: variable fees, well-designed loans, and active measures to promote access.

Element 1: Variable Fees

In this approach, tertiary institutions are financed from a mix of taxation and tuition fees. Each institution sets its fees, which for each student are covered by his or her loan entitlement. Fees give institutions more resources to improve quality and, through competition, help to improve the efficiency with which those resources are used, thus improving quality and diversity and assisting choice. As discussed earlier, the argument for competition is rooted in the idea that students in tertiary education are broadly well informed and that their information can be further improved. Thus the argument is not for law-of-the jungle competition, but for regulated markets.

Perhaps counterintuitively, variable fees are also more fair than other approaches, notably because they facilitate redistribution from the better-off to the worse-off. One of my earliest newspaper articles criticized the 1974 Labour government in the United Kingdom for restoring universal milk subsidies. The aim was to help the poor, but the subsidy was worth more to the middle class because they drank more milk. It would have been much more progressive to have charged an unsubsidized price for milk and used the resulting savings to increase benefits designed more explicitly for poverty relief.

Variable fees replace the former strategy (price subsidies for milk) by the latter (income transfers targeted at particular people). The strategy has two elements:

- Variable fees introduce higher charges for those who can afford them (note that with income-contingent loans, "can afford" refers to earnings as a graduate, not to family circumstances while a student).
- Redistributive policies help poor people to pay those charges.

To an economist, these elements are staggeringly familiar: the first, a price increase, represents a movement *along* the demand curve. Taken alone, this element would harm access. However, (a) the fees are deferred (element 2), and (b) transfers are targeted to groups for whom access is fragile (element 3). This moves their demand curve *outward*.

Thus the strategy is deeply progressive. It shifts resources from today's best-off (who lose some of their fee subsidies) to today's worst-off (who receive a scholarship) and tomorrow's worst-off (who, with income-contingent repayments, do not repay their loan in full).

The obvious argument against fees is that they deter students from poor backgrounds. That is true of up-front fees, but not of fees that students pay only after they have attended university or other tertiary education and have graduated. This brings us to the second part of the strategy.

Element 2: A Well-Designed Loan Scheme

Student support is through loans with income-contingent repayments. The loan entitlement should be large enough to cover fees and, in richer countries, living expenses, and it should carry an interest rate broadly equal to the government's cost of borrowing. This element presupposes that a country can meet the implementation prerequisites discussed in the following section.

Some amplification is needed about interest rates. The default rate should be related to the government's cost of borrowing. However, if someone has extended spells out of the labor force, her loan can spiral upward. In terms of strict rationality, that should not matter, since repayments will never exceed x percent of monthly earnings and the loan is eventually forgiven. But in practice, large nominal debts worry people. Thus, although there is a strong case against blanket interest subsidies, there are good arguments for targeted interest subsidies for people who have low earnings or are out of the labor force.

If loans are large enough to cover fees, the package resembles "free" tertiary education financed through taxation. Students pay nothing at the time they go to university. Part of the cost is paid through taxation and part through their subsequent income-contingent repayments. From the viewpoint of the graduate, the latter are different from tax in only two ways: they are paid only by people who have been to university and benefited financially, and they do not go on forever. Thus income-contingent loans are logically equivalent to free tertiary education financed by an income-related graduate contribution.

The viewpoint from the ministry of finance is somewhat different. Although loans bring in private resources in the longer term, a loan scheme, by definition, has up-front costs because it lends the money first and receives repayments later. Thus there are major advantages if students can borrow from private sources, but, particularly in a developing country, private lenders will charge a substantial risk premium unless there is a government guarantee; if there is a government guarantee, the loans will be classified as public spending, as discussed below.

Element 3: Action to Promote Access

It can be argued that there are three roots to exclusion:

- Shortage of money, that is, the student comes from a low-income family;
- Shortage of information, for example, the student is badly informed about the benefits of education and training; information in this context includes aspirations; and
- Shortage of education, for example, the student attends a failing school.

Thus a person might not participate in tertiary education because he or she:

- Left school at the earliest leaving age, because of any combination of these three shortages, or
- Never considered staying on, not least because of a shortage of information, or
- Thought about staying but thought, wrongly, that he or she did not have the capacity to succeed, or
- Was debt-averse.

The last item requires amplification. It can be argued that income-contingent loans have built-in insurance against inability to repay and, to that extent, are a sure bet. Provided loans are large enough to make tertiary education free at the point of use, the argument continues, such loans are all that is needed.

If all students are well informed, that argument is strong, and consumption smoothing through income-contingent loans is, for the most part, all that is necessary. But not all potential students are well informed. In particular, they might underestimate the benefits of tertiary education or overestimate the costs. There is empirical support for this conjecture. Usher (2005) finds that the average Canadian underestimates the benefit of a university education by a factor of five. In those circumstances, *given what they know*, it is rational for people to be unwilling to take out a loan, even an income-contingent loan. This is the origin of so-called debt aversion. For groups to whom the analysis applies, loans alone are not enough, hence the third element in the strategy: measures designed to promote access directly.

Polices must address all three roots of exclusion. Measures to address financial poverty should be wide-ranging:

- An income-tested grant for children above the minimum school-leaving age would encourage them to complete school.
- An income-tested grant or scholarship could cover some or all of the costs at university or college. There may be advantages in offering full scholarships to first-year students from poor backgrounds, who are unsure about whether they are well suited to university. By the end of their first year, they are no longer badly informed and, if doing well, are more prepared to finance the rest of their degree, at least in part, through a loan.
- Both policies could be supported by financial incentives to tertiary institutions to widen participation and by extra resources to provide additional intellectual support at tertiary institutions for students from disadvantaged backgrounds.

A second set of money measures supports access by offering assistance for people with low incomes after graduation:

- Targeted interest subsidies could freeze the real value of debt of people with low earnings, including people who are unemployed.
- People with low lifetime earnings could be protected by writing off any loan not repaid after (say) 25 years.
- The loans of workers in the public sector could be progressively written off.
- People caring for young children or elderly dependents could be granted loan remission.

Information poverty, the second strategic impediment to access, receives far too little attention. Action to inform schoolchildren and raise their aspirations is therefore critical. The saddest impediment to access is someone who has never even thought of going to university.

Finally, problems of access to postcompulsory education cannot be solved entirely within the tertiary education sector. More resources are needed earlier in the system, not least because of the growing evidence that the roots of exclusion lie in early childhood (Feinstein 2003).

Lessons about Implementation

Fiscal pressures make loans seem attractive to ministries of finance. However, loans are difficult to implement, so many countries have a lamentable record of collecting repayments. It is one thing to design a good loan system and quite another to make sure that the money is paid promptly and accurately to the right people and that repayments are collected effectively.

Effective reform rests on a tripod of skills: strategic policy design, political implementation, and administrative or technical implementation. In many ways, policy design is the easy task. The more difficult part is to make schemes work in practice, both in political and in administrative terms.

Most people are not aware of implementation or, where they are, underestimate what is involved or pay only lip service to its importance. The idea that if one understands a policy one can establish a program for implementing it is generally false. A person with one of the skills frequently fails to grasp the importance of the other two. Academics, whose expertise is policy design, generally ignore implementation. Politicians may give too little weight to the coherence of a policy strategy or to meeting its administrative requirements (for example, failing to allow enough time and include an adequate administrative budget). Technical experts may take an excessively narrow approach.

Alongside technical aspects, implementing student loans has obvious and major political dimensions. Although largely taken for granted once they have become established, their initial introduction has been politically difficult in many countries. In the United Kingdom, the introduction of student loans in 1990 provoked enormous demonstrations, although today loan design is part of my undergraduate teaching. In 2004 in the crucial vote on a bill to bring in variable tuition fees, a government with a parliamentary majority of 160 won by only five votes. In Australia, similarly, the proposal to introduce an income-contingent charge in 1989 to pay for part of tuition costs provoked political turbulence, but the system is now regarded as part of the landscape.

The experiences of the United Kingdom and Australia illustrate the need for robust political capacity. That capacity not only is necessary when the scheme is introduced, but needs to continue. New Zealand illustrates the case where initial reform momentum faltered for lack of continuing action by government to sustain support. As noted, New Zealand introduced a system with variable fees fully covered by an income-contingent loan charging an interest rate broadly equal to the government cost of borrowing. Political pressures plus populist politics combined so that expensive and regressive blanket interest subsidies were introduced.

Prerequisites for an Effective Loan System

Implementation also has major administrative implications, which policy makers typically underestimate or ignore.

Technical Prerequisites

A country should not embark on a loan scheme without the following:

- A reliable method of identifying individuals. This task is the responsibility of national government.
- The capacity to maintain records of amounts borrowed, cumulative borrowing and interest charges, and the value of each person's repayments. This task is the responsibility of the loans administration.
- The capacity to collect repayments. Income-contingent repayments are best collected by the tax or social security authorities or, failing that, by employers. Evidence suggests that relying on educational institutions to collect loan repayments does not work well, for example, in Chile and the Republic of South Africa (World Bank 2006: box 3.7). As well as domestic repayment, it is also necessary to have the capacity to collect repayments from graduates who are working in other countries.
- The capacity to track the income of each borrower. Ideally this is the task of national government through personal income tax or social security contributions.

The first three elements apply to any loan scheme. As explained more fully below, a country unable to implement income-contingent repayments will generally have difficulty collecting conventional loan repayments.

Establishing a Loans Administration

A series of requirements has to be in place if a loan scheme is to be put in place successfully.

- Enough time has to be allowed for getting from the passage of legislation to the delivery of loans to the first cohort of borrowers.
- Strong political sponsorship is essential: someone must have the vision and power to make sure that the policy happens as proposed.
- Clear ownership of the scheme is also essential, often by the education department.
- The introduction of a loan system is not an event, but a process. Thus political support has to be strong when the system is being established and continue when it is in operation.

A further series of requirements is more narrowly technical, including ensuring that there are enough people with the necessary skills, legislative preparation, information technology development, and effective project management.

A number of problems are common:

- Policy makers may introduce changes to the scheme once work is under way. Such changes are often incompatible with the planned administrative structure.
- The political timetable for the introduction of a scheme is often incompatible with the timetable necessary for administrative purposes. U.K. governments consistently underestimate the time, skills, and energy necessary to make policy work.
- Ownership of the scheme may be unclear or diffuse.

Running the Scheme

Running a scheme once it has been established involves identification of the student, record keeping (amounts borrowed, repayments, accumulation of interest), and collection of repayments within the country and from graduates working abroad. A more detailed list of the necessary capacities is set out in box 1.

BOX 1. Technical Capacity to Implement a System of Student Loans

When the student first takes out a loan, it is necessary to:

- Establish her identity reliably;
- Provide her with information about her entitlement and about the operation of the loan;
- Establish the size of the loan to which she is entitled, which will require information about what degree, what university, and perhaps her own income and that of her family;
- Establish that she actually turns up at the relevant university.

While she is at university, it is necessary to

- Establish that she continues her studies;
- Keep track of her grades, if the loan is dependent on academic performance;
- Keep track of the dates and amounts of further borrowing.

After she has left university, it is necessary to

- Track her through changes of name and address;
- Measure her income and, if the system is income contingent, collect repayments alongside personal income tax, liaising as necessary with the tax authorities.

However, even the most effective tax system cannot deal with all repayments. Thus a country also needs the capacity to do the other things necessary to collect repayments effectively:

- Collect repayments from people who are outside the country; for example, on the basis of their last completed tax return;
- Track down and pursue delinquents; this could include threatening to blacklist their credit rating; it could also include other methods; for example, an applicant for a U.S. green card needs to certify that she has no outstanding tax debts in her home country;
- Ensure that any concessions on repayment are granted;
- Answer queries;
- Record repayments and calculate the outstanding balance, taking account of interest charges;
- Keep the borrower notified of the balance of her loan;
- Cause the collection of repayments to cease once the loan has been repaid.

A country should not try to put in place a system of student loans until it can undertake these tasks effectively.

Depending on how the loan scheme is financed, the loans administration may also need the skills to operate in financial markets.

Illustrations

Merely to list all of these requirements indicates the size of the task. The following tales from the front are intended to add life to the general points above.

- Some institutions have a large peak in communications, such as tax returns around the filing deadline or student loan applications at the start of the academic year. If such a system is paper based, as until recently, how does one deal with tasks like opening envelopes when there can be literally millions of them to open?
- Where the system is electronic, the analogous problem is whether the system can cope with a large peak without crashing.
- If a loan scheme processes loan applications by optically scanning handwritten paper applications, can the scanner cope with an application that has spent two weeks folded in a student's pocket or has a large coffee stain on it?
- Does the system have a way of coping where an applicant for a loan misspells (paper based) or mistypes (electronic) his or her own name? This is not fanciful.
- Can the system cope with a massive peak of phone enquiries, for example, by automatically moving people from other tasks to manning the telephones at such times? Again this is not fanciful. If any element in the system breaks down (for example, the system of loan disbursement fails), there will be a large surge of telephone enquiries; if nothing is done, a breakdown in disbursement is rapidly followed by a breakdown in the system of telephone enquiries.

According to the World Bank (2006: box 3.7), given the wide array of institutional requirements both to establish and to run a scheme,

> It is not surprising that successful income-contingent loans in advanced economies—including Australia, New Zealand, the Netherlands, Sweden, and the United Kingdom—are not echoed in poorer countries. Chile and South Africa have such schemes on a small scale, with repayments collected by universities, a method that has proved unsatisfactory. Both schemes have met with some success, but would be fiscally costly on a larger scale. Thailand is planning to introduce an income-contingent loan scheme in 2006, the success of which will depend greatly on the effectiveness of income tax collection. Designing a cost-effective repayment mechanism in poorer countries should be at the top of the policy-maker agenda.

An Implementation Myth

Alongside the myths about policy design discussed earlier, there is an implementation myth—that it is easier to collect repayments with conventional loans, with fixed monthly repayments, than with income-contingent loans. In particular, it is sometimes argued that an advantage of conventional loan repayments is that they do not depend on tax collection and can therefore be used in a country without an effective income tax system. That argument is generally false.

Mortgage repayments require a fairly sophisticated collection mechanism. Commercial banks are expert in collecting repayments for loans that are (a) short term and (b) secured on a physical asset. This is the point Friedman noted 50 years ago. Neither applies to student loans. There are good reasons for wanting student loans to have a fairly long duration: it is efficient if the lifetime of a loan bears a rational relationship to the lifetime of the asset being financed by the loan—hence there are 25-year home loans, but three-year car loans—and a longer repayment period makes possible smaller monthly repayments or larger loans. In addition, there is no security for borrowing to finance human capital. For both reasons, collection by banks is likely to be administratively demanding and hence to require some sort of government guarantee.

However, government guarantees to private lenders create problems. If the guarantee is not generous, banks will decline to get involved. But if the guarantee is sufficiently generous, banks have no incentive to pursue repayments vigorously, not least because they have no desire to alienate people who will become their best customers. The incentive structure is thus inimical to effective collection, leading to high default rates.

A second difficulty with government guarantees is what is known as the classification problem. International guidelines for national accounting determine whether spending is public or private. If students borrow money from banks, but the government guarantee is generous, the government, in effect, takes the risk of default. Thus there is no genuine risk transfer and, under international guidelines, lending by banks to students counts as *public* borrowing. The classification problem is central to discussion of the ways of bringing private finance into postcompulsory education as, for example, in Hungary. This topic is rarely discussed and little known, but a developing country ignores it at its peril.[3]

On the face of it, public collection of conventional repayments might work better. However, this approach requires considerable administrative capacity. Even where that administrative capacity exists, the public sector ends up running a student loan collection agency *and* a tax collection system, raising the question of whether resources devoted to collecting mortgage-type student loan repayments would not be used better to bolster the effectiveness of the tax system. In the United Kingdom, the need for the Student Loans Company to conduct an annual reconciliation of individual accounts with the tax authorities helped to strengthen the effectiveness of both institutions.

Whether collected by a public or a private agency, mortgage repayments require an income test. The argument is simple. If repayments (say, $100 per month) are unrelated to a person's income, a mechanism is needed to protect people with low or no earnings, both for equity reasons and to ensure that the scheme remains politically viable. But the corollary is that the agency organizing repayments has to administer an income test. This is a difficult task of measurement and enforcement even in an advanced country, let alone in a poorer country that does not have an effective tax system (which was the argument for having mortgage-type loans in the first place). An income test, in short, is administratively demanding

and costly. With a mortgage scheme, these costs are *in addition* to those of the tax system.

In sum, mortgage-type loans work well for physical assets such as housing. With lending for human capital, in contrast, the theoretical arguments suggest that they expose both borrower and lender to excessive risk and uncertainty. The outcome is inefficient because it wastes talent and is inequitable because capital market imperfections bear most heavily on the least well-off. Separately, mortgage-type loans are considerably more demanding administratively than is generally realized.

Options for Developing Countries

This section discusses options that might be available to policy makers in a country with severely constrained fiscal resources and limited institutional capacity. After initial exposition of the core tradeoffs, subsequent discussion focuses on ways of finding the resources to finance higher education, ways of allocating those resources, and the possible role of international agencies. The bottom line is that there are no easy answers. If there were, this paper would not be necessary.

Core Tradeoffs

As noted at the start of the paper, countries pursue (a) larger systems of higher education and (b) higher quality, while (c) seeking to operate within resource constraints. It is feasible to achieve any two of these objectives, but even rich countries face problems in achieving all three. This is particularly true of countries that rely mainly on taxation to finance the system.

- It is possible to have a large system that is mainly tax financed. But in countries with such systems (for example, France, Germany, and Italy) the major concern is quality.
- It is possible to have a high-quality system that is tax financed. But in countries with such systems (the United Kingdom until 1990), the system is small, with worries both about national competitiveness and about access for students from poor backgrounds.
- It is, in principle, possible to have a system that is large and high quality and tax financed (Scandinavia), but such a system is expensive in fiscal terms, with doubts about the long-term quality of the system, as scarce fiscal resources are increasingly pressed by population aging, rising health spending, and similar trends.

If tax finance is scarce, it follows that there are three broad strategies:

- A small, tax-financed system that at best can be of good quality;
- A large tax-financed system that generally will be of low quality; and
- A system with mixed public and private finance, thus easing the quantity-quality tradeoff.

Better Resource Mobilization: The Ministry of Finance Question

A number of questions stand out, as Min Weifang poses in his keynote address in this volume: What is the efficient size of the funding envelope? What is the proper role for private finance? Within that, what is the role for student loans, and what options remain where loans are not feasible?

What Size Funding Envelope?

What volume of public resources should be put into education generally and, within that, what should be the rule for dividing that total among primary, secondary and higher education, and, within higher education, between teaching and research?

Although these are the right questions for ministries of finance to ask, none has a complete answer. The root of the problem is the difficulty of quantifying the benefits of education. This conclusion is not a counsel of despair, but an argument against spurious accuracy in attempts at quantification; in reality, as in other areas, such as setting a poverty line, a large part of the decision about budget allocations is a joint product of fiscal constraints, political negotiation, and social values.

What can be said? At least in richer countries, there is a case for rebalancing public funding away from tertiary education and toward primary and secondary education. Part of the argument, set out in the first section, is that tertiary education is well suited to partial private finance. A second element is that such rebalancing affects a person's life chances in ways that are equitable *and* assist development outcomes.

Notwithstanding the major measurement problems already mentioned, there is strong evidence that resources are misallocated. Carneiro and Heckman (2002) find that rates of return to human capital decline monotonically across preschool, primary, secondary, and tertiary education. The implication is that taxpayer subsidies should broadly follow this pattern. Yet in most countries public education spending per recipient *rises* across the education spectrum, being lowest for preschool education and highest for universities (for the case of the United Kingdom, see Alakeson 2005: fig. 1).

This line of argument suggests two sets of lessons. First, policy makers should not consider higher education finance in isolation, but from a life-cycle perspective that includes earlier education.[4] Second, the division should probably change over time: certainly, the balance between finance for schools and finance for higher education should be kept under review. On the one hand, the balance of public funding should tip increasingly to school education as efficient sources of private finance for higher education become available; on the other hand, as economic development proceeds, a country will typically need more higher education, including more spending on research. The two trends, taken together, suggest that as economic development proceeds, the balance between public and private finance of higher education should generally move toward the latter. This policy direction is not based on ideology but on the theoretical arguments presented at the start of the paper.

What Role for Private Finance?

Family resources have the advantage of simplicity, but two disadvantages: well-known capital market imperfections lead to an inefficiently low level of investment in human capital, and the approach restricts access to students whose families can afford to pay

and, perhaps, a small number of students on scholarships. Access to loan finance starts to address both sets of problems.

Wholly private loans have the advantage of relaxing fiscal constraints. However, such loans (for example, from banks) will generally be available only where the student borrower can provide a guarantor such as a home-owning parent. This approach does not make loans accessible to poor people, but it (a) makes the system less regressive and (b) over time brings in additional resources.

Palacios Lleras (2004) advocates privately financed income-contingent loans in the form of so-called human capital contracts. These have much in common with Milton Friedman's (1955) original proposal for basing student support on equity finance rather than loan finance. The idea is interesting analytically. But a major question remains about the ability of an unsecured, privately financed system to offer a good deal to applicants from poorer backgrounds. The approach also faces implementation issues: On what basis will private finance be available in an area with little market experience, and how would cost-effective collection of income-contingent repayments through private sector mechanisms work?

What Role for Student Loans?

Publicly organized loan schemes can be less selective than private schemes and ideally should be available to all students without cherry picking. But, as noted earlier, although it is easy to give out money, getting it back is administratively much more demanding. One option is to introduce a small loan scheme, accepting that it will have a high default rate and high administrative costs. This is risky, however, since it could discredit the idea of loans.

How could a developing country implement income-contingent repayments? There are several possibilities:

- In the form of fixed monthly repayments, but where people can request a lower payment if they can demonstrate that their earnings are below a threshold, as in the Netherlands. Although in principle the least demanding administratively, the approach depends on the capacity to measure earnings; where this is not possible—for example, where informal earnings are widespread—income-contingent repayments become impossible.
- On the basis of a person's last completed tax return, hence lagging by an average of 18 months, as in Sweden and Hungary.
- As a payroll deduction alongside income tax and social security contributions, as in Australia, New Zealand, and the United Kingdom. Although preferable in educational terms, since loan repayments track earnings with no lag, this approach is difficult, if not impossible, to implement in most developing economies.

If there is no feasible way to implement income-contingent repayments, might mortgage repayments be an alternative? Perhaps, but such repayments are not simple or automatic, for the reasons set out earlier. Not the least of the problems is that if a loan is repaid in equal monthly or annual installments, those installments need to be fairly large, to ensure that the loan is repaid reasonably quickly. However, this

requires a system of deferring repayments if a person's earnings are low, which, in turn, gets back to the need to measure a person's income, and the inability to do was the reason for considering mortgage repayments in the first place.

What are the options if a public loan scheme is not feasible? Where institutional capacity is insufficient for an effective loan scheme, the best short-run approach is to rely on the imperfect private mechanisms described above, using limited taxpayer finance for targeted financial assistance.

Better Resource Allocation: The Ministry of Education Question

The previous section discussed where resources for higher education might come from. This section discusses the parallel question, also tackled by Min Weifang in his keynote address in this volume: through what mechanisms should those resources be allocated (a) across higher education institutions and (b) across students. Discussion considers three issues: central planning or competition, the size of university system, and the allocation of resources to promote access.

How Much Competition?

The general arguments were set out earlier: central planning is less and less useful the larger and more diverse the higher education sector. Central planning of universities may be feasible in countries where the sector is small, but earlier arguments suggest a move toward more competitive allocation of resources as the system becomes larger.

With central planning, public resources go directly to higher education institutions; in a more competitive environment, at least some of the resources are channeled to universities via students. In the former case, how should public resources be allocated to universities? Once more, there are no easy answers.

- A fixed sum per student, perhaps with some variation by subject, for example, more per medical student than per law student: this is administratively the simplest but creates no incentives for universities to improve quality or to widen access.
- As above, but adjusted for quality: the question then is which measure of quality to use. Does it refer to the quality of the process (for example, high-quality teaching) or to the quality of outcomes (for example, how many graduates find relevant jobs relatively quickly after graduation). One has only to state the question to indicate the measurement problems.

Competition between universities can take different forms. Suppose that there are five universities, each currently with 1,000 students, and suppose further that each university receives $1 million from the government, that is, $1,000 per student, as its only source of finance. This is a system of pure central planning. At the other extreme, the government could give a $1,000 voucher to each of 5,000 students and give each a choice of where to study. Competition thus arises on the quantity side; a university that attracts more students will grow and vice versa; in the extreme, a university that attracts too few students will go bankrupt. The number of intermediate cases is infinite: some funding could go to student vouchers and some directly to universities or vouchers could be tied to subjects that policy

makers wish to encourage or to particular universities, for example, to achieve regional balance.

The advantage of competitive incentives is the potential for more efficient use of resources, including the incentives to improve quality. But such a system requires institutional capacity. Higher education is suited not to law-of-the-jungle competition (Winston 1999) but to regulated markets; governments need to have the capacity to regulate effectively. In addition, competition can create incentives deleterious to quality, such as grade inflation; thus quality assurance is important; again, government needs the capacity to ensure that quality assurance takes place (although it does not have to be a public sector activity).

Competition can occur with regard to numbers (enrollment) or prices (tuition fees). The simple example of vouchers implicitly assumed that all universities charge the same fee or, where fees vary, they vary only by subject and are determined by government. But competition can arise also on the price side, if universities are allowed to set their own fees.[5] The theoretical argument for price variation is strong for a large, diverse system. But, again, there are arguments in favor of regulated markets rather than free markets and, again, implementation issues arise.

Price competition is desirable where three sets of conditions hold:

- Where a university system is large and diverse, making the allocation issue too complex for the central planner alone;
- Where consumers (students and employers) are well informed, not least through an effective system of quality assurance, so that consumer sovereignty is welfare-improving; and
- Where a system of loans is in place that addresses capital market imperfections.

Even then, there are good arguments for imposing a maximum level on fees. The level of the ceiling should be high enough (a) to bring in extra resources and (b) to strengthen competitive incentives, but low enough (c) to preserve the longer-term political viability of the reform and (d) to allow universities with little experience of operating in a competitive environment time to build the necessary management capacity. Over time the ceiling can be raised. But a case can be made for retaining the ceiling, at least as a reserve power for government, not least because the top universities (that is, those most likely to charge high fees) are not wholly competitive: they sell not only good teaching (which is competitive) but also a place in a student's elite peer group (that is, access to the network), which is a positional good and thus gives the university an element of monopoly power.

Although the direction of travel is clear, implementation imposes major constraints. First, competition brings greater gains in a larger system, with well-informed consumers and a well-functioning loan system. These all impose heavy demands on institutional capacity. So do quality assurance and the capacity to regulate markets, for example, via the ceiling on fees.

What Size of University System?

Should a country have a small, elite system or a larger system? The issue is important for both economic development and fiscal capacity.

Although advanced countries need large systems of higher education so that, once more, the direction of travel is clear, poor countries might be better off with small systems, using higher education as a mechanism of technology transfer and economic growth. But in a poor country, the demand for higher education may be low, so participation would be low even if a loan scheme were in place. Thus financing higher education with public resources (domestic and international) and providing it free or charging low tuition to students selected by a competitive screening process might be a better initial strategy to increase the supply of skilled labor. In such a scheme, limited taxpayer resources could finance good-quality higher education for a few students, or there could be a hybrid system, with taxpayer resources to pay for (say) two years of university education, leaving the rest to private finance. A potential worry is that in such a system the best and brightest are the most susceptible to brain drain. A loan scheme would partly address this problem but, in the poorest countries, is likely to be infeasible and, for the reasons just indicated, perhaps also undesirable.

In countries with high growth rates and rising per capita income (China, for example) growing fiscal and institutional capacity make it possible and desirable to have a larger, more diverse system of higher education. Introducing competition is desirable, and the system should draw in both public and private resources. A loan scheme would be a significant element in drawing in private resources.

Allocating Resources to Promote Access: Needs Based or Merit Based?

Should public resources go to students in the form of a grant (that is, not repayable) or a loan? Separately, where students are given grants, should they be based on needs or merit?

Loans are desirable but are unlikely to be feasible in poor countries. Thus very limited grants, if any, may be all that is possible.

Merit-based awards are likely to be mainly a middle-class benefit because children from middle-class backgrounds usually do well on tests and other measures of achievement. Entry to the top U.S. universities is mainly middle class even where admission is needs blind, precisely because the pool of applicants with top grades is heavily skewed. This suggests that needs-based grants are a better instrument for widening access. Thus the issue is the relative weight that policy makers attach to equity and efficiency. If equity is given priority, loans are not feasible, and fiscal capacity is limited, taxpayer support to students should mainly be needs based. In contrast, merit-based awards could be more appropriate in a country where finding talent is regarded as more important than widening participation.

That said, as earlier discussion made clear, action to widen access at age 18 is only part of the story. Governments serious about widening access need to target resources much earlier.

What Role for International Agencies?

International agencies can help in various ways.

Assistance with Strategy

The World Bank and other agencies can provide assistance to maximize the extent to which policy makers are well informed. This involves pooling knowledge both between richer and poorer countries and between poorer countries. The long history of failed loan schemes illustrates the extent to which countries have tried, and failed, to reinvent the wheel. Part of that role should be to warn against loans if the institutional prerequisites are lacking.

Financial Assistance

Financial assistance can be tied to reform of the educational system or be in the form of more general budgetary support.

Specific Help with Loan Schemes

Once a country develops the institutional capacity to organize a loan scheme effectively, international agencies can help in several ways. First, they can offer technical assistance in designing a loan scheme, which minimizes administrative demands. Countries like Australia, New Zealand, and the United Kingdom have extensive experience with income-contingent loans.

Second, the existence of an effective mechanism for collecting repayments opens up the possibility of raising part of the initial cash-flow costs from nongovernmental sources, including international financial organizations and commercial lenders (the Hungarian loan scheme receives a significant part of its finance from the European Investment Bank).

It might also be possible to foster international cooperation in collecting loan repayments. Many graduates emigrate from poor countries, typically to richer countries. A potentially important role for the World Bank or OECD would be to broker bilateral or multilateral agreements between developing countries and OECD countries, whereby the latter help to collect loan repayments of immigrants from developing countries (for fuller discussion, see Barr 2001: chap. 14).

Conclusions

Two questions should be distinguished:

- Is a system of student loans desirable? In principle, the answer is yes, given the case for expanding higher education, fiscal pressures, and the regressive nature of excessive reliance on tax finance.
- Is a loan system feasible? This second question is often ignored or given insufficient attention. This is not accidental. Powerful drivers encourage premature schemes, including wishful thinking by governments that it is possible to expand higher education at limited fiscal cost and insufficient understanding of the conditions necessary for implementation (international organizations have at times been guilty of this).

Can a country implement a loan scheme effectively? Policy makers have to address three sets of questions:

- Does the country have the technical capacities, listed in box 1, necessary to collect repayments?
- Can the country finance the up-front costs of the loan scheme from public or private sources? Does the government have the fiscal capacity to finance the up-front costs? If not, does it have the considerable technical capacity necessary to bring in private finance in a manner compatible with the statistical criteria of the International Monetary Fund?
- Is the country sufficiently free of corruption so that the system can operate as planned?

In answering these questions, country capacities lie on a spectrum:

- Advanced countries have the fiscal and institutional capacity to implement loans effectively (although in practice many have schemes with badly designed features).
- Poor countries have neither the fiscal nor the institutional capacity and should not attempt to implement a public loan scheme; private loan arrangements are the most that are possible.
- Middle-income countries have no universal answer; the feasibility of a loan system depends on the view taken by policy makers of the capacities listed in box 1.

Finally, is there any simple advice for policy makers?

- The optimal solution has three elements: variable fees, a good loan system, and active measures to promote access. The strategy allows a student to finance his or her studies entirely from loans, entirely from family resources (more likely where the student is from a wealthy family), entirely from his or her earnings while a student (more likely where the student has highly marketable skills), or from any mix of these elements. If the loan has a rational interest rate, the borrower faces a budget constraint that avoids obvious distortions to the exercise of these choices.
- Perhaps the worst solution is the premature introduction of a large-scale public loan scheme. The resulting ill effects are twofold: a fiscally incontinent scheme is expensive, and a badly implemented scheme risks discrediting a good policy option for the future. Embarking on this path assuming that things will turn out right lies somewhere on a scale from risky to irresponsible.

In between the best and the worst, matters are less clear-cut. If it is judged that an effective loan system should be left for the future, remaining options are suboptimal, and choices will depend on the country's capacities and objectives:

- Finance higher education out of taxation on a small scale to provide good-quality higher education for a few students or lower-quality higher education for more students. The choice between the two will depend on (a) the needs of the economy, in particular, the level of development and (b) the capacity, or lack of it, to provide high-quality higher education.

- Rely on private finance, accepting that this will restrict access to students whose families can afford to pay and, perhaps, a small number who are on scholarships (whether based on needs or merit).
- Use taxpayer resources to pay for (say) two years of university education, leaving the rest to private finance.
- Use development assistance to ease the tradeoffs among size, quality, and access.

Notes

1. But note the problems caused by government guarantees, discussed later in the paper.
2. The large literature on this and other aspects of the economics of education is surveyed by Blaug (1976, 1985); Glennerster (1993).
3. One reason why the issue is little known is that the arrangements in the United States—a government guarantee for loans that are classified as private—ignore the rules. This approach is not available to developing countries. For a nontechnical discussion, see Barr (2001: chap. 14). The full technical details are in IMF (2001).
4. The 2007 World Development Report (World Bank 2006: chap. 3) emphasizes this approach.
5. In Kazakhstan, there is a larger voucher for students attending private universities.

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Technological Innovation: Linkages between Universities and Industry

Wellsprings of Modern Economic Growth: Higher Education, Innovation, and Local Economic Development

MARYANN P. FELDMAN AND IAN I. STEWART

Modern economic growth is a complex phenomenon that is increasingly dependent on innovation: the ability to create economic value through the creative application of knowledge. Arguably, knowledge is the most important asset in the modern economy, and universities, in large part, exist to create, perpetuate, and diffuse this currency. While universities have long served as a source of knowledge creation and dissemination, relationships with firms and engagement with for-profit activities are becoming more direct and focused. Indeed, one of the new responsibilities of institutions of higher education is to create effective technology transfer mechanisms, whether the purpose is to promote social or economic development, to enhance economic competitiveness, or simply to increase the stock of knowledge. Of course, knowledge is an ethereal concept that is perhaps best considered as embodied in what economists call human capital—that is, individuals who have received the benefit of education and who are able to appreciate, integrate, and augment knowledge and engage in innovative activity. Skilled human capital requires investment in higher education—that is, institutions dedicated to advanced learning, sophisticated research, and public service are important to the functioning of a modern economy.

Recent literature debates the relative contribution of human capital and institutions in generating economic growth. Economists often view universities as providing skilled labor and ideas as inputs to firms' production functions. This reductionist view ignores the institutional role of universities as public entities for intellectual discourse, the cultivation of experimentation, and the development of novel ideas. Certainly, from either perspective, universities are important, as they provide institutional structures both to organize scientific inquiry and to augment human capital.

Increasingly, we also recognize that geographic units smaller than nations, commonly identified as regions, cities, or jurisdictions, are the loci of creative activity. More than 100 years ago, Alfred Marshall wrote about the importance of the local

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Annual World Bank Conference on Development Economics 2008, Regional

organization of economic activity for enhanced productivity and efficiency. Rather than becoming quickly outdated, this remains a relevant contribution due to the emergence of places like Silicon Valley, Route 128, and a series of other prominent local industrial complexes. Research universities and other institutions of higher education feature prominently in accounts of the development and genesis of these industrial clusters. Evidence indicates, however, that universities are necessary, but not sufficient, for technology-based economic development to occur and that universities typically lag, rather than lead, economic development, becoming responsive only once an entrepreneurial spark has been ignited (Braunerhjelm and Feldman 2006).

Most important are questions about the role of institutions of higher education and how best to create and enable human capital with the ultimate goal of reaping rewards in terms of wealth creation and higher standards of living. While investigation has increasingly considered the role of research universities, it is more appropriate to consider higher education as a diverse sector that includes complementary and reinforcing institutions such as liberal arts colleges, institutes of technology, professional schools, community colleges, and continuing education programs. Taken together, these academic institutions provide the basis for the range of skills required for advanced economies and form the fabric of competitive regions. How best to organize higher education in order to create and transfer knowledge and sustain innovation and economic growth is an important question for both advanced and developing economies.

This paper provides a framework for considering the evolving role of institutions of higher education in generating economic growth and development. The goal is to provide an overview of the current thought pertaining to universities and knowledge transfer, a significant task, given the burgeoning literature. This paper is intended to introduce the topic and challenge the conventional wisdom. We begin by clarifying some terms.

Clarifying Terms

When an issue is significant, the popular discussion may easily become muddled; terms may be used interchangeably and without precision, and as a result, the debate becomes superficial. To avoid this carelessness, a series of definitions that discriminate between the components of innovation are provided in order to advance the discussion and enrich the choice of policy options. In daily conversation, terms like *invention* and *innovation*, as well as *science* and *technology*, among others, are often used interchangeably. However, for academics and policy makers, there are important distinctions among these terms, and these distinctions give each term a unique meaning and enrich the discussion. Invention is about discovery and the creation of something novel that did not exist previously. Innovation carries invention further with the commercial realization of the value of the invention or the receipt of an economic return. This is a subtle but important distinction. Thus a patent, the legal protection of an idea, reveals an invention, while, for example, the marketing and consumer acceptance of a new drug are evidence of an innovation.

Science, in a broad sense, is the unfettered search for knowledge for the sake of understanding. That search is based on observed facts that may be replicated through

experimentation or theory. Thus science begins with conventional preliminary conditions and searches for some unknown results to address fundamental questions related to hypotheses about the world. The process of investigation is known broadly as research and may be *basic*, with the intention of advancing science, or *applied*, with an orientation toward some practical end. These delineations are two ends of a continuum of problem solving, as basic research suggests avenues of inquiry that are advanced by applied research. Likewise, research is enriched—made more complex and significant—as applied work creates the need for more theoretical work and suggests new avenues for further basic research. In addition, and most critically, while science is classified by disciplines that define traditions of inquiry, and scientists are trained within these specific traditions, applied problem solving frequently creates the need for multidisciplinary teams or even creates new disciplines to colonize the frontiers of knowledge. Examples include the rapidly evolving fields of biochemistry and biomedical engineering or the emerging fields of nanotechnology, genomics, or proteomics.

In contrast, industrial *research and development* (R&D) is the systematic augmentation or deepening of knowledge by applying it to some practical problem or new context with the idea of generating a commercial return. While science is typically conducted by universities and institutes of higher learning, R&D is typically conducted by private firms. An important distinction is that both public and private firms have a responsibility to earn returns for their shareholders and investors. In general, the more basic the science involved in a research project, the more difficult it is to appropriate the resulting returns. This is due to particular characteristics of the knowledge that research creates. A variety of government incentives and public-private partnership programs have evolved over time from governments' desire to steer private investment toward more basic types of scientific activity and to stimulate the development of new technologies that private firms would not consider attractive investments in the absence of some incentives. These incentives include direct grants, R&D subsidies, and other programs that encourage firms to conduct projects with universities or government laboratories.

A similar distinction may be made with regard to education and training. Training is task oriented and conforms to a set of skills, techniques, and practices. Typically, training is oriented to a job, occupation, or profession. While professional education is typically at a high level and its graduates command high salaries, curriculum has the well-defined outcome of conveying well-codified practices, such as being able to read financial statements in the case of business, being able to drill teeth in the case of dentistry, and being able to conduct and interpret a patient history in the case of medicine. Education has a broader goal of expanding knowledge and providing the capacity to create new knowledge.

Knowledge has the characteristics of being nonrival and nonexcludable, which classify it as a public good. *Nonrival*, in the economists' terminology, indicates that one person's use of knowledge does not impede another's use of it. Consider the example of a mathematical formula. Knowledge is created when the formula is first derived and formal proofs are demonstrated. The result is most likely a scholarly publication that codifies the knowledge, rendering it easy to diffuse and put into practice. Once the formula is known, the fact that one scientist uses it does not diminish its

usefulness or utility to other scientists. In fact, the value of the formula may actually increase as a result of its more diffuse use and acceptance. Thus knowledge, once created, is nonrival in that many economic actors may enjoy it simultaneously. *Nonexcludability* refers to the fact that, once knowledge is discovered, it is difficult to contain or to prevent others from using that knowledge. Once an idea is known, it frequently seems obvious to others and can be replicated at what is known as zero marginal cost. As a result of these two conditions, the social value of knowledge is greater than the value that the creator may be able to capture, a classic case of an externality. Private firms are likely to underinvest in knowledge production, since the returns to the firm are smaller than the returns to society. This is the traditional justification for government funding for research.

Intellectual property (IP) can take many forms, including but not limited to products and processes that are protected through patents, trademarks, or trade secrets and authored works that are protected through copyright. Most governments consider certain kinds of creative endeavors as intellectual property and allow inventors legal recognition for these endeavors. For example, some forms of IP include software, databases, plant varieties and other biological materials, as well as "tangible research property." The latter includes items such as circuit chips, organisms, drug targets, formulations, and engineering prototypes. It is, however, up to the creator to decide whether an invention, discovery, or new idea is to be legally recognized and protected. For example, a researcher who immediately publishes a discovery has made the decision not to treat it as IP and to make it freely available to the public for use.

Commercialization is the process that turns an invention into an innovation and involves defining a concept regarding who is willing to pay for the new idea, what attributes they value, and how much they are willing to pay for the added value. The ability to legally protect an invention therefore forms the basis for commercialization activities, as it precludes others from copying the invention, entering in the market, and competing for a share of the economic profit. More important, if firms did not have the ability to protect their discoveries, they would have no incentive to invest in many important R&D activities, such as clinical trials, thus interfering with the creation and diffusion of knowledge. As such, IP creation is a fundamental ingredient of the commercialization process and an important vehicle for the transfer of knowledge between legal entities and the public.

While patenting measures invention, commercialization requires the additional steps of translating inventions into consumer needs and product markets. At its earliest stages, before applications are easily described or generally appreciated, realizing the potential of an invention requires a sophisticated understanding of consumer needs, existing markets for product innovation, and factor inputs. Commercialization, even when ideas are abundant, may not be completed because outcomes are highly uncertain, risk aversion may cause projects to be delayed or abandoned, or the relevant organizations may not be able to collaborate.

Technology is information that is put into use to accomplish some task. This information may take many forms, including both hardware (physical, material objects) and software (digital material, procedures) or combinations thereof. As such, technology has a fairly broad definition and includes anything that helps to improve the

efficiency and quality of daily life. For example, electronic and computer technology helps its users to share information and knowledge quickly and efficiently. Vitamins, new biochemical formulations, and drugs alter one's health and improve one's lifestyle, making up another important class of technology. Using this definition, technology may often be considered a form of intellectual property. In general, technologies are often broadly classified based on their area of application, and therefore terminology such as information technology (IT), biotechnology, and nanotechnology have become commonplace.

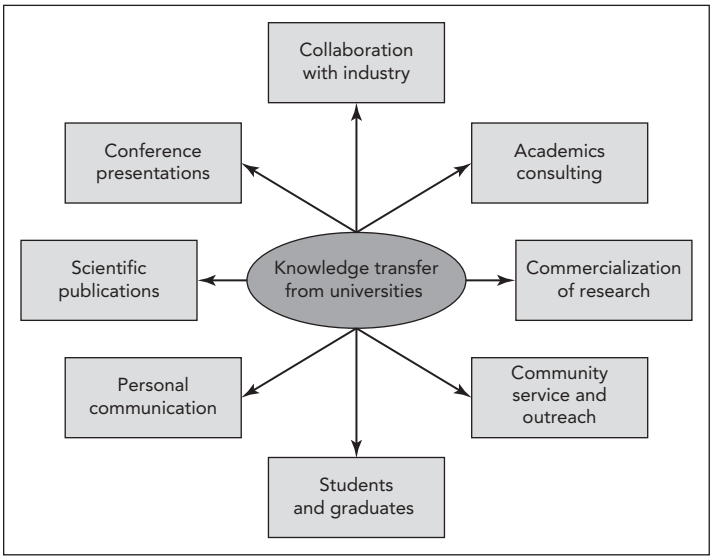
Technology transfer is the application of information. Technology transfer is therefore a distinct and important subset of knowledge transfer; knowledge transfer is a broader concept that encompasses a set of relationships. In the literature, technology transfer is often considered as a formal activity within or across organizations. For example, a discovery derived from research in a scientist's lab may be licensed to a firm that will commercialize the technological innovation into a product or service to be sold in the marketplace. Hence, the technology is transferred. Although commonly associated with commercial goals, examples of technology transfer also may be found between nonprofit organizations or institutions and even between groups within the same organization. Direct technology transfer is often treated as a function and handled by a specific office or department within an organization such as a technology transfer office (TTO) business development office or research foundations.

Knowledge Transfer Motivations

Most modern institutions of higher education have well-developed policies, practices, and infrastructures in place to support the transfer of knowledge. Knowledge is transferred from the university through formal and informal mechanisms (see figure 1). There is typically greater emphasis on formal channels of knowledge transfer and market transactions, as these are easier to measure and evaluate. Of course, the informal and less direct role, while more evasive, may be even more important. The public space function of institutes of higher learning provides meeting places for serendipitous interaction and chance encounters and may result in the formation of diverse networks that facilitate novel ideas, creativity, and exploration. There are attempts to formalize the informal mechanisms of knowledge transfer as, for example, the benefits of colocation become interpreted as the justification for science parks and incubator facilities.

The historical conceptualization of innovation—the linear model—places institutions of higher education at the earliest stage of knowledge creation and focuses on university research as the generator of ideas. Cohen, Nelson, and Walsh (2002) find that more than one-third of industrial R&D managers use university research as an input, and Mansfield (1998) finds that, in the absence of academic research, approximately 14 percent of new product introductions in seven U.S. industries would not have been developed without substantial time delay. Beise and Stahl (1999) arrive at similar results for industrial innovations in Germany. The importance of technology transfer varies considerably among industry sectors; however, university-industry partnerships are generally more important in sectors where science plays a major

FIGURE 1
Knowledge Transfer Mechanisms from Academic Institutions



role, as is the case in the biotechnology and information technology fields. The Yale and Carnegie Mellon surveys of R&D labs have tended to emphasize industry differences, noting that pharmaceutical firms spend the greatest percentage of sales on R&D and tend to use university research disproportionately (Cohen, Nelson, and Walsh 2002; Klevorick and others 1995).

In practice, university research involves a rich mix of scientific discovery, clinical trials, beta testing, and prototype development, and industry linkages to university-based research are demonstrated to be complementary to firms' R&D strategies (Bercovitz and Feldman 2007b). From the firm's perspective, it is generally accepted that collaboration is primarily a valuable complement to, and extension of, the firm's in-house research, not a way to replace it. Access to the outside knowledge, expertise, and awareness of leading-edge research and to independent verification or inquiry provides an incentive for firms to seek collaboration with a university. Research from higher education entities enables firms to see that the solutions are chosen from among the array of options that are outside of the firm's typical consideration. Collaborative R&D projects involving universities and other higher education entities are frequently supported by matching funding from various levels of government, thus reducing the cost of doing research and encouraging these partnerships.

From the university's perspective, interest in collaboration with industry is stimulated by three factors: financial pressures resulting from growing public demand to see economic value from the public investment in education and research, the fact that a larger share of public funding is contingent on finding private sector cofunders in the form of matching grants, and finally, the interest of researchers in seeing that the results of their work are relevant and being applied by industry.

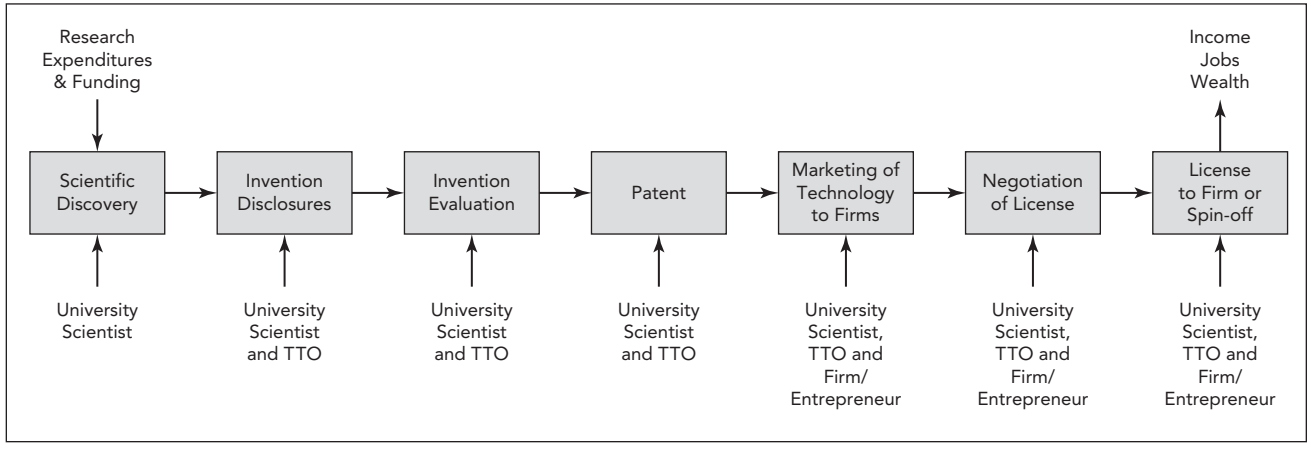
Formal Technology Transfer

Technology transfer and the flow of knowledge from the university to the firm are dependent on the characteristics of the firm, the university, and, more important, the efficiency of the technology transfer office in bridging this gap. As such, many important actors are involved in this process. Figure 2 provides an overview depicting how technologies flow from the university to industry. Based on this process, the key stakeholders are university scientists, who make discoveries that may either be published in traditional channels of knowledge dissemination or protected as intellectual property; university technology managers and administrators, who serve as a liaison between academic scientists and industry and manage the university's intellectual property; and firms or entrepreneurs, who license and commercialize university-based technologies. Each actor has different motivations and objectives.

Although the formal transfer of technology from the University to the firm can take many forms, we will use a simple stepwise example to illustrate some of the typical steps involved in the process. Often technology transfer begins at the time a discovery is made by a university scientist or investigator conducting research in a laboratory. The research is typically funded by a government research grant with few if any direct claims to the IP. If the researcher believes at the time that the discovery is important (i.e. novel, unique or commercially exploitable) a decision must be made whether or not to protect the IP. Depending on the institution, the researcher will have several options. Where the institutions policy claims ownership on all IP the researcher will typically have an obligation to disclose the invention to the institution at which time they must decide whether or not they will 'push' to publish the research foregoing commercial exploitation, work with the institution to commercialize the invention, or to allow the institution to commercialize the invention independently. Similar choices also exist for researchers working at institutions where the inventor may retain ownership, however, the inventor will have the added option of commercializing the invention independently. In addition to the intellectual property policies of the institutions, the decision to work with the TTO is often governed by the inventors perceptions of the skill sets, professionalism and depth of resources available to the TTO (as provided by the institution) and more importantly, the incentives (both financial and social) that the individual faces (Bercovitz and Feldman 2007a). In the United States, the Bayh-Dole Act of 1980 requires that all discoveries with commercial potential that originate from federal research grants be disclosed to the university TTO.

Where the discovery has been disclosed and the inventor has elected to work with the TTO, the TTO managers evaluate the technology to determine its suitability for commercialization. The evaluation is a very important step and requires experience and judgment because the commercialization process is time consuming and costly. In general, the TTO review process will include technical analysis, IP assessment (patentability and freedom to operate), market assessment (commercial potential) and determine the best commercialization strategy (e.g. license or start-up). It is often the case where a fair degree of certainty can be made in assessing the technical merit of the discovery (and its current development status) and whether or not a patent can be

FIGURE 2
Flowchart of How Technology Is Transferred from an Academic Institute to Industry



filed, however it is unclear whether there is a market for the invention or more appropriately a receptor firm interested in licensing and commercializing the invention.

As stated above, patent protection can be quite expensive if global patent protection is sought, and many universities have a limited budget for filing patents. Universities may apply for domestic patent protection, which safeguards the technology at a much lower cost, or use provisional patents as a way to stop the clock for a limited time. Provisional patents cost less and are used when more time is required to evaluate the technology and its marketability or to collect more data to file a stronger patent. If prior to filing or during provisional period an industry partner becomes interested in the discovery, then the decision to proceed or continue with patent protection is expedited. Once a patent application is filed, the technology is the formally marketed through business development efforts.

Business development activity is led by the TTO; however, faculty members often provide additional technical input and help to identify industry partners. Once the TTO has secured interest by an industry partner, it enters into negotiations to license the technology, focused on obtaining a royalty stream against future revenue licensing fees, other forms of direct or indirect payment from a commercialized product or an equity stake in a new venture (Feldman and others 2002). In these arrangements, the TTO works with the scientist and firm to structure a deal that safeguards the university's interest but, at the same time, does not financially handicap the private firm and limit its ability to move the technology forward.

The simple description of technology transfer implies that it is primarily a linear translation of research results into various commercial applications. In practice, however, the technology transfer process is viewed more adequately as a relational process in which questions, answers, clarifications, and other information flow in both directions. In such cases, research has suggested that the efficiency of the transfer of technologies is related to the firm's connectedness with the university researchers and inventors and is facilitated by frequent interaction. Appreciation of new discoveries aiding the subsequent commercialization of new technology is highly uncertain, requires a shared vision of what the potential might be and how best to move the technology forward, and often requires devising a terminology and conceptual schema even to talk about the discovery and its market potential. Using this approach, the receptor organization transforms the research-based technology into a product or service that can be sold in the marketplace by constructing a common, shared meaning of the technology with the inventor or university through frequent interaction, questioning, skepticism, and creative playfulness—what the literature describes as the transmission of tacit knowledge.

The transfer of technology from academic practitioners to industry is an easily described process, however, the reality is often quite complex at the social level. As described by Siegel and others (2004), technology transfer requires consideration of the actions, motives, and organizational cultures of scientists, university administrators, and the firm or entrepreneurs (see table 1). For example, Merton (1957) suggests that a primary motive of university scientists is recognition within the scientific community, which emanates from publications in top-tier journals, presentations at prestigious conferences, and federal research grants. This favors open transmission of

TABLE 1. Key Stakeholders and Their Roles and Representative Motives in the Transfer of Technology to the Private Sector

Stakeholder	Actions	Primary motive(s)	Secondary motive(s)	Organizational culture
Academic scientist	Discover new knowledge	Achieve recognition within the scientific community: publications, grants (especially if untenured)	Financial gain and a desire to secure additional research funding (mainly for graduate students and lab equipment)	Scientific
Technology transfer office (TTO)	Work with faculty members and firms or entrepreneurs to structure deals	Protect and market the university's intellectual property	Facilitate technological diffusion and secure additional research funding	Bureaucratic
Firm or entrepreneur	Commercialize new technology	Achieve financial gain	Maintain control of proprietary technologies	Organic or entrepreneurial

knowledge in what are known as Mertonian norms. Scientists are also motivated by financial gain, both to realize personal returns and to secure additional resources for graduate students and laboratory equipment. The fraction of a licensing royalty payment allocated to faculty inventors is determined by the university's revenue distribution formula, which typically will fall between 25 to 75 percent. Secondary motives may include securing additional research funding for the university via royalties and licensing fees, sponsored research agreements, and an intrinsic desire to promote knowledge transfer. Firms and entrepreneurs seek to commercialize university-based technologies almost exclusively for financial gain and therefore seek to maximize their returns. As such, control becomes a major factor when a firm enters into a relationship with an academic institution or university, and the firm will often require exclusive rights to new technologies and focus on time to market, since the financial benefits from innovation may depend on rapid development of a new product or new process. Differences in the motives, actions, and organizational cultures of the three key stakeholders highlight the complexity of this relationship and its importance to efficient knowledge transfer from the university TTO to a firm.

Digging deeper, it must be acknowledged that the efficiency of the transfer of technology is strongly dependent on the early stage nature of IP generated at the university. These IP will naturally carry more development and patent protection risks. It is therefore more challenging to market the technology and requires that the TTO manager will have broad and effective skill sets to manage all aspects of the business development activities required. With reference to the AUTM 2006 licensing survey, in considering 164 U.S. institutions that had at least one dedicated licensing FTE there were only 4569 licenses and options executed. During this period, the same institutions reported 29.2 billion dollars in research expenditures originating from government grants and 2.9 billion dollars in research expenditures originating from industry or a

combined research budget of about 32 billion dollars. During this research period, 864 licensing FTE's recorded 17,852 invention disclosures and filed 10,751 new patent applications. Crudely taken, these data suggest that in addition to managing a growing historical portfolio and other obligations, each TTO manager will review approximately 20 new invention disclosures and work to file 12 new patent applications in a given year and be involved in executing approximately 5 different licensing agreements, which may be considered a fairly challenging environment. Given the heterogeneous nature of discovery and the attention to detail required to assess, protect, and market an invention, these data suggest that on average most managers will be quite active in a given year. More interesting, however, is that for this given year, although approximately 32 billion dollars were received in research support, the total licensing revenue received in this period was 1.9 billion dollars suggesting that through commercial activity the return on investment in aggregate is only 6 percent. This is only a gross estimate and it is recognized that the licensing revenue received during this period was generated from research funded in the past. However, given that the relative ratio of research dollars to revenue received has been more or less consistent for the past several years, it remains illustrative of the relative return on gross research investment for these institutions in aggregate.

Given these statistics and the importance of this complex function, it is easy to understand that the university TTO has become a primary focus of study for those looking to understand and improve the efficiency of knowledge transfer. For example, Bozeman (2000) has conducted an in-depth review of the literature and concluded that five key drivers affect the efficiency of the process: first, the process orientation of the TTO (that is, process versus results driven); second, the probability of market impact (the commercial success or resulting economic development derived from the transfer); third, the possibility for political gain (does fulfilling the technology transfer process have a political impact?); fourth, the opportunity costs (does the prevailing culture view this to be important or a waste of time?); and fifth, the scientific and technical human capital (skill and quality of the participants in the process).

Table 2 summarizes the conclusions from a selection of more recent articles focused on TTO effectiveness, which tend to confirm the view that the organizational structure and strategy of the TTO, in addition to the skill sets and motivation of its managers, are critical to the effectiveness of commercialization-based knowledge transfer. Specifically, the university TTO manager must bridge the boundaries of the university-firm interface and manage the process. For example, the TTO may scan the industrial landscape for ideas and information about potential markets for new technologies, bringing the manager in direct contact with entrepreneurs in the business domain. These sorts of interactions provide necessary feedback and transmit the needs and interests of both the university and firm to each other. The boundary spanning performed by the TTO manager involves relationship or network building that facilitates effective communication with both stakeholder groups and forges alliances between scientists and industry. In many universities, depending on how the offices are structured, the TTO director may have limited discretion and responsibility for the budget necessary to support these activities. Often the vice president for research will bear ultimate responsibility for these activities including setting the budget. In many

TABLE 2. Review of the Key Drivers Affecting the Efficiency of University TTOs

Focus	Author	Paper title	Data used in study	Key findings
Organization, culture and location	Friedman and Silberman (2003)	University technology transfer: the impact of organization and environment	Literature review and analytical models developed from the Association of University Technology Managers (AUTM) data	Analysis strongly supports four factors not previously examined in the literature that will enhance university technology transfer: (1) the experience of the university's technology transfer office, (2) greater rewards for faculty involvement in technology transfer, (3) a clear university mission in support of technology transfer, and (4) the location of the university in a region with a concentration of high-technology firms.
Communication	Daghfous (2004)	An empirical investigation of the roles of prior knowledge and learning activities in technology transfer	Literature review and analysis based on a survey of 4,600 projects undertaken at Penn State	A significant positive relationship was found between the learning activities performed by the firm during the development and implementation stages of the technology transfer project and the benefits to the firm from the project.
Organizational structure	Siegel and others (2004)	Toward a model of the effective transfer of scientific knowledge from academicians to practitioners: qualitative evidence from the commercialization of university technologies	Based on 55 structured interviews of 98 university-firm technology transfer stakeholders associated with five U.S. research universities	Determined that there are numerous impediments to effectiveness in university-firm technology transfer. They are (1) cultural and informational barriers among the three types of key stakeholders (university administrators, academics, and firms or entrepreneurs), (2) TTO staffing and compensation practices, and (3) inadequate rewards for faculty involvement in university-firm technology transfer. Two somewhat surprising results are that many faculty members have decided to circumvent the formal process and that involvement in university-firm technology transfer may improve the quantity and quality of basic research.

Organizational incentives: TTO	Siegel, Waldman, and Link (2003)	Assessing the impact of organizational practices on the relative productivity of university technology transfer offices: an exploratory study	Quantitative analysis was based on 1997 AUTM report; qualitative analysis based on 55 interviews of 98 entrepreneurs, scientists, and administrators at five research universities	Based on the qualitative evidence, the most critical organizational factors are (1) reward systems for faculty involvement in university-firm technology transfer, (2) compensation and staffing practices in the TTO, and (3) actions taken by administrators to extirpate informational and cultural barriers between universities and firms.
Organization: university research	Jacobson, Butterill, and Goering (2004)	Organizational factors that influence university-based researchers' engagement in knowledge transfer activities	Extensive literature review with a Canadian focus	Researchers working in universities report certain structural barriers to engaging in knowledge translation activities. The group analysis of barriers and solutions suggests that five domains of organizational policy and practice—promotion and tenure, resources and funding, structures, knowledge transfer orientation, and documentation—may be critical to promoting researchers' engagement in knowledge transfer.
Culture	Feldman and Desrochers (2004)	Truth for its own sake: academic culture and technology transfer at Johns Hopkins University	Historical survey of Johns Hopkins and comparison with current literature	The institution and its culture largely determine the "preferred" knowledge transfer mechanism of research to the public.

cases, however, the core focus of the research office is on publications and public funding, including research contracts with firms. As such, a given institution may have limited experience with commercialization or not recognize it as a core activity and, as such, fail to appreciate the challenges and importance of technology transfer as a source of revenue, impact, and local economic development. In either situation it is clear that the successful commercialization of university inventions depends heavily on how the primary stakeholder, the institution, supports and promotes the internal TTO function. Weak or minimal commitment will likely result in weak or minimal results from the office.

All of the outcomes of interest are predicated on individual faculty members disclosing their inventions (Bercovitz and Feldman 2007a). There are multiple reasons why faculty may choose not to participate. First, faculty may not disclose because they are unwilling to spend the time on the applied R&D required to interest businesses in licensing the invention. This is perhaps countered by the trend toward patenting basic scientific results from projects like the human genome, which, though basic, may have immediate commercial potential. Second, faculty may not disclose because they are unwilling to risk publication delays, which may be required to allow prospective licensees to initiate the patenting process. This is arguably more a perceptual problem than a reality, as there are strategies to accommodate both academic and commercial interests and experienced peers can help to navigate the process. The final reason faculty members may not disclose is because they believe that commercial activity is not an appropriate activity for an academic. This view represents an older Mertonian norm of open academic science. However, to the extent that faculty members do disclose inventions, it appears that academic norms are changing in favor of greater participation in commercial activity. This raises a set of important questions about the types of research conducted. Commercially relevant research is more likely to be applied rather than basic and to be focused on specific applications rather than the type of unfettered inquiry that may provide platform discoveries, which promote more substantial economic growth.

Start-up Companies

Start-up companies are a means to advance a new academic discovery, since established firms may be unwilling to invest in risky, unproven technology, especially if the new technology may supplant their existing investments and expertise. The formal definition of a university start-up is a new firm created through the license of a university technology. The Association of University Technology Managers (AUTM) reports that 4,543 new companies have been formed around licenses of university technology since 1980. The rate of increase is significant, as there were 462 start-up companies founded in 2004 alone.

Universities vary greatly in their approach to creating start-up companies, which is typically more difficult than negotiating a license with an existing company. The number of start-ups is determined largely by the experience of the TTO managers involved and the availability of external resources important to the creation of new ventures.

Some universities create many spin-offs, whereas others focus more on licensing. Spin-offs are more prevalent in information technology and biotechnology, while licensing is more common in pharmaceuticals, medical devices, and agriculture. In general, the formation of new firms has become an attractive alternative to transferring technology to the commercial realm for several reasons. First, since many academic discoveries are early-stage, additional work is required to demonstrate proof of concept and viability of the business model (Jensen and Thursby 2001). Large companies are typically not interested in doing this work. Second, based on the successful examples of the Massachusetts Institute of Technology and Stanford University, credited with playing an active role in the genesis of industrial clusters in Route 128 and Silicon Valley, respectively, university spin-offs are seen as a means for local economies to capture the benefits of proximity to a local research university. Administrators can cite the number of start-ups formed as a benchmark of the university's contribution to the local economy.

Spin-off firms are local phenomena, staying close to the source of their competitive advantage. For university-based spin-offs, the university serves as the source of advantage, providing skilled labor, specialized facilities, and expertise. AUTM reports that, on average, about 75 percent of start-up companies were located in the same state as the institution from which the company licensed the technology. As universities and state governments have provided incentives for faculty to start companies or engage in joint research projects with companies, the attraction of proximity to a university has grown.

Over the past two decades, much has been learned about academic start-ups (Lerner 2005). First, starting new ventures based on university technology is certainly not easy. Despite the confidence of many academic entrepreneurs and university administrators, the process of creating a sustainable new company is very challenging. Second, in the vast majority of cases, new firms do not generate enormous wealth for academic institutions. More modest returns with a long-term horizon are the norm. Third, directly financing firms through internal venture capital funds is unlikely to be a successful strategy for academic institutions. Traditional venture capital financing brings experienced managers and connections that are difficult to replicate. Fourth, old frameworks regarding conflicts of interest must be rethought to accommodate the special needs of start-ups.

Similarly, Levin and Stephan (1992) focus on the motivation of scientists, drawing on life-cycle models of academic careers: scientists invest heavily in human capital early in their career to build a reputation and establish a position in a field of expertise. In the later stages of their career, scientists typically seek an economic return for their human capital. For scientists, starting a company serves the purpose of appropriating the value of their intellectual property as well as providing access to additional funding mechanisms to further their research agenda. Programs like the U.S. Small Business Innovation Research (SBIR) Program have facilitated the transition from the academic lab to a start-up company.

In the United States, the potential financial rewards of starting a company, coupled with tightening university budgets and competition for the relatively fixed pool of public funding, create incentives for scientists to engage in entrepreneurial activity

(Powell and Owen-Smith 1998). In this regard, the ability of individual scientists to appropriate the value of intellectual property is affected by national policies and variation in IP procedures and influences the academic scientist's decision to start a new company. Moreover, individual scientists who receive grants and awards for basic research have the intellectual capital required to start a company; however, they may not possess the entrepreneurial spirit or the business acumen to run a company. In many cases, the TTO will play a major role in working with the scientist to put together a business plan, arrange funding, and establish the company.

Technology Transfer Policy Initiatives

Although every country develops a set of policies regarding university-firm commercialization initiatives, it is certainly true that policies introduced in the United States have had significant influence and often serve as a benchmark for other countries. Three major U.S. legislative acts have paved the way for the technology transfer policy currently in place in U.S. academic institutions. Specifically, in the late 1970s, the U.S. Congress, influenced by many years of negative trade balances, decided to change U.S. science and technology policies to increase the flow of research and technological resources from U.S. research universities and federal R&D laboratories to industry. The need for more and faster technology transfer from universities to industry emerged as a major legislative agenda when Congress passed three laws: the Bayh-Dole Act, the Stevenson-Wydler Technology Innovation Act, and the Cooperative Research Act. All three pieces of legislation were important in providing the necessary foundation for universities to develop the infrastructure required to build and support knowledge transfer (commercialization) activities with industry. Of these three pieces of legislation and subsequent amendments, the Bayh-Dole Act has received the most attention and critical review from both academics and industry observers.

Two of the most respected business magazines, *Fortune* (Leaf 2005) and *The Economist* ("Innovations Golden Goose," *The Economist*, December 12, 2002), have arrived at diametrically opposing views on the impact of the Bayh-Dole Act. *Fortune* decries Bayh-Dole, while *The Economist* embraces it. More specifically, *The Economist* has gone so far as to say that it is "possibly one of the most inspired pieces of legislation in the U.S. in the last 50 years." *Fortune*'s criticism is largely related to the unintended consequences of increased litigation, which amounts to very significant "hidden costs" associated with the transfer process. As pointed out by Crowell and Greenwood (2005), however, the legal costs associated with enforcing this legislation are associated largely with patent protection rather than pure litigation. Shane (2004) concludes that the Bayh-Dole Act gave universities an incentive to take a more commercial approach to patenting and licensing than they had adopted in the past.

Universities can only appropriate the returns to invention for technologies for which licensing is effective (Levin and others 1987). The Bayh-Dole Act provides

incentives for universities to shift their research at the margin toward technologies in which licensing is more effective (Levin and others 1987). This post–Bayh-Dole distortion has important implications for understanding conflict and power dynamics between university departments. The demands of private industry have led fields closely tied to industry to move away from the traditional norms of open science to focus on property rights, which is anathema to more basic scientific inquiry. The potential for economic returns shifts resources to more applied fields, however; these fields ultimately rely on the more basic fields for their long-term viability. Technology policy appropriate in one field may not be appropriate in another: blunt instruments may have effects that are inconsistent with overall objectives (Klevorick and others 1995). In addition, academic fields in the humanities face the need to create marketable products, potentially distorting the academic enterprise. The effects of changes in public policy should consider industry effects (Levin and others 1987). In addition, high-opportunity discoveries may benefit if there is a large community of scholars and companies advancing the field. To the extent that patent protection and licensing practices limit this inquiry, there may be a net loss to society.

Although the debate still rages, governments around the world recognize the importance of developing a national policy and often look to the U.S. model. For example, Germany, Republic of Korea, and Taiwan (China) are the most recent economies allowing academic institutions, as opposed to individual professors, the right to own inventions resulting from research in their lab. In Japan, the government is privatizing the entire university system, in part to enable Japanese universities to become economic catalysts like their U.S. counterparts. Mowery and Sampat (2004) examine the Bayh-Dole Act as a model for other Organisation for Economic Cooperation and Development governments and conclude that, in light of existing government-supported academic infrastructure, the Bayh-Dole Act appears to have been neither necessary nor sufficient for the post-1980 growth in university patenting and licensing in the United States. Moreover, given the very different institutional landscape in the national higher education systems of much of Western Europe and Japan, emulation of Bayh-Dole seems likely to be far from sufficient to trigger substantial growth in academic patenting and licensing or university-industry technology transfer. Indeed, there is some question as to the necessity of a patent-oriented policy to encourage stronger research collaboration and technology transfer (Valentin and Jensen 2007).

The conventional wisdom is that American universities transfer technologies more rapidly and more effectively than their European counterparts. However, a closer look at the fragmentation of patent laws in Europe and the widely differing regulatory framework has shown that European academics are not that different from their American counterparts (Schmiemann and Durvy 2003). In order to achieve the same levels, the technology transfer function at European institutions requires more visibility, enhanced public policy support, better professional training, and a professionally managed network like the AUTM to facilitate good exchange practices. Policies to accelerate the commercialization of academic research now play a central role in U.K. government strategies for promoting regional economic development and

enhancing national competitiveness (European Commission 2004a, 2004b). In addition, the European Commission is committed to taking its share of related responsibility and has recently fostered the PROTON network of European technology licensing offices. An intense discussion on the (re)introduction of a grace period between academic publication and patent application has recently begun across Europe. Additionally, some European Union member states have abolished the professor's privilege to patent discoveries, and the university will consequently take up patenting on behalf of the institution. It is not unlikely to expect trends similar to those experienced in the United States after the changes to its regulatory framework in the 1980s.

Academic Knowledge Transfer via Highly Qualified Personnel

Among the key contributions that publicly funded universities make to economic growth in the knowledge-based economy is the training of highly qualified personnel. New graduates, who have had the opportunity to participate in research, enter industry equipped with expertise and problem-solving networks. They bring knowledge of recent scientific research, as well as an ability to solve complex problems, perform research, and develop ideas. Students also bring with them a set of qualifications, helping to set standards for knowledge in an industry. Senker (1995) suggests that graduates bring to industry an attitude of the mind and a tacit ability to acquire and use knowledge in a new and powerful way. Nelson (1987) notes that academics may teach what new industrial actors need to know, without actually doing relevant research for industry. Studies by Martin and Irvine (1984) show that students trained in basic research fields, such as radio astronomy, move into industry over time and make substantial contributions.

In the United Kingdom, the Co-operative Awards in Science and Engineering (CASE) studentship program of Research Councils U.K. provide one example of wider efforts internationally to encourage so-called knowledge transfer and thereby harness publicly supported university research more closely to the goals of national competitiveness, regional economic development, and local regeneration (Demeritt and Lees 2005). The CASE program is designed to provide participating doctoral students with the transferable skills and applied research experience to make them employable beyond the academy. The Economic and Social Research Council (ESRC), in particular, sees the "collaborative awards scheme linking academic and non-academic partners in the training of PhD students" as crucial to ensuring "that future social scientists . . . have the skills to work in a non-academic as well as an academic environment" (ESRC 2004). Likewise, in its own in-house review, the Engineering and Physical Science Research Council (EPSRC) judges the success of its own CASE program partly in terms of its ability to increase "the number of students immediately taking up industrial careers" (Holtum 2003).

Recent studies have also found that finding and retaining talent are critical factors influencing the development of clusters and the growth of dynamic urban economies. Locations with large talent pools reduce the costs of searching for and recruiting talent;

they are also attractive to individuals who are relocating because they provide some guarantee of successive job opportunities. Basic university research advances fundamental understanding and provides a substantial rate of economic return through the preparation of a highly skilled workforce, contributing to the foundation of many new technologies, attracting long-term foreign (and domestic) investment, supporting new company development and entrepreneurial companies, and participating in global networks. Cortright and Mayer (2001) conclude that there is no general set of conditions that generate particular industrial clusters in the United States; rather there appears to be a unique factor associated with each. An alternative view is that cluster formation is a complex, self-organizing process that is predicated on the actions of entrepreneurs and their symbiotic relationship with their local environments. The cluster and the characteristics of the cluster therefore emerge over time from the individual activities of the entrepreneurs and the organizations and institutions that coevolve to support them.

Absorptive capacity refers to the ability to assimilate and replicate new knowledge gained from external sources (Cohen and Levinthal 1990). Absorptive capacity results from a prolonged process of investment and knowledge accumulation within the firm, and its development is path dependent (Mowery, Oxley, and Silverman 1996). Therefore, the persistent development of the ability to absorb knowledge is a necessary condition for a firm's successful exploitation of knowledge outside its boundaries. A parallel line of research in the broader technology transfer literature suggests that possession of relevant technical skills facilitates inward technology transfer (Agmon and von Glinow 1991; Rosenberg and Frischtak 1991). Gambardella (1992) further argues that higher levels of absorptive capacity would improve a firm's ability to exploit sources of technical knowledge outside its boundaries. Firms with a high level of absorptive capacity are likely to have a better understanding of new knowledge and to harness new knowledge from other firms to help their innovative activities (Makhija and Ganesh 1997; Tsai 2001). Without such capacity, firms are hardly able to learn or receive knowledge from outside. The ability to benefit from investments in higher education will depend on the absorptive capacity of local firms.

Reconsidering the Conventional Wisdom

Given the amplified interest in universities as engines of economic growth, there is great experimentation worldwide with policy instruments, initiatives, and incentives. The challenge is to promote technology transfer while maintaining the breadth, integrity, and objectivity of academic research and scientific inquiry. The term entrepreneurial university describes the myriad changes taking place within universities, affecting individual academic careers as well as the way universities interact with the external environment and the demands placed on them. Universities have added economic development and engagement with commercial activity as a third mission to their existing mandates of educating students and conducting research (Etzkowitz 1983; Slaughter and Leslie 1997). As in any time of change, unrealistic expectations

may come to dominate the discussion and hijack the discussion. Three pieces of the prevailing conventional wisdom that we examine here deserve further consideration.

First, there is a belief that research universities are the most important institutions for economic development and growth. However, it is important to remember that research universities, like other economic entities, require complementary assets to realize their potential and supply chains to provide them with resources. The complementary assets are firms with absorptive capacity both to employ skilled labor and to use research findings. If receptor firms do not exist locally, then anything a local university produces will become an export to other places: graduates will leave for employment elsewhere and research results will benefit distant firms. The supply chain for higher education certainly involves significant continuing investment in resources, including physical plant and equipment. The government typically funds universities; however, philanthropists and foundations, recognizing the need in developing countries, are providing grants. Funding is necessary to recruit and retain faculty. While it is possible to conduct some activities virtually, thus saving the cost of a physical plant, universities are important social spaces, and a university's infrastructure has important symbolic value. Moreover, universities require a steady supply of students who have the requisite background to be able to engage in a university education. Universities are the pinnacle of the education system. One university alone cannot create economic prosperity. It is more appropriate to talk about higher education as a diverse sector that includes complementary and reinforcing institutions such as liberal arts colleges, institutes of technology, professional schools, community colleges, and continuing education programs. Taken together, these academic institutions provide the basis for the range of skills required for advanced economies and form the fabric of competitive regions. Korea provides an example of a country that has rapidly built an education system and now has excellent universities.

Second, the conventional wisdom affords great importance to formal technology transfer, expecting licensing and start-up companies to provide a revenue stream for the university. While it is true that certain universities have received significant licensing revenues, this is the exception rather than the rule. In the United States, with 30 years of experience, most university TTOs do not even break even, let alone make money. Well-known big hits make headlines, but what is more important is the contribution that universities make through a variety of more mundane exchanges; informal mechanisms become more important than the formal exercise of intellectual property rights. For years economists have justified investment in education and university research by invoking a market failure argument. The idea is that rational economic agents underinvest in knowledge because it is difficult to fully appropriate the investments. This argument has been misconstrued to suggest that greater reliance on market-oriented solutions such as intellectual property rights is required to correct the problem. Universities face pressure to protect aggressively the intellectual property that results from academic discoveries and to collaborate with private industry for greater relevance. Often, these two goals are in conflict: more stringent IP protection places universities in direct competition with firms. Negotiating IP rights is often contentious, and many firms report that they do not wish to license technology from universities. University TTOs are organized and incentivized differentially. Some

TTOs are oriented toward a service function, while others labor under an expectation of self-sufficiency, creating opportunistic behavior and restricting access to university IP. Many authors recognize that economic activity in general, and knowledge creation more specifically, benefits from openness, the basis of the open source movement. Most interesting, openness is congruent with the Mertonian norms of science and, arguably, the system that created the economic growth that policies are now attempting to institutionalize. Ironically, the success of universities in creating knowledge that has yielded great economic value has led to a set of policies and procedures that have the potential to erode the fundamental integrity of the system. In sum, the traditional university knowledge transfer mechanisms of publication, public presentation, educational activities, consulting, and collaboration are still more effective for creating economic growth than the formal mechanisms associated with active IP protection.

Finally, there exists a perception that universities are engines of economic growth. This is an exaggerated view of what is possible for universities to accomplish. Comprehensive case studies of Silicon Valley and Route 128 highlight the supportive, but not motivating, role of local universities. The literature concludes that research universities are a necessary, but not a sufficient, condition for economic development to occur. Moreover, university involvement with emerging industries appears to lag rather than lead their development, with entrepreneurs engaging universities. The prime actors who realize value from knowledge are private firms that add a vision of how knowledge may be used if introduced to the market and how economic return may be generated. It is important to remember that general-purpose or wide-range platform technologies of the sort that come from fundamental scientific breakthroughs, notably computer science and biotechnology, are rare. The vast majority of innovation may be attributed to minor improvements, adjustments, and refinements to existing products, manufacturing processes, and organizational practices. While not particularly glamorous, these activities add economic value and provide a basis for sustained competitive advantage. In addition, while science is important to innovation, new ideas are frequently suggested by individuals who work on the shop floor, who use products, and who supply machinery or materials. Indeed, innovation spans the spectrum of an economy's industrial activity. The view that innovation is limited to new science-based or so called "high-technology industries" is myopic, as it ignores the equally transformative nature of innovation in mature industries that are already in place.

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Higher Education, Innovation, and Economic Development

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> It is absurd to think that we can derive the contour lines of our phenomena from our statistical material only. All we could ever prove from it is that no regular contour lines exist. . . . We cannot stress this point sufficiently. General history (social, political, and cultural), economic history, and industrial history are not only indispensable, but really the most important contributors to the understanding of our problem. All other materials and methods, statistical and theoretical, are only subservient to them and worthless without them.
>
> —*Schumpeter 1939*

In the United States, the richest country in the world, more than 90 percent of a cohort pursues a higher education. In Burkina Faso, one of the poorest countries in the world, only one out of 100 young people gets access to higher education. Does it follow that Burkina Faso would be better off by investing more in higher education? Or is it the other way around: does the low frequency of education reflect the extreme poverty in the country? As we shall see, bringing innovation and learning into the picture may help us to understand the mechanisms at play.

Graduates[1] normally have a higher salary than nongraduates, and economists take this as an expression of higher (marginal) productivity. Why are graduates more productive than nongraduates? What functions can a graduate execute better than a nongraduate? What skills attained in the education system make the graduate more efficient? Which skills are required in the current era of rapid change? Are they the

Bengt-Åke Lundvall is with the Department of Business Studies, Aalborg University, Denmark. While working on the first version of this paper, the author benefited from interaction with Judith Sutz, Edward Lorenz, Rene Nesgaard Nielsen, Keynor Ruiz, Mammo Muchie, and Claes Brundenius. Most important were critical and constructive comments from Shulin Gu. In the revision of the draft, the author was assisted by Allan Dahl Andersen and by comments from two anonymous referees. Although most of the empirical material comes from Denmark or Europe, an attempt is made to draw conclusions for less developed countries. To some degree this reflects the fact that the kind of data used are not accessible for the less developed part of the world, but it also reflects the author's background and use of data-rich Denmark as a laboratory.

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same in a poor country as in a rich country? What are the implications for the organization and teaching methods of higher education? Again, bringing innovation and learning into the picture helps us to understand the mechanisms at play.

This paper introduces new perspectives on higher education by relating it to innovation and learning and draws some preliminary policy conclusions for developed and less developed countries. But the recommendations are preliminary and tentative for good reasons. One reason is that we know far too little about skill building and innovation in less developed countries, and much more research is needed on this topic. Much of the analysis is based on empirical studies pursued in Denmark. Specifically, there is a need to open up the "black box" inside which graduates use their skills and competencies. This paper can only offer a first glimpse.

The other reason is that both the challenges and the required solutions differ widely across the world. While almost all countries in the South and East have created universities inspired by Western models, the context in which they operate is fundamentally different and so is the form and content of what goes under the label university (Altbach 1989; Martin and Etzkowitz 2000). Such differences may reflect the income level, but the size of the country matters, and so does the specific combination of history and geography. The colonial history of the Latin American, Asian, and African countries has put its stamp on how higher education is organized on these continents.

To give full justice to such diversity and complexity is, of course, not possible in a brief paper. To design adequate policy, there is a need to combine general principles and insights with a deep and thorough analysis of the specific higher education system and its insertion in the national innovation system. While statistics showing the number of graduates distributed by discipline may be of some relevance, it is necessary to dig much deeper into the complex reality hidden behind such figures (see the introductory methodological advice stemming from Schumpeter).

Graduates as Equilibrators and Innovators

In this section, I present models and empirical analyses that give general insight into the roles that graduates play in the economy. I start by presenting two classical contributions and move on to bring innovation and learning centrally into the analysis.

Two Attempts to Explain Why Higher Education Contributes to Economic Growth

Policy makers with responsibility for higher education need to convince ministries of finance to use scarce public money for higher education. The most usual approach has been to look for social rates of return higher than private rates of return. That kind of analysis has sometimes produced results that support investment in higher education, but not always.[2] The problem is that this approach neglects social, cultural, and health benefits not reflected in wage differences. Moreover, it is highly questionable whether the basic assumptions that lie behind the analysis—that agents

are optimizing and that wages are equal to marginal productivity—are consistent with the fact that we live in a rapidly changing world characterized by disequilibria and radical fundamental uncertainty. And as argued in this paper, disequilibria and uncertainty are key factors when it comes to determining the usefulness of graduates in the economy.

Compared to the numerous attempts to calculate rates of return, few economists have asked the more down-to-earth question: Why and through what mechanisms do people with a lot of education contribute more to the economy than those with a little education? Here I use two exceptional and important contributions as building blocks for the analysis: one by Nelson and Phelps (1966) and the other by Schultz (1975).

Nelson and Phelps (1966) present a simple growth model where people with higher education contribute to economic growth through two mechanisms. First, they are able to pursue regular activities more efficiently than the average worker. Second, and here is the new insight offered by the paper, they are more competent when it comes to exploiting new technical opportunities in the economy. To support the second assumption, the authors refer to empirical data showing that highly educated farmers introduce new methods before and with better results than the average farmer.

The conclusion from the analysis is that the marginal productivity of the highly educated will reflect the rate of technical change (exogenously given in the model). In other words, *the rate of return on investment in higher education will be positively correlated with the rate of technical progress*. In a stationary economy, we would expect the rate of return to be low, while in an economy characterized by rapid technical change we would expect it to be high. In the light of this model, we might expect the impact on economic growth from expanding higher education in Burkina Faso to remain limited as long as its base of technology remains stagnant. However, for a less developed economy that has entered a trajectory of catching up, the contribution of higher education would be high. High national rates of unemployment among graduates in certain poor countries (World Bank 2002 quotes graduate unemployment rates of 35 percent in Sri Lanka and 22 percent in Nigeria) may be seen as reflecting economies where there is little technical progress. *A general conclusion is that the role of higher education needs to be assessed in the wider context of the national innovation system and that higher education policy needs to be coordinated with a wider set of innovation policies.*

Schultz (1975) follows a similar line of thought but takes the reasoning several steps further. The title, "The Value of the Ability to Deal with Disequilibria," and the reasoning are intriguing, not least because they come from an economist belonging to the Chicago tradition within economics (Backhouse 2004). The empirical evidence used as background for the discussion is similar to that used in the paper by Nelson and Phelps (1965): it refers to farming in India and more specifically to the fact that, while farmers with education were significantly more productive than average in regions where the green revolution took place, this was not the case where methods of farming remained unchanged.

Schultz interprets these and other examples from agriculture and small firms as showing that education makes individuals better prepared to "deal with disequilibria." When the individual is exposed to change, such as new technological

opportunities, he or she will be more or less competent in finding a solution, and it is assumed that one major impact of education is to enhance this skill, which Schultz refers to as "entrepreneurial." He makes the interesting observation that stationary economies are closer to general equilibrium than dynamic ones. Again, we would expect the contribution to economic growth from investment in higher education to be modest in a stationary economy and high in an economy with a high rate of technical and organizational change.

The Innovation System Framework and the Double Shift in Focus

These two contributions are highly relevant for understanding the role of higher education in the current era, and I use them as building blocks for the analysis. But I extend the analytical perspective through *a double change of focus*. In the two models, graduates operate mainly as *equilibrators*. First, I demonstrate that graduates contribute to economic growth by being *innovators*. Second, I demonstrate that, in order to understand the real challenges for higher education, it is necessary to take into account that *agents learn by doing, using, and interacting*. I take into account that graduates when dealing with disequilibria and acting as innovators become more competent in the process of doing so.

This is fundamental since, in the current era, learning is the most important of all economic activities. I still believe that knowledge is the most important resource and consequently learning the most important process in the economy. And I see the neglect of "learning as skill building" as the singular most fundamental weakness of standard economics. This paper introduces a double shift in focus, in which innovation is given more attention than allocation and learning is given more attention than choice.

Learning refers not only to people and organizations getting access to more information. At the core of the concept is a process where people become more skillful in what they do. Individuals as well as organizations learn through problem solving in connection with regular economic activities. Learning results in explicit knowledge about the world as well as in tacit knowledge about how to do things (Lundvall and Johnson 1994).

Innovation refers to the process of introducing new ideas into the marketplace. Ideas may be new for the whole world, but they may also be new locally for a country or for an organization. Innovation is an interactive process, with feedback from users and early adopters. At the core of the current innovation process is collective entrepreneurship, in which several agents interact and work together to introduce change (Christensen and Lundvall 2004).

While it is important to understand allocation as resulting in the efficient use of existing resources, it is equally important to understand how new resources appear. While it is important to understand the choices made by economic agents in the context of the *learning economy*, it is even more important to understand how agents learn and become more competent in everyday economic life. The concept *innovation system* is used to analyze the adequacy of the institutional setup of an economy focusing on innovation and learning rather than allocation and rational choice.

TABLE 1. Changing the Perspective on the Economy

Principle	Allocation	Innovation
Rational choice	Standard neoclassical	Management of innovation
Learning	Austrian economics	Innovation systems

Table 1 illustrates that learning as well as innovation, in principle, may be analyzed in analytical frameworks closer to the standard neoclassical economics. It is possible (but not logically satisfactory) to apply the principles of rational choice to the analysis of innovation. It may, for instance, be assumed that "management of innovation" aims to allocate funds to alternative research and development (R&D) projects according to the private rate of return, taking into account the risk that the projects will not succeed.[3]

Austrian economics (Hayek and Kirzner) share with neoclassical economics a focus on the allocation of scarce resources. But they present the market as a dynamic learning process in which the allocation of scarce commodities is brought closer to the ideal of general equilibrium without ever finding this state.[4]

The Graduate as Innovator: Some Results from Empirical Analysis

A series of doctoral dissertations organized at the Department of Business Studies, Aalborg University, has analyzed different aspects of the role of higher education in processes of innovation (Dahl 2003; Drejer 1999; Nielsen 2007; Pedersen 2005; Vinding 2002). Access to survey data for a large number of firms combined with detailed register data on employee characteristics for the surveyed firms has made it possible to obtain new insights in this field (Lundvall 2002a; Nielsen 2006).

The Disko surveys on innovation, skill building, and organizational change have been pursued three times (1996, 2001, and 2006). They are addressed to management in the firm and cover around 2,000 firms in all industries belonging to the private sector, with the exception of primary agriculture. The surveys have been distributed through Statistics Denmark and all available register data, including the extremely detailed labor market information on all employees and firms, have been linked to the questionnaire.

Taking into account a number of factors that may affect the propensity to innovate, we find a positive effect on the propensity to innovate (here measured as a positive response to the question asking whether the firm has introduced a new product in a three-year period) of having employees with a graduate degree. What is more interesting is that this effect is especially strong in small and medium-size firms operating in low- and medium-technology sectors (see Vinding 2004). One interpretation is that in such, often family-owned, firms, there is a cultural resistance to hiring graduates, while graduates may be attracted to big organizations where they can interact with other employees with a similar background. The first part of this interpretation finds support in the additional result that, after controlling for size, sector, and other relevant variables, the independent family-owned firms are significantly less innovative than the firms belonging to a Danish or foreign industrial group (Jensen and others 2007).

The role of graduates in small-firm innovation has been analyzed in a rigorous way in Nielsen (2007). The analysis focuses on 200 small Danish firms originally without academic personnel. It studies the innovation performance in period $t + 1$, distinguishing firms that hire a first graduate in period t from the rest. The analysis demonstrates that, taking into account a series of relevant control variables, the first-time hiring of a graduate with an engineering background has a significant positive impact on the propensity to introduce a new product (Nielsen 2007).

The analysis goes one step further, asking whether innovation in period t triggers a demand for skills in period $t + 1$. This is what we might expect from the analysis of Schultz, since an innovation would establish disequilibria within the organization. Here, the result is that technical innovation does not have a significant effect on the hiring of graduates. But the analysis shows that firms that engage in organizational change in period t have a higher propensity to hire graduates with a nonengineering background in period $t + 1$.

Higher Education Produces Both Equilibrators and Innovators

These results are based on Danish data. Potentially, they have important direct and indirect implications for higher education.

First, when designing higher education, we should take into account that graduates operate both as *innovators* and as *equilibrators*. The results indicate that engineering graduates are more active as innovators, while management and social science graduates have a bigger role as equilibrators. A single-minded focus on training engineers and scientists may not be rational if the objective is to promote economic development.

Second, there is a need to consider how well teaching programs prepare students for these roles. Innovation is a process requiring close interaction between individuals and organizations. Therefore, while skills in mathematics and language are fundamental, they need to be combined with social skills. Below I argue that traditional teaching modes need to be combined with teaching based on problem-based learning, using theory and analytical tools to analyze problems taken from the real world.

Third, we find some evidence indicating that business organizations where the capability to innovate would benefit from hiring graduates may not do so for institutional or cultural reasons. Barriers at the microlevel operating both on the supply and on the demand side result in a lower innovation capacity for the innovation system as a whole.

These observations, while based on data from a completely different universe, may be of special relevance for less developed countries where the *distance from the academic world to the world of industry is even longer.* The distance may be reflected in vicious circles reproducing stagnant technical change.

To some degree the low demand for graduates in the private sector reflects cultural barriers that restrict the hiring of graduates, while to some degree reflecting irrelevant or incomplete skills. The absence of graduates, in turn, reduces the innovative capability of firms, leaving industry in a stagnant mode. Stagnant technology is reflected in modest demand for graduates. In such a situation, it makes a difference

how far universities succeed in rooting their research and higher education efforts in the local society.

It also implies that there may be a need for *government initiatives to stimulate demand for "first graduate hired"* in the firm. In situations with high unemployment among graduates the positive socioeconomic net effects of time-limited marginal employment subsidies may be substantial. The alternative, which seems to be the case in several less developed countries, where the public sector tries to absorb graduate unemployment, does not have any positive effect on the innovative capacity of the economy.

Finally, the distinction between graduates as equilibrators and innovators may be a useful illustration of the importance of *diversity* as a basis for understanding the stability and growth of national innovation systems. Peter Allen (1988) presented a case study related to fishery in Canada, where he found that the system was sustainable and efficient only because there were two types of fishermen. He called them, respectively, Cartesians and Stochasts. The Cartesians used rational calculation, including all kinds of secondary information based on the experiments made by the Stochasts, who were always on the outlook for new fishery areas.

It would be interesting to follow up on Schultz's analysis and examine different economies as populated by the two kinds of entrepreneurs—innovators (Stochasts) and equilibrators (Cartesians)—and to study the implications for the higher education system. The actual mix in the economy may explain the kind of economic dynamics that characterizes a specific innovation system. The successful catching up witnessed first in Japan and later in Republic of Korea and Taiwan (China) placed a strong emphasis on engineering skills used to absorb international technology through technological learning. As these economies move closer to the technology frontier, they may have to reform higher education so that it gives graduates stronger competence as innovators.

A more indirect lesson is that higher education should aim at a diversified output and that ambitious attempts to standardize the national higher education system should be reined in. The most successful innovation process might involve collaboration among engineers and scientists with different approaches to problem solving. In Denmark two universities educate most of the country's civil engineers, and they offer two forms of education. One is more traditional, based on learning through lectures and course work (Denmark's Technical University), while the other makes much more use of problem-based learning (Aalborg University). The resulting diversity in approaches to problem solving among Danish engineers enriches the innovation system. One of the most fundamental strengths of the U.S. higher education system emanates from its diversity, spanning arts colleges, land grant universities, and research universities, both private and public.

Higher Education in the Learning Economy

This section takes into account that agents involved in innovation and in coping with disequilibria learn and become more competent in the process.

The Learning Economy as a Response to the Acceleration in Change

In various contexts, I have introduced an interpretation of what actually took place in the economy over the last decades under the heading the *learning economy* (Lundvall and Johnson 1994). The intention is to distinguish this concept from the more generally used term the *knowledge-based economy*. The concept of learning economy signals that the most important shift in trend is not the more intensive use of knowledge in the economy but rather the fact that *knowledge becomes obsolete more rapidly than before*; therefore, it is imperative that firms engage in organizational learning and that workers constantly attain new competencies.

The pace of change can be illustrated by the fact that half of the skills that a computer engineer has obtained during his education will become obsolete one year after the exam has been passed, while the "halving period" for other wage earners with higher education is estimated to be eight years (Ministry of Education 1997: 56).

Returning to the contribution by Nelson and Phelps, let us assume that the relative demand for higher education would increase as the rate of change accelerates. One of the very clear outcomes of the Jobs Study of the Organisation for Economic Co-operation and Development (OECD) was that this was the case in *all* OECD countries in the period after 1985. In all OECD countries, either income differences or employment opportunities became more unequal between those with higher education and those without. A different way to characterize the learning economy is as an economy where the demand both for innovators and for equilibrators is increasing and, since those with a higher education are more successful in these roles, the relative position of employees with higher education is strengthened.

The transition to a learning economy confronts individuals and organizations with new demands and has important *implications for higher education*. The most obvious is that the education system needs to *enhance the learning capacity* of students. This does not necessarily conflict with teaching specific and complex bodies of theory or with the use of specialized tools. But it implies that the way teachers teach and the way students learn are crucial, since they will affect the future learning capability of the student.

A second major implication is that higher education institutions need to be ready to support *continuous and life-long learning for academics*. Especially in fast-moving fields of knowledge, there is a need to provide regular and frequent opportunities for experts to renew their professional knowledge. The current boom in master's level programs in business and public administration may indicate the growing recognition among individuals and management that renewing competencies is of great importance. But so far, they tend to operate mainly in relation to management functions. Similar programs may be needed in other areas where "effective demand" is less strong.

Finally, rapid change in science and technology and the need to move quickly from invention to innovation present a strong argument for keeping a reasonably *close connection between* the two basic functions of universities: *education and research*. Teachers who have little or obsolete knowledge about what is going on in current research are not helpful when it comes to giving students useful insights in dynamic knowledge fields.

These are implications for fast-changing and rich societies with strong emphasis on innovation and learning. What about less developed countries? The next session introduces some fresh European data showing that workplace learning takes place differently in different European countries. Some of these differences reflect different levels of economic development, and the analysis of these differences suggests how to link higher education and learning to economic development.

How Europe's Economies Learn

Lorenz and Valeyre (2006) have developed a highly original and informative European Union (EU)-wide mapping of the adoption of different types of work organization with a focus on learning opportunities and employees' discretion in organizing their work.

The Third European Survey of Working Conditions on which the mapping is based was directed to approximately 1,500 active persons in each country, with the exception of Luxembourg with only 500 respondents. The total survey population is 21,703 persons, of which 17,910 are salaried employees. The analysis presented here is based on the responses of the 8,081 salaried employees working in establishments with at least 10 persons in both industry and services, but excluding agriculture and fishing, public administration and social security, education, health and social work, and private domestic employees.

Cluster analysis is used to identify four different systems of work organization:

- Discretionary learning,
- Lean,
- Taylorist, and
- Traditional forms.

Two of these, the discretionary learning and lean forms, are characterized by high levels of learning and problem solving in work. The principal difference between the discretionary learning and the lean clusters is the relatively high level of discretion or autonomy in work exercised by employees grouped in the former. More than 85 percent of employees grouped in the discretionary learning cluster affirmed that they have control over the pace and methods of work, whereas only slightly more than 50 percent of the employees grouped in the lean cluster affirmed this. Tasks are also more complex in the discretionary learning cluster than in the lean cluster.

Referring back, it is possible to say that all those who work in the two learning modes operate as equilibrators: they regularly have to reallocate resources in an attempt to solve problems as a response to change imposed on them. But the discretionary learning cluster also has innovators who, when confronted with new types of problems, develop new methods to solve them.

Discretionary learning thus refers to work settings where a lot of responsibility is allocated to the employee, who is expected to solve problems on his or her own. Business services are a typical example where many jobs involve a continuous confrontation with new and complex problems. Although some of the tasks take place in a

team, teamwork is not seen as imposing narrow constraints on the work. Employees operating in these modes are constantly confronted with disequilibria, and as they cope with those, they learn and become more competent. But some of their earlier insights and skills also become obsolete.

Lean production also involves problem solving and learning, but here the problems are defined more narrowly and the set of possible solutions is less wide and diverse. The work is highly constrained, and this points to a more structured or bureaucratic style of organizational learning that corresponds rather closely to the characteristics of the Japanese, or lean production, model.

The other two clusters are characterized by relatively low levels of learning and problem solving. In the traditional cluster, the complexity of learning and tasks is the lowest among the four types of work organization, while at the same time constraints on work are relatively low. This class groups traditional forms of work organization in transport and services where methods are, for the most part, informal and not codified.

Table 2 shows that people working in different national systems of innovation and competence building *have very different access* to workplace learning. The discretionary learning forms of work organization are most widely diffused in the Netherlands, the Nordic countries, and, to a lesser extent, Germany and Austria, while they

TABLE 2. National Differences in Organizational Models
percent of employees by organizational class

Country	Discretionary learning	Lean production learning	Taylorist organization	Simple organization
North				
Netherlands	64.0	17.2	5.3	13.5
Denmark	60.0	21.9	6.8	11.3
Sweden	52.6	18.5	7.1	21.7
Finland	47.8	27.6	12.5	12.1
Austria	47.5	21.5	13.1	18.0
Center				
Germany	44.3	19.6	14.3	21.9
Luxembourg	42.8	25.4	11.9	20.0
Belgium	38.9	25.1	13.9	22.1
France	38.0	33.3	11.1	17.7
West				
United Kingdom	34.8	40.6	10.9	13.7
Ireland	24.0	37.8	20.7	17.6
South				
Italy	30.0	23.6	20.9	25.4
Portugal	26.1	28.1	23.0	22.8
Spain	20.1	38.8	18.5	22.5
Greece	18.7	25.6	28.0	27.7
EU-15	39.1	28.2	13.6	19.1

Source: Adapted version based on Lorenz and Valeyre (2006).

are little diffused in Ireland and the Southern European nations. The lean model is most in evidence in the United Kingdom, Ireland, and Spain and, to a lesser extent, in France, while it is little developed in the Nordic countries or in Germany, Austria, and the Netherlands. The Taylorist forms are more present in Portugal, Spain, Greece, and Italy, while the traditional forms are more present in these four Southern European nations as well as in Germany, Belgium, and Luxembourg.

Lorenz and Valeyre (2006) use logit regression analysis in order to control for differences in sector, occupation, and establishment size when estimating the impact of nation on the likelihood of employees being grouped in the various forms of work organization. The results show a statistically significant "national effect" when controlling for the structural variables, thus pointing to considerable latitude in how work is organized for the same occupation or within the same industrial sector.

The analysis shows that the lower the income level, the bigger the proportion of the workforce that works in either simple or Taylorist organizations. The richer the country, the more workers are employed in learning contexts. One interesting perspective raised by these data is that *economic development may be defined and analyzed as a transformation of working life*. Historically, we see, first, a transformation from simple to Taylorist organization of work as farmers are absorbed by factory work. Later on, an increasing share of the workforce enters into more flexible forms—lean or discretionary learning—and in some current high-income countries the majority of workers work in discretionary learning workplaces.[5] One important lesson is that, while codified knowledge and advanced science become more important as the economy develops, organizational learning simultaneously produces an increase in demand for less-structured knowledge (Jensen and others 2007).

The North-South pattern observed in Europe supports the assumption that industry's capacity to absorb graduates as employees is higher in rich countries than in less developed countries. The pattern also indicates that employees in countries at the technological front learn more than those in poor countries. In general, the problem of growing social, international, and regional inequality is fundamental for how higher education systems should be designed in the globalizing learning economy. Several different mechanisms are at play, and therefore this set of problems is treated in a separate section below.

Education and Training for Learning Organizations

Since the discretionary learning forms of work organization depend on the capacity of employees to undertake complex problem-solving tasks in relatively unconstrained or "organic" work settings, it can be expected that nations with a high frequency of these forms will have made substantial investments in development of the knowledge and skills of their labor force. Investments in education and training take various forms, and in what follows I compare tertiary, or third-level, education with the continuing vocational training offered by enterprises through both external and internal courses.

Tertiary education develops both problem-solving skills and formal and transferable technical and scientific skills. A major goal of most EU nations over the last two to three decades has been both to increase the share of their population with

third-level education and, more specifically, to increase the number of graduates qualified in science and engineering.

While most of the qualifications acquired through third-level education are relatively general and hence transferable in the labor market, the qualifications an employee acquires through continuing vocational training are more firm specific. Some of this training will be designed to renew employees' technical skills and knowledge in order to respond to the firm's requirements for ongoing product and process innovation.

Other parts of continuing vocational training, notably the provision of in-house courses, are more organizationally focused and designed to develop employee competence in the firm-specific routines and operating procedures that are required for daily production activities. This kind of vocational training is highly complementary to the more informal forms of learning that occur on the job, as employees seek solutions to the problems they confront in their daily work.

Figure 1 shows the correlations between the frequency of the discretionary learning forms and two of the four measures of human resources for innovation used in the European Union's Trendchart innovation benchmarking exercise: the proportion of the population with third-level education and the number of science and engineering graduates since 1993 as a percentage of the population age 20–29 years in 2000.[6] The results show a positive correlation ($R^2 = 0.26$) between the discretionary learning forms and the percentage of the population with third-level education and no discernible correlation between the discretionary learning forms and the measure of the importance of new science and engineering graduates.

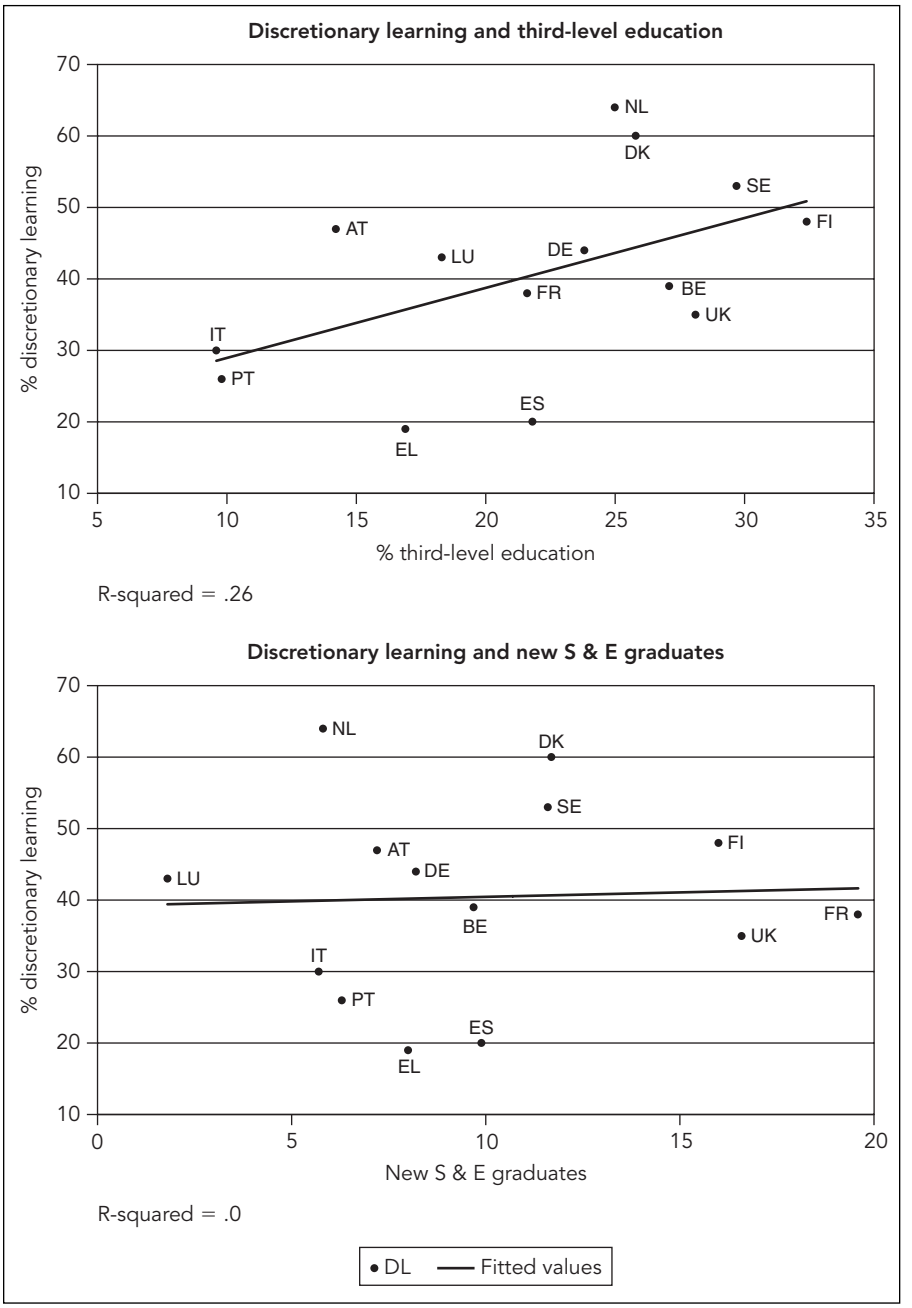
Figure 2 also points to a north-south divide within Europe. The four less technologically developed Southern European nations are characterized both by low levels of firm-level continuing vocational training and the low use of discretionary learning, while the more developed Northern and Central European nations are characterized by relatively high levels of vocational training and extensive use of the discretionary learning forms.

When interpreting the data presented here, it is important to note that much of the continuing vocational training may be directed toward graduates. In Lundvall (2002a), we find a strong "Matthews's effect" in the distribution of training opportunities in Danish firms. The employees with higher education were offered opportunities to attend courses much more frequently than the workers with less formal education.

These results do not imply that third-level education contributes little to firms' innovative performance. Rather, the point is that the bottleneck for constructing learning organizations in a less developed economy would appear to be at the level of firm-specific vocational training and not at the level of formal third-level education. Portugal, Spain, Italy, and Greece, all of which have made important strides in increasing the number of science and engineering graduates, stand out for their low levels of investment in continuing vocational training and for ranking the lowest on the discretionary learning scale.

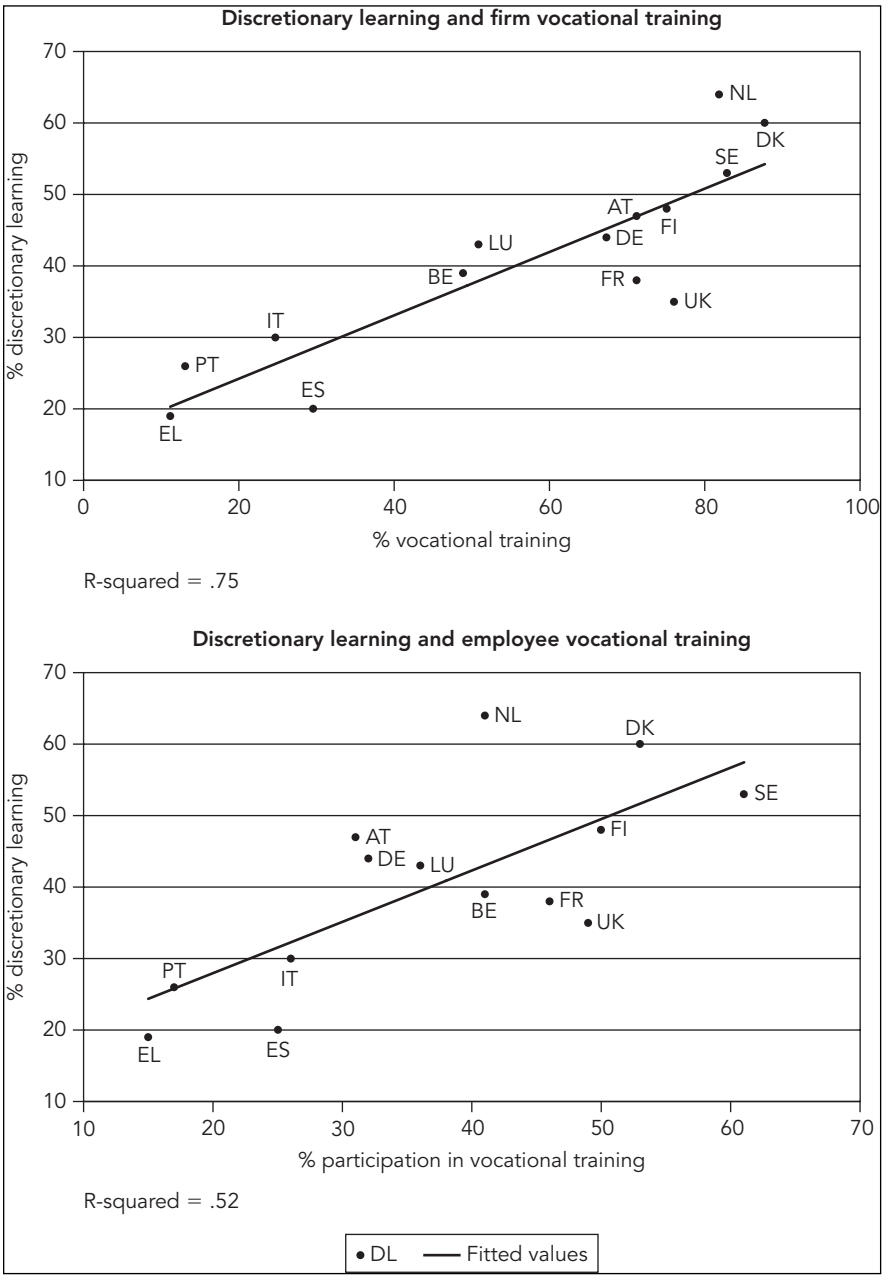
Again, the analysis indicates that investing in higher education is much less efficient if the economy does not establish the prerequisites for creating learning

FIGURE 1
Formal Education and Discretionary Learning



Source: Lorenz (2006).

FIGURE 2
Enterprise Continuing Vocational Training and Discretionary Learning



Source: Lorenz (2006).

dynamics, including continuous efforts to upgrade competencies at the firm level. Keynor Ruiz (1997) reveals serious weaknesses of labor market institutions in Costa Rica when it comes to support for organizational learning inside firms.

Inequality and Learning in Economic Development

Table 3, which maps international differences in the frequency of discretionary learning, distinguishes between managers and workers. The class of managers includes not only top managers but also middle managers and professionals, including technicians, while the worker category includes workers with and without professional training as well as clerks. The table shows that the higher the employees are in the professional hierarchy, the higher the probability that they are engaged in discretionary learning. This is true for all of the countries listed.

TABLE 3. National Differences in Organizational Models
percent of employees by organizational class

Country	Discretionary learning[a]	Share of managers in discretionary learning	Share of workers in discretionary learning	Learning inequality index[b]
North				
Netherlands	64.0	81.6	51.1	160.0
Denmark	60.0	85.0	56.2	151.2
Sweden	52.6	76.4	38.2	200.0
Finland	47.8	62.0	38.5	161.0
Austria	47.5	74.1	44.6	166.1
Center				
Germany	44.3	65.4	36.8	177.8
Luxembourg	42.8	70.3	33.1	212.4
Belgium	38.9	65.7	30.8	213.3
France	38.0	66.5	25.4	261.8
West				
United Kingdom	34.8	58.9	20.1	293.0
Ireland	24.0	46.7	16.4	284.8
South				
Italy	30.0	63.7	20.8	306.8
Portugal	26.1	59.0	18.2	324.2
Spain	20.1	52.4	19.1	274.3
Greece	18.7	40.4	17.0	237.6
EU-15	39.1	—	—	—

Source: Calculations made by Edward Lorenz specifically for this paper on the basis of the data referred to in connection with table 2.

— Not available.

a. After correction for job structure and sector composition.

b. The index is constructed by dividing the share among "managers" engaged in discretionary learning with the share of workers engaged in discretionary learning. If the share was the same, the index would be equal to 100.

What is more interesting is the finding of a strong indication of different learning modes in different countries. In the most developed economies (with the exception of France and the United Kingdom), inequality in the distribution of learning opportunities is moderate, while it is very substantial in the less developed South. For instance, the proportion of the management category engaged in discretionary learning in Portugal is almost as high as in Finland (62 percent in Finland and 59 percent in Portugal), but the proportion of workers engaged in discretionary learning is much higher in Finland (38 and 18 percent in Finland and Portugal, respectively). Finland is among the highest ranked both in income per capita and in innovation activities, while Portugal is at the other extreme on both accounts.

This pattern indicates that a movement toward a learning economy is one where inequality in learning opportunities is reduced. The countries at the top of the table are countries where income inequality is low, and they are highly successful in adapting to the changes imposed on them by new technologies and new forms of more intense, global competition. So while it might be true that higher education fosters people who are successful as equilibrators and innovators, the innovation system as a whole is most efficient when those people interact with a broader segment of the workforce in promoting or coping with change.

For the design of higher education systems in less developed countries, and also for countries in the south of Europe, these observations raise an issue of how education programs can be designed in such a way that the social distance in working life between management and workers is not too large. The experience of the Nordic countries, always appearing at the top of global competitiveness assessments, together with the United States, also demonstrates that public policies that reduce income inequality may actually promote innovation and growth through their positive effect on participation in learning and change.

Reflections on Public Policy for Higher Education

This section presents some ideas about public policy in relation to higher education. It is obvious that any attempt to introduce change needs to be based on broad participation of civil society and not least on engaging change agents within the academic community. Universities are conservative institutions, and in extreme cases countries might consider building new ones rather than reforming the old ones.

A Pessimistic Conclusion?

Not so many years ago, the World Bank argued against investment in higher education in Africa, recommending that governments focus their efforts on primary and secondary education. This recommendation was based on the observed low rates of return on the investments (Samoff and Carrol 2004). The analysis presented here may be interpreted as leading to equally pessimistic policy implications. The paper has argued that, in poor economies with little technical progress and little economic change, the demand for graduates will remain low.

But this paper draws another conclusion. As pointed out in more recent World Bank documents, investments in higher education should not be assessed exclusively on the basis of the contribution to economic growth (World Bank 2002). And, since there is now agreement that all countries should invest in higher education, we are left with a different and more challenging question: *How should higher education be organized so that it contributes to a take-off in innovation and economic growth in a less developed economy?*

Still, there is a need to combine this with an even more fundamental change of perspective in which the focus moves from promoting supply to creating demand for educated workers. For each single less developed economy, there is a need to develop a strategy aimed at making the national innovation system more active and dynamic. With success, such a strategy would establish stronger demand for higher education. This perspective requires that *policies for higher education be seen as integral parts of a much broader set of policies aimed at promoting innovation in the economy.*

How to Organize Universities in a Less Developed Economy?

There are many problems for the policy maker responsible for higher education. Some problems have to do with funding, efficient administration, and the quality of teachers and graduates. This section focuses on one specific set of problems related to *the high degree of separation of higher education from the rest of society*. I believe that shortening this distance is a key to getting positive results from investment in higher education in less developed economies.

In many developing countries, the prevailing "university models" are the leading U.S. universities in the Boston and San Francisco areas or possibly the universities in Cambridge or Oxford. The idea that each single university should become a world center of excellence is attractive in the sense that it emphasizes quality and meritocracy in contrast to corruption and mediocrity. But it is not all for the good. A very bad replica of the star universities may be detrimental to economic development. Another U.S. model could give more useful inspiration, and this is *the land grant university* with its extension services.

The first of these *regional universities* were established around 1860 with the direct purpose of contributing to regional development; they were supported by regional civil society and by the federal as well as state and local authorities. In the twentieth century, they started to combine research and higher education with an active extension system for distributing useful knowledge to the region. The extension service was aimed not only at the business sector, including farmers, but also at housewives and adults in general. I believe that universities of this kind may produce graduates better equipped to solve problems and contribute to innovation in less developed regions and countries than the standard research university.

Such an approach may be combined with establishing one or more *national universities* that consciously try to link up with the so-called global networks of excellence. But it is obvious that establishing such elite universities always will result in brain drain, at least as long as the domestic demand for advanced knowledge remains limited. For such universities, it is therefore necessary to socialize students in such a

way that they graduate with a certain pride of country and university brand to give them some roots in their home country.

The national universities may be linked through collaborative network agreements to the regional universities, and job descriptions for professors may include that they should serve at both in order to give regional universities updated knowledge about frontier research. Regional universities should be stimulated to develop advanced research in niches where they reveal strength or in areas where regional demand is strong. Such local forms of excellence should be rewarded in line with the excellence of the national university.

Higher Education Should Contribute to General Competencies

One of the most important insights from innovation research is that the *innovation process is interactive* (Christensen and Lundvall 2004). Transforming a new idea into a marketable product involves teamwork and interorganizational interaction with customers and knowledge institutions. In a context of accelerating change, general skills that support learning become increasingly important.

What matters for the performance of a graduate is a combination of professional and specialized knowledge acquired through reading books and following lectures and a set of so-called general skills, including, especially, the capacity to communicate, cooperate, and interact with others. In a less developed economy, such skills involve the ability to interact efficiently in a cultural environment quite different from the academic context.

General competencies are sometimes referred to as personal skills and sometimes as workplace skills. This terminology is problematic since it gives the impression that they are something separate, to be added on after the university training has been concluded. One way to make the transition to working life less painful for graduates is for universities to take more responsibility for the formation of general skills.

As can be seen from the Danish survey data in table 4, there is a close connection between firms engaging in organizational change and learning and the demand for social skills. When management in firms engaged in organizational change over a two-year period are asked about the kind of competencies they give more weight to when hiring new employees, they tend to give more weight to social skills than do management in firms not engaged in organizational change.

As shown in table 4, there is stronger demand for professional skills in firms establishing new forms of organization, but the gap is much smaller than when it comes to general skills. Firms that engage in organizational change require employees who can communicate and collaborate internally and externally.

This implies that the teaching at universities needs to be adjusted in order to prepare students for communication and cooperation with other categories of workers and experts. The way in which students study and learn at university affects their social skills when they exit as graduates and so does the broader cultural context of the university. In the modern literature on learning, this relates to the idea of learning as moving from the periphery to the center of communities of practice. The idea of education as a process that fills empty bottles, the form of which is determined elsewhere, is as widely shared as it is inadequate (Guile 2003).

Table 4. Changes in Task Content for Employees in the Period 1993–95 for Firms That Have Made Organizational Changes and Firms That Have Not

	More		Less		Unchanged		No answer	
Task content	**Made changes**	**Made no changes**	**Made changes**	**Made no changes**	**Made changes**	**Made no changes**	**Made changes**	**Made no changes**
Independence of work	72.6	37.1	4.2	2.7	21.2	56.3	2.0	3.8
Professional qualifications	56.4	36.3	7.5	5.3	33.3	53.8	2.8	4.4
Routine character of tasks	5.6	8.2	41.8	15.5	45.0	67.1	7.7	9.1
Cooperation with colleagues	59.1	27.1	5.8	4.5	31.8	63.3	3.2	5.0
Cooperation with management	64.9	28.6	5.9	4.2	26.1	62.2	3.1	4.9

Source: Voxted (1999); Disko survey.

University education everywhere has inherited some forms of transmitting knowledge to students, such as lectures, often in big crowded rooms, referring to standard textbooks often based on the reality of the United States or the United Kingdom. This method of learning is highly inefficient. One problem is the lack of relevance of the substance in relation to the concrete context; this problem is, of course, most dramatic in less developed countries. *Research focused on domestic problems attempting to adopt research methods and tools to the local context may be helpful to developing more relevant teaching material.*

The second problem is that this traditional form of learning does not prepare students to use the theory and methods in a real-life context; neither does it replicate the kind of learning that is required in a future professional life. In professional life, most learning takes place through problem solving, often in a context of collaboration with others with a different background. *Problem-based learning and combining theoretical work with periods of practical work are an obvious response to these problems.*

This consideration is especially important in less developed countries, where universities tend to select a small group of the population among the elite to become the new elite. Elite education in narrowly defined disciplines may be detrimental to innovation even if it takes place at centers of excellence. Both the socialization and the selection functions are important for what kinds of scientists and engineers are produced by the national system of higher education. *The way students learn* to become proficient in a specific discipline or profession is thus crucial for how they will function in their future profession.

This implies that a concept and indicators of quality with several dimensions are needed in order to evaluate education outcomes. Achievement tests in mathematics, physics, and language capabilities need to be combined with tests of interactive capabilities. A high level of the first type of capability is of limited value for innovation if the level for the second type is low. A principal task for higher education is to contribute to *collective entrepreneurship*—that is, to general skills supporting an interaction with others resulting in innovation.

Students' Activities Should Be at the Core of the Third Mission

When it comes to seeing universities as a source of innovation, focus is normally on specific organizations and efforts to link university research to business organizations. Often the focus is on efforts to establish science parks in physical proximity to universities or on engaging universities in patenting their research results.[7] In contrast, I argue that *universities' most important contribution to innovation remains their formation of graduates with good problem-solving skills.* This view is widely shared among innovation scholars (see, for instance, the report of Salter and others 2000).

The strong emphasis that policy makers and university administrators put on a separate "third mission" as compared to the much lower attention they give to reforming "ordinary education" is highly problematic, since it results in neglect of the substantial gains that could be achieved by modernizing the education system. Such educational reforms would seek to deepen and widen the network relationships between university and industry.[8]

The Third Mission and the Market Orientation of Universities

In recent years there has been a strong emphasis on reforming universities to take on what has been called the third mission. This has often been presented as synonymous with the idea that universities should become more market oriented (Etzkowitz and Leydesdorff 2000).

Actually, the stronger market orientation should be kept separate from the idea of strengthening of the third mission. The concept of the third mission goes back to 1914, when the extension service was added to other basic activities at land grant colleges through the Congressional Smith-Lever Act in the United States (Graham 1994). The extension services were not and are not primarily profit oriented, and the principal aim is not to make money for universities. On the contrary, the establishment and setup involved strong elements of civic service to the local society that supports the university. A similar tradition of serving local societies and weak segments of the population can be found at universities in many of the Latin American countries (Arocena and Sutz 2005).[9]

Closer university-industry interaction may stimulate innovation in the economy. Contract research for firms, informal consulting for firms, and many other forms of collaboration may take place without seriously undermining the autonomy of the university, especially if it is built in an atmosphere of mutual understanding and respect and if the collaboration is transparent.

Nonetheless, there are three major negative consequences of taking the market orientation of universities too far. First, installing intellectual property rights on outcomes of academic research cannot avoid having a negative effect on knowledge sharing within and outside the university, and it undermines the academic ideal of open access to knowledge. Second, in the knowledge-based economy, it is critically important for society to have access to an institution that is credible when it comes to critically assessing and validating "what is reasonably reliable knowledge." There are, as I see it, no serious alternatives to universities when it comes to fulfilling this function, and making them subordinate to economic or to political interests makes them less reliable as judges and witnesses. Third, as universities become simultaneously more international in their scope and more market oriented, they will come under the scrutiny of World Trade Organization and European competition regulators. The long-term outcome of this might be that, since fundamental research and normal higher education cannot be clearly separated from their commercialized activities, public funding for these core activities may become classified as illegal subsidies of business activities. This might undermine the very foundation of the knowledge-based society.

In Lundvall (2002b), I have argued that, to balance the need for universities to get closer to the business sector with the need for a certain relative autonomy, university activities will have to be diversified, with protected realms for "slow and deep research."

To argue that a reluctance to transform universities into profit-oriented business organizations is to support an ivory tower model is highly misleading. Actually, to engage universities in protecting and selling knowledge in the form of patents may be seen as building equally inaccessible business towers (Garnsey 2007).

The Third Mission and Higher Education

It is far from obvious that the best way to form the competence of students is to isolate them on campus for three to five years and expose them exclusively to academic teaching for this period. Laboratory work and case material do not establish sufficient links between theory and practice. In most disciplines and professions, students can enhance their learning by being confronted with problems outside the university. Periods of fieldwork or practical work related to the object of study are useful in preparing students for a future career. Educational programs may be organized in such a way that students contribute to the third mission of the university and at the same time profit from the experience in terms of learning. Long educations may be split up into parts, with periods of practical activity in between.

It is often neglected that the success of third-mission programs reflects not only the supply side but also the demand side. For instance, firms without personnel with a higher education are not prepared to interact, or capable of interacting, with universities. Educating graduates in such a way that they find employment in industry is therefore a key to strengthening university-industry collaboration. Danish data show that firms with college-educated employees are more prone to collaborate with universities and other knowledge institutions than firms without. For small firms, the probability of intensifying the cooperation with a science institution is significantly higher (Lundvall 2002a).

One important way to increase the interest of firms in hiring academic personnel and, on this basis, collaborating with universities is to establish some kind of exchange during the study period. As mentioned, a complementary policy response could be to give time-limited, marginal employment subsidies to private firms that hire their first employee with a higher education.

Promoting Excellence When Knowledge Attracts Knowledge?

One of the important consequences of the move toward a globalizing learning economy is that inequality becomes a major problem at all levels. If market mechanisms are given free play, the globalizing learning economy leads to a growing concentration of both knowledge and income at all levels. This constitutes an inherent contradiction, since learning seems to be especially successful in contexts with small gaps in income and social status—see, for example, the data on discretionary learning in the Nordic countries. The new distribution problem calls for "a new new deal," where the focus is on redistributing learning opportunities and learning capabilities. It is, therefore, a major task for international organizations and national governments to find ways to stimulate such redistribution.

One dimension of the growing inequality is the geographic concentration of wealth and knowledge. We have seen that the more knowledge is advanced, the more new knowledge is created in a region through the processes of learning and innovation. Within countries, similar patterns are evident of growing regional gaps in knowledge and income.

Knowledge used in the economy always has tacit elements that make it difficult to move knowledge from one site to another. Since it is more expensive to produce new knowledge than to use knowledge on a wider scale, certain locations will become very active in terms of innovation. It is easier to develop complex new technology at a site located close to advanced knowledge institutions, sophisticated suppliers, and customers than at a site without a strong knowledge infrastructure.

In the learning economy, the increasing mobility of people reinforces global as well as regional inequality. For individuals eager to advance in the learning economy, it is rational to move to places where a lot of learning is taking place. There might be other specific attractors for "the creative class," such as cultural diversity, as found in the work by Richard Florida (1999), but the most basic attraction is that there are other creative people and ample learning opportunities in the area.

Similar mechanisms are at work in the competition between higher education organizations. They are reinforced by public rankings making students and professors eager to join certain highly prestigious universities. Allocation mechanisms giving extra resources to those universities that publish the most will widen the gap between the elite universities and the rest.

In public policy, there is a certain ambivalence in relation to these phenomena. On the one hand, most national ministries of education or science aim to establish one or more "world-class universities." But, on the other hand, it is obvious that concentrating all education and research at very few universities would result in an extremely uneven regional distribution of knowledge and economic development.

Especially for less developed countries, it is highly problematic to allocate resources mainly to the most established universities with the most highly developed international connections. Many of these resources risk becoming part of the global drain in the direction of rich countries and multinational companies (Hoebink and Van der Zanden 2004).

This is one further reason why regionally anchored universities should be given a fair share of resources for research and education. Such universities may be more flexible when it comes to experimenting with, for example, problem-based learning methods and interdisciplinary research.

Conclusions

I am painfully aware that many difficult policy issues related to higher education have not been given sufficient attention in this paper. Rather than listing those and analyzing each separately, I have tried to deepen our understanding of some general mechanisms that link higher education to economic development and tried to draw some policy implications on this basis. I have done so mainly through references to research on innovation and learning in Denmark and Europe. I see the global network Globelics as a means to understand better these processes in less developed economies (see the annex to this chapter).

To get a fresh perspective, I have focused more on learning and innovation and less on rational choice and allocation of existing resources. I find that the major problem

for higher education in many countries is a lack of domestic demand that reflects an incomplete and stagnating national innovation system. Therefore, I have focused on reforms of the higher education system that might contribute to building a more complete and dynamic innovation system. Most of the reforms have aimed to shorten the distance between higher education and society to make the transfer from university to work less painful and, at the same time, to build new and more solid bridges between universities and industry.

But higher education is only one part of the national innovation system. In order to break vicious circles, there is a need for a comprehensive national strategy rooted in a strong common engagement to change. Such a strategy needs to be based on a solid analysis of the national innovation system. It needs to give much attention to human resources in general, not only in higher education, but also in primary and secondary education as well as labor market institutions. It also needs to include an industrial policy that aims to develop economic activities that match domestic skills and ideally are characterized by steep learning curves. Studying innovation systems in Latin America, Africa, and Asia, I have found little evidence that market forces spontaneously establish the necessary prerequisites for catching up (Cassiolato, Llastres, and Maciel 2003; Gammeltoft, Lundvall, and Muchie 2003; Lundvall, Interakummerd, and Lauridsen 2006). Developing countries seem to have more to learn from Friedrich List and "the Other Canon" than from Adam Smith (Reinert 1999).

The poorest countries in Africa and elsewhere might not be able to break out of their vicious circles by any kind of intelligent technocratic effort, not even with very substantial international aid. In these countries, a prerequisite for taking off may be social mobilization from below, involving a major collective effort to engage in far-reaching social and political change. The history of my home country, Denmark, demonstrates that this can take place in a quite peaceful way. The radical transformation of Danish agriculture in the second half of the nineteenth century laid the foundation of a growing and successful economy (in 2005 Denmark was ranked as the world's most competitive economy by the U.K. magazine *The Economist*). A fundamental prerequisite for this transformation was the ideological mobilization of small farmers, the establishment of folk high schools that gave the farmers self-confidence and knowledge, and the cooperative movement. Spiritual leadership of high moral quality is important: Without the active role that the popular and charismatic priest Grundtvig played in the process, the transformation might not have taken place at all.

Annex: What Can Be Learned from the Globelics Experience?

Globelics is a global research community combining scholars working on innovation studies with scholars working on development studies. It has been characterized as a network for "researchers without borders" (Luc Soete). Globelics (see www.globelics.org) held its first informal meeting outside Aalborg in 2002. The concept was developed over the three previous years in discussions I had with colleagues from

the South (Cassiolato, Gu, and Muchie) and the North (Soete, Johnson, Freeman, and Nelson).

The first annual conference was held in Rio 2003, followed by annual conferences in, respectively, Beijing (2004), Pretoria (2005), and Trivandrum (2006). The 2007 conference (2007) took place in Saratov, Russia. All the Globelics annual conferences have taken place in developing countries, and financing has been raised within the host country. Scholars from the North contribute to keep costs down by raising their own travel funds, and they also try to raise some support for young scholars traveling South-South.

Besides the annual conferences, regional and national networks have been established in Asia, Latin America, and China (see www.cicalics.org). Each year 40 doctoral students, coming equally from Asia, Africa, Latin America, and Europe, are invited to Globelics Academy in Lisbon, where world-leading scholars in innovation studies meet for 10 days and give lectures and methodological advice for their thesis work. A similar Cicalics Academy takes place in China every year, with a majority of Chinese students and of international lecturers. New initiatives in Africa and India may soon result in similar activities in these areas.

The purpose of Globelics is to counterbalance the increasingly uneven global access to research networks. It gives scholars in less developed countries access to the most recent research, and it opens up channels for publication of their work. It also makes possible the sharing of experiences among scholars from different parts of the developing world, bypassing metropoles in the North. Several major research projects with global scope use Globelics as host: the Catch-Up Project coordinated by Richard Nelson, the Brics Project coordinated by José Cassiolato, and the Unidev Project coordinated by Claes Brundenius.

Globelics has a scientific board with distinguished scholars such as Christopher Freeman and Richard Nelson and with leading scholars from the South. But basically Globelics is a self-organizing global network. It draws its energy mainly from the fact that scholars from the North and the South find it highly rewarding to work together and learn from each other in a seriously committed but friendly atmosphere.

One major long-term positive effect is that young scholars from all parts of the world, sometimes working in isolation and under difficult conditions, get inspiration and support in their effort to do good research on innovation. There is already a lively "Globelics community" of young scholars who correspond regularly on both a scientific and a social basis.

It is difficult to say whether the Globelics experiment can be replicated in other fields of knowledge. The innovation research community has always had a strong social dimension that was brought into it by the leading scholars in the field: Christopher Freeman, Keith Pavitt, and Richard Nelson. Without this social capital, the experiment might have failed. If it could be replicated, it would certainly be a highly efficient way of contributing to capacity building in the South. It is low cost and highly productive in terms of publications and research training. And to participate in it is certainly more enjoyable than is participating in most other research endeavors.

Notes

1. In this paper, to simplify, I refer to the sites of higher education as "universities" and to those who leave the system with a full education as "graduates." I do so well aware that there are forms of higher education, including professional schools without connection to research activities, where this terminology may be misleading.
2. Pritchett (2001), using aggregate data for national economies, comes out with very negative results in this respect, showing that investment in education, in general, has no positive effect on economic growth; in some national cases, he even finds a negative impact. But he also refers to a few studies showing that the impact of the *quality* of education has a major impact on growth. I return to the quality issue later in this paper.
3. Arrow (1973) has pointed out the obvious: innovation is a phenomenon not ideal for that kind of analysis because the fundamental characteristic of innovation is that it gives rise to something that is not known in advance.
4. Their definition of learning differs from ours, since they do not see learning as competence building.
5. A large proportion of workers engaged in simple work may reflect underdevelopment. In poor countries, the alternative to lack of employment is to deliver simple services as an underemployed and self-employed service worker. As the economy grows, professionalization may take place, moving some functions from being characterized by simple work to being characterized by lean production and discretionary learning. Other functions in personal services remain in the category of simple work.
6. See http://trendchart.cordis.europa.eu/.
7. Inzelt (2004), who writes her paper in the triple-helix tradition, lists no less than 16 forms of collaboration between universities. None of these includes the hiring of graduates from universities, and the paper has very little to say on the importance of the fact that embodied knowledge changes place when a graduate moves from the university to industry.
8. The reason that such reforms are neglected may reflect the fact that they are both more difficult to realize and less visible for the public. They need to take place at the core of the university function, and they do not have the same symbolic effect as when a minister opens yet another science park.
9. The U.S. extension service programs are of great interest for developing countries because they tend to combine idealistic norms with a very practical orientation. The idea is to mobilize theoretical knowledge for the solution of everyday problems in agriculture, households, and society at large. At least for developing countries, they are certainly a much more important source of inspiration than the Bayh-Dole Act.

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Comment on "Wellsprings of Modern Economic Growth: Higher Education, Innovation, and Local Economic Development" by Maryann P. Feldman and Ian I. Stewart and on "Higher Education, Innovation, and Economic Development" by Bengt-Åke Lundvall

FUMIO KODAMA

I would like to take this opportunity to offer two sets of comments, first on the paper by Lundvall and second on the paper by Feldman and Stewart.

Comment on Lundvall's Paper

In the first paragraph, Lundvall introduces the idea of graduates acting both as *innovators* and as *equilibrators* in what he calls the *learning economy*. However, Japan's history, as exemplified by Souichirou Honda and Sakiti Toyota who are not university graduates, suggests that our graduates have acted more as equilibrators than as innovators. Therefore, I would like to concentrate my comments on the equilibrator side.

The Concept of Equilibrators

The concept of equilibrators, which is derived from examples in agriculture and small firms, assumes that education makes individuals better prepared to "deal with disequilibria." In manufacturing, however, technologies are more or less system technologies: they are architectural and hierarchical, involving hundreds of components. The disequilibrium often comes from the modular nature of technology, in which

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Annual World Bank Conference on Development Economics 2008, Regional

technological progress is achieved through the simultaneous and parallel development of several component technologies. Therefore, the task of engineers is better characterized as dealing with *integration* than with disequilibria.

Modes of Learning

In order to understand the real challenges for higher education, it is necessary to take into account the fact that agents learn by doing, using, and integrating. Arrow (1973) introduced the idea of learning by doing, based on the manufacturing of airplanes. Rosenberg (1983) went further to introduce the idea of learning by using, which became obvious in software development. In the recent technologies, hardware and software interact with each other, making the consolidated development of these two kinds of technologies important. This involves two kinds of learning: by doing and by using. Reliable integration is essential because it guarantees that these types of learning will interact in a reliable way. Therefore, higher education needs to teach not only problem solving, but also *integration*.

Specificity of Innovation Systems

The mix of innovators and equilibrators in the economy may explain the economic dynamics of a specific innovation system. The successful catching up witnessed first in Japan and later in the Republic of Korea and Taiwan (China) emphasized engineering skills, which were used to absorb international technology through technological learning.

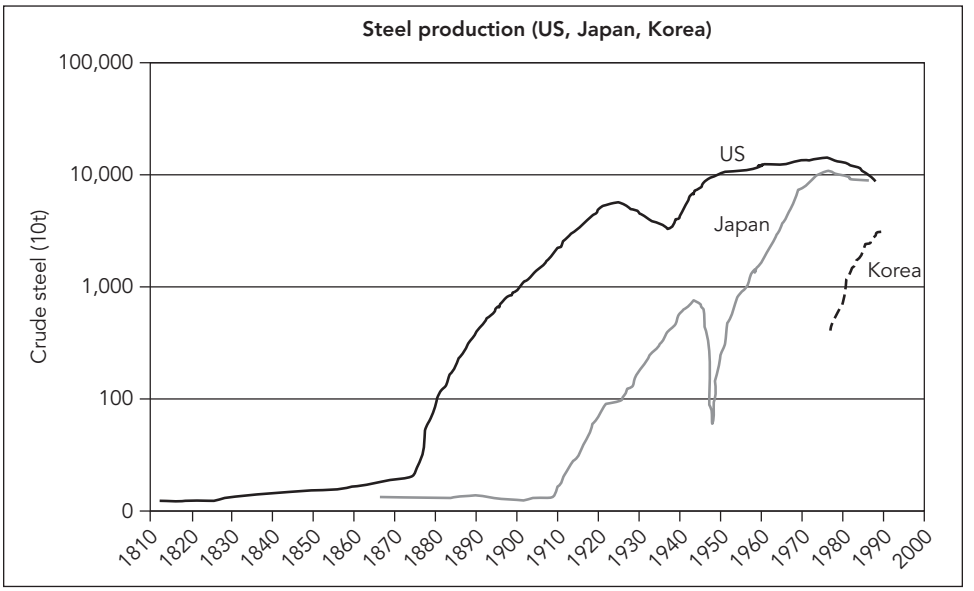
Although the pattern in which one country catches up with another looks similar, the mechanisms are different. As shown in figure 1, the U.S. steel industry caught up with England's industry between 1870 and 1920, Japanese industry caught up during 1920–70, and the Korean industry caught up rapidly in just fifteen years, during 1975–90.

However, the mode of learning differs among them. The United States caught up by learning by doing, while the Japanese did so by learning by using. In order to illustrate the differences, I use the example of blast furnace technologies, which became more sophisticated between 1962 and 1992. In 1962 the system only used four sensors, while in 1992 it used 15 sensors and computer controls, including artificial intelligence techniques, to send the information to be processed.

The Korean steel industry caught up quickly by following a different mode of learning, which I call "learning by integrating" (Kodama 2006). The rapid development of Korea's industry was due to the Korean style of technology importation, the Japanese style of technology development, and the synergy between these two. Kim (1997) compiled comparative data regarding the channels of technology transfer in 1962–93. As shown in table 1, Korea transferred technology by relying heavily on the importation of capital goods, while the Japanese did so by using technology licensing contracts.

Indeed, technological know-how was embodied in Japanese manufacturing equipment and functional components, as a result of the mode of learning employed by technology suppliers: "learning through joint development," as depicted in table 2.

FIGURE 1
Steel Production in the United States, Japan, and Korea, 1920–2000



Source: Sato 1996.

TABLE 1. Channels of Technology Transfer in Korea, 1962–1993

Channel	Amount (US$ billion)	Percent Japanese	Percent United States
Direct investments	11.2	40	30
Technology introduction contracts	7.9	32	48
Purchase of capital goods	278.8	43	26

TABLE 2. Rate of Joint Application for Patents, Nippon Steel Corporation, 1977–93

Process	Overall rate of joint application (A)	Rate of joint application with device makers (B)	B/A
Iron making	17.22	1.73	10.01
Steel making	21.04	6.36	30.23
Metal rolling	18.19	6.85	37.66
Surface processing	15.49	1.86	12.01

However, technology transfer in the form of learning by integrating became possible and was put into action because Korea was able to continue supplying technical personnel suitable for this mode of learning. Those who received basic education and graduated with a degree in science or engineering in Korea went on to study abroad, especially in the United States and other Western countries. They acquired

TABLE 3. Field of Study and Location of Koreans Receiving a Doctorate in a Foreign Country, 1982–98

Field and location	Number
Natural sciences & Engineering	9,132
Humanities and others	7,123
Total of overseas PhDs	16,255
In United States	9,904
In Japan	2,490
In Germany	1,369
In France	835
In United Kingdom	427

Source: Survey conducted by Korea, Ministry of Education.

doctorates in engineering, sought further education, and gained work experience there. Many of them returned home to share in the rapid growth of the Korean economy. The results of a detailed survey by the Korean Ministry of Education on the status of Koreans receiving a foreign Ph.D. in 1982–98 are presented in table 3. These people understood individual components of the technology and had sufficient capacity to realize the learning-by-integrating method, which combines various technologies in a sophisticated manner.

Comment on Feldman and Stewart's Paper

Feldman and Stewart's paper sought to provide a solid overview of the recent literature and thought pertaining to universities and knowledge transfer. I begin by clarifying terms and then present my arguments that Japan's experiences with technology transfer differ slightly from the standard theories developed based on the experiences of Western scientific and industrial communities.

Clarifying Terms

In clarifying the term *technology transfer*, Feldman and Stewart did not cite the very early work of Harvey Brooks of Harvard University, who states that technology transfer occurs whenever systematic, rational knowledge developed by one group or institution is embodied in ways of doing things by other groups or institutions (Brooks 1966). This definition implies a distinct relocation of knowledge between autonomous entities, requiring the existence of both a supplier and a receiver of new technology. It further implies that relocation is successful, or effective, only when the transfer is complete and adds value to a receiver's competencies. This definition is relevant to the Japanese experience. I have argued that technology transfer is most successful when it is applied within a receiver-active paradigm, in which receivers engage aggressively in the transfer process (Morin and Kodama 1993). This perspective is reinforced by research substantiating links between successful

innovation and early involvement of lead users in product development projects (von Hippel 1988).

Knowledge Transfer Mechanisms

The importance of technology transfer varies considerably among industry sectors; university-industry partnerships generally are more important in sectors where science plays a major role, as is the case in the fields of biotechnology and information technology. Although these statements are reasonably sound, there are major differences between biotechnology and information technology. Using the Japanese Patent Database, I have measured the science linkages (number of scientific papers cited per patent) for different fields of technology (Tamada 2002). Based on these measurements, it is possible to argue that the importance of science or universities differs in different industrial sectors and that it is important to be cautious about generalizing the growing importance of university science for every sector of industrial development. I have examined the entire text of the sample patents (300 patents in each of four areas) and counted the number of academic papers cited. The results show that biotechnology patents have the largest number of citations, followed by those in nanotechnology, information technology, and environmental areas, in that order.

As seen in table 4, the science linkage indexes among different patent classifications differ significantly from one another. The technologies related to biotechnology are by far the closest to science. This suggests that the process of creating new technology in bioindustry differs from the process in other industries, although the informal technology transfer between universities and the private sector in Japan is thought to be more efficient than the formal one in many technology-based industries. However, in science-based industry, problems exist, such as de facto the giving of preferential treatment to large firms, disincentive for further development as a result of unclear intellectual property rights, and so on (Kneller 2003). Although informal communication will retain its important role in the future, the Japanese innovation system should be modified keeping this in mind.

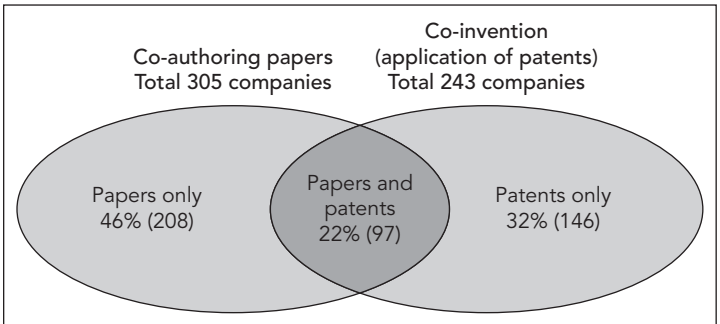
Universities Not Sufficient for Economic Development

By asking why knowledge transfer does not work, Feldman and Stewart conclude that universities are not sufficient for economic development. However, it is important to analyze why universities are not sufficient. Over the past 10 years, we have

TABLE 4. Science Linkage by Technical Area (Sampled from Japanese Patents)

	Cited papers		Cited patents	
Technical area	**Total**	**Per patent**	**Total**	**Per patent**
Random sample	179	0.60	1,749	5.83
Biotechnology	3,439	11.46	1,102	3.67
Nano technology	597	1.99	2,125	7.08
Information technology	95	0.32	927	3.09
Environment	77	0.26	1,193	3.98

FIGURE 2
Collaboration between Professors and Companies[a]



a. The unit of analysis is the company (total 451).

collected data on papers and patents published by engineering professors at the University of Tokyo and have compared those data with the corresponding data on professors from the Massachusetts Institute of Technology (MIT; Suzuki and others 2004). The number of papers written increased both at the University of Tokyo and at MIT. The number of patents, however, did not change. The number of papers per professor at the University of Tokyo is equivalent to the number at MIT, in spite of the fact that the database only includes papers written in English, which obviously favors the MIT professors. However, in Japan, the majority of patents are registered by private companies, with university professors coauthoring key papers and corporate researchers appearing as co-inventors. Therefore, I investigated how professors and companies collaborate with one another. The results are shown in figure 2. Nearly 46 percent of collaborations are with coauthorship, with 32 percent of these being for patent applications and 22 percent being for both coauthorship and patent. In the case of MIT professors, only 3 percent of collaborations are for both coauthorship and patents.

The complementary relation between coauthorship and co-patenting indicates how the receiver-active paradigm works and gives good evidence of the proactive attitude of Japanese firms receiving technology transfer. The process of technology transfer is initiated through coauthorship, and the two parties can share a common understanding of how scientific discoveries are to be transformed into useful technologies. Only after this mutual understanding has been reached can they apply for a patent. In other words, without joint collaboration in research, companies cannot be *proactive* in understanding and receiving university research.

Lack of Absorptive Capacity

Feldman and Stewart's third proposition is that knowledge transfer does not work because absorptive capacity is lacking in the local area. This proposition is not limited to the local area, but absorptive capacity is critical for proactive technology

transfer from universities. A case study of TOTO, a Japanese manufacturer of sanitary products, provides us with an excellent example of how the ability to absorb new sciences can regenerate a company's main business. TOTO sought to commercialize a toilet system in which organic compounds are decomposed biochemically, a technique that relies on the photocatalytic properties of titanium dioxide discovered by researchers at the University of Tokyo. This development relied on scientific findings published in three separate papers in *Nature* magazine (Fujishima and Honda 1972; Kawai and Sakata 1980; Wang and others 1997). More interesting, the paper by Wang and others (1997) was coauthored with TOTO researchers who had discovered that titanium dioxide is also superhydrophilic (water attracting). This case study underscores the importance of adopting proactive strategies in establishing university-industry linkages:

- A testing platform should be provided early enough to grasp the opportunity to use scientific discoveries that will come later.
- The scientific discovery is often thought to be for purposes that are far different from those that finally turn out to be effective. Several scientists can be involved in each area of application, and the mobility of scientists can play a crucial role.
- The university-industry linkages can be reciprocal and are not necessarily a one-way street from the university to the industrial firm.

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Comment on "Higher Education, Innovation, and Economic Development" by Bengt-Åke Lundvall and on "Wellsprings of Modern Economic Growth: Higher Education, Innovation, and Local Economic Development" by Maryann P. Feldman and Ian I. Stewart

SHAHID YUSUF

As competition in global markets becomes more fierce, firms from middle- and upper-income countries are having to make hard choices. They are being forced to move out of some labor-intensive "commodified" manufactures where they compete mainly on the basis of prices and place their bets on products and services for which nonprice factors, such as technology, design, or innovation, are the keys to competitiveness. To make this transition, firms are having to develop or deepen their capabilities, to harness new technologies, and to innovate without easing up on the effort to contain costs. Success depends on the actions of the firms themselves: the strategies they adopt, the incentives they offer to employees, and the way in which they manage their human resources. Success also rests on government policies and on other institutions, which, in conjunction with firms, contribute to the effectiveness of the national innovation system.

The papers by Lundvall and by Feldman and Stewart discuss and provide insights into the process through which knowledge is enhanced within universities and firms and on how firms go about using their knowledge for commercial purposes. The two papers present a wealth of observations and findings drawn from recent research on the United States and Europe. I will comment on some of these, indicating areas of agreement and raising questions where I have doubts.

The two papers focus on conditions in the advanced Western countries and, although Lundvall's paper does attempt to address countries at an early stage of development, he is less successful in showing how his views on the learning economy resonate with the East Asian experience. As Professor Lundvall observes, educated workers are both "innovators" and "equilibrators," they both push the knowledge frontier outward and are instrumental in incorporating available

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Annual World Bank Conference on Development Economics 2008, Regional

knowledge into production practices. However, he then notes that the contribution of educated workers is greater when technological change is occurring and they can capitalize on this change, as happened, for instance, with the green revolution in South Asia during the 1960s. When technology is stagnant, educated workers contribute little, if at all. This proposition was validated to a degree by the research on Indian agriculture conducted by Foster and Rosenzweig (1996), which showed that rates of return on schooling were greatest in those areas of India where productivity grew more because of technological advances. Although educated workers had a substantial role in assimilating and adapting the new crop varieties introduced in the 1960s, I wonder whether Lundvall's proposition is broadly applicable to countries in the catch-up phase of development. In this stage, the economy is at an interior point in the production set, and there are numerous unexploited technological opportunities for educated individuals. Moreover, if the educated are the innovators, then an increase in the supply of trained workers should, in principle, trigger the process of technological assimilation and incremental advance. In other words, exogenously given technological change is not necessary to generate a high return on education; the educated can endogenously initiate technical progress. If technology stagnates in "late-starting economies," it may have very little to do with the availability of skills or the paucity of opportunities or the state of the national innovation system. Macro policy or sociopolitical factors may be holding the country back. In the face of these, increasing the supply of innovators or equilibrators need not lead to any significant acceleration of innovation (which has been a source of concern for policy makers in Singapore) or technology-induced growth. More likely, in a stagnating economy, the most enterprising innovators will emigrate, and the lack of suitable opportunities or prolonged unemployment will erode the skills and render obsolete the knowledge of many who remain.

Lundvall underlines the importance of introducing tertiary-level skills into small and medium-size firms, a point that is echoed by Feldman and Stewart, and there may well be some merit to doing so. However, in the advanced countries, small and medium-size firms in certain industries are among the more innovative (although large firms spend more on research and development, are serial innovators, and hold the largest number of patents), and, as Feldman and Stewart note, 60 percent of university licenses in the United States are issued to small firms. In fact, the entry of firms in industries such as biotechnology, software, electronics, and information technology is an important conduit for introducing new products and services. The German Mittelstand are mostly medium-size, family-owned firms, as are many engineering firms in Switzerland, and these firms tend to be highly innovative in their own narrow niches, both with respect to product and process innovation. These firms have every incentive to seek skills. Other small and medium-size firms in industries such as apparel, leather goods, and food processing can be efficient producers but rarely innovate, and for such firms, hiring university graduates would make little business sense. It also would not promote links with universities because, as Feldman and Stewart note, the early-stage technologies generated by universities are inappropriate for firms of this kind.

Hence, for a category of small and medium-size enterprises in certain industries subject to technological change, employing more graduates could stimulate innovation and internship schemes such as the ones referred to in Feldman and Stewart's paper. In the higher-tech sectors in the United States, small and medium-size firms are frequently owned or run by highly trained individuals, who generally hire more skilled and technical workers, as noted in a recent paper by Berry and Glaeser (2005). But it is an open question as to whether the vast majority of small and medium-size enterprises in traditional low- and medium-technology sectors would benefit from an infusion of graduates, even if financial incentives persuaded college graduates to work in those businesses.

As the importance of innovation has come to be better recognized, policy makers and educators have begun seeking ways to instill creativity in students. There is disenchantment with "traditional teaching modes" and a growing trend noted by Lundvall with "problem-based learning" and the use of information technology to enhance innovative capabilities. The trouble with this view is that East Asia's growth successes over the past decades have been made possible in no small part by the rigor of traditional rote learning. The science and engineering skills of East Asian students as well as their willingness to learn have strongly contributed to the speed of the catch-up. In addition, during the past decade, economies such as Republic of Korea, China, Taiwan (China), and Singapore, for example, and Japan over several decades, have shown themselves to be highly innovative, initially in an incremental sense, but more recently in a much broader way. The generation that is responsible for the flood of patents from East Asia (especially from Japan, Korea, Taiwan [China], and now China) and for innovations in products, processes, and designs was schooled in a traditional manner. Once given the incentives to innovate in an open system, this generation has responded to an extent that compares very favorably with the level of innovation in Europe and the United States. After all, a third of new businesses in Silicon Valley in the United States are being started by first-generation Asians, most of whom were trained in the "traditional schools." Doubtless a number of these individuals gained from a dose of "problem-oriented" education in graduate schools in the United States, but their educational foundations and technical skills are rooted in Asian systems of teaching, which are frequently criticized for stifling creativity. Perhaps the mode of schooling has little bearing on eventual innovativeness and cognitive skills, and, instead, it is the home environment, quality of teaching, and motivation of students that are decisive (Hanushek and Woessmann 2007; Yusuf and others 2003).

While there is a case for reforming higher education in East Asian countries, for example, and most countries are engaged in some kind of reform, European countries—and the United States—also are dissatisfied with their higher education systems and are struggling to find a way forward. It is not apparent that there are any really good models that low- and middle-income countries at a catch-up phase can adopt without many modifications (for example, how to raise teacher quality or effectively use information technology).

The American land grant university suggested by Lundvall, which catered to the needs of rural communities for skills, research inputs, and extension services, is a

model that might be appropriate in certain circumstances. But it may not suit the needs of middle-income countries for workers who are able to assimilate the latest technologies in manufacturing and producer services, let alone innovate. For most of the late-starting countries, the future lies more in industry (possibly agro-industry also) and urban services, than in agriculture. Rural-based universities and colleges in developing countries have great difficulty attracting high-quality staff and students, most of whom make their way to institutions in the major cities. Although the system may well be inegalitarian, the elite urban institutions in the style of the Massachusetts Institute of Technology are the institutions that produce the innovators and the equilibrators who are responsible for the technological progress achieved by the leading Asian economies. Whether we take China or India or Korea, it is the elite universities that are supporting the development and diversification of the economy, predominantly through the provision of well-trained workers still largely schooled in the traditional manner.

Looking forward, should learning systems in Asia be reformed along the lines sketched by Lundvall, and should university-industry linkages be tightened, as discussed in the paper by Feldman and Stewart?

Lundvall favors a system that minimizes the inequality of learning opportunities; teaches students to solve problems, communicate, and collaborate better; instills in them pride in their country and civic attributes; and offers them many opportunities for additional vocational training in "discretionary learning environments." This kind of system is aligned with the needs of an advanced economy such as Denmark, which is gravitating mainly toward high-end services and a small technology- and design-intensive manufacturing sector. How such a system could be introduced in low- and middle-income industrializing countries, most of which are a considerable distance from the technological frontier, is not dealt with in the paper. An egalitarian learning environment is attractive, but how is it to be achieved, and absent a substantial improvement in the quality of instruction, curricula, and facilities, would it produce enough students of a high caliber or lead to a "dumbing down"? Has any successful developing country adopted such an objective? Is it desirable for many firms in the Asian context to aim for a discretionary learning environment, and how would they go about doing so? A Samsung or a Huawei could try and create such an environment in a part of the firm dealing with research and development, but for the whole firm to become a learning organization is harder to perceive, especially when the majority of Asian firms have yet to evolve organizational structures resembling those in some of the advanced industrial nations.

Feldman and Stewart examine the utility of university research, which can then be commercialized through patenting and licensing with the intermediation of technology transfer offices (TTOs). Such university-industry links are receiving increased attention in the United States, Europe, and parts of Asia, as policy makers come to see future growth becoming tied more closely to technological progress and universities actively seek additional sources of earnings. The experience to date is quite mixed.

Technology links between firms in certain industries and universities have flourished in the United States because of the structure of U.S. education, as Feldman and

Stewart point out. U.S. companies make use of university-based research, particularly in fields such as pharmaceuticals and biotechnology, but also in others. A few universities derive a handsome income from the licensing of technology and are engaged in active collaboration with mature firms and start-ups, some by their own graduates and faculty. But even in the United States, few TTOs cover their costs, and the aggressive efforts of universities to protect their intellectual property and seek royalties are giving rise to tensions with the business community (Mowery 2007). In Europe such linkages are sparse. Universities rank low as sources of technological knowledge, and firms mainly see them as suppliers of trained workers (Hughes 2007). In Japan firms have multiple informal links with university professors in leading universities and sometimes send their staff to work in university labs (Kodama and Suzuki 2007); however, U.S.-style technology links are far fewer. Under the circumstances and given the various stages at which late-starting countries find themselves, what are the lessons from advanced countries?

Feldman and Stewart do not comment on the utility of U.S. experience for industrializing countries or on how the experience with TTOs or intellectual property or science parks might be translated into policy guidelines. They limit themselves to a few observations:

- Universities should do a better job of preparing students for industry, and programs for internship with firms would be helpful. This echoes a point also made by Lundvall.
- Proactive firms, which are conducting their own research and development and know what kind of research findings would be most useful, are in the best position to locate, absorb, and develop university research.
- Most technology coming out of universities is at an early stage, which makes it difficult to start new firms and also lessens its attraction for existing firms.

In summing up, let me say that both papers highlight the role of universities in equipping students for the knowledge economy and indicate that this is likely to remain their principal function. That they could do a much better job with increased investment of resources in more effective and egalitarian training systems is certainly possible, but neither paper offers clues as to how this might be done. Although Asian economies have sound reasons for being dissatisfied with their universities, it is not obvious how they can incorporate a few strengths of the U.S. and Nordic systems.

What individual countries do should depend on their education, culture, and stage of development and be guided by a clear sense of feasible longer-term objectives as well as the availability of sufficient funding. A Nordic system may be inappropriate for a low-income country on the first rung of the technology ladder.

Firms rather than universities have largely determined the pace and volume of innovation, and this is likely to persist. It is their pursuit of technological change and efforts to innovate that will affect the demand for training workers and, although the feedback loops are often weak, the kind of training that universities provide. It is, moreover, the demand for technology from firms that will exert the bigger influence on the emergence of links between universities and the business sector, not how

aggressively universities sell themselves, although research and its marketing by universities certainly can help.

Universities are the handmaidens of technological change in high-income economies as well as low-income ones, but firms lead the way, with help from government policy and market institutions. Research by firms, the demand for technology from firms, and their focus on innovation are the drivers of the knowledge economy. How to make firms innovative is the priority. Policy makers can provide some of the inputs, universities can supply the innovators and equilibrators, but firms have to devise the strategies, the organization, and the incentives to make the best use of these.

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Higher Education and Labor Markets in Asia

Higher Education and the Labor Market in India

PAWAN AGARWAL

Countries around the world face a serious problem of growing unemployment, particularly among the youth, and rising wage inequality between skilled and low-skilled or unskilled workers. Skills-biased technological changes and increased cross-border trade raise the vulnerability of low-skilled workers. For this reason, many countries are focusing on education and training as a central element of their development strategy. Although primary and secondary education is obviously very important, the quality and size of the higher education system are what ultimately will differentiate a dynamic economy from a marginalized one. It is felt that decent jobs in the future will require some kind of higher education qualifications. This makes a case for expanding higher education to reach a larger number of people across the world.

More and better higher education has become a gospel, an article of faith, for most countries. With rising enrollment, unemployment and underemployment of graduates are growing across a wide range of countries. There are concerns that higher education is not equipping students with the skills and competencies required in the labor market. As a result, mounting shortages of skills coexist with rising graduate unemployment and underemployment. This concerns employers, education policy makers, and students alike. This phenomenon is not unique to India; however, given the numbers involved and the high-growth path on which India is engaged, it takes a particularly acute form here. Another aspect is more specific to India: by skipping the manufacturing stage and going straight to the services sector stage, India has upset the conventional path to growth, taking the supply of graduates by surprise.

This paper discusses the paradox of skill shortages and graduate unemployment and underemployment in the context of India's nontraditional pattern of development. The paper is based on recently released census data and analyzes the linkages between higher education and labor markets in the context of recent developments. The paper is organized as follows. The next section reviews the higher education and

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Annual World Bank Conference on Development Economics 2008, Regional

training sector in India and brings out its key features; this is followed by a section analyzing the labor market, its structure, and employment trends, particularly for graduates; a section examining employment prospects and skill shortages; and a section analyzing the issue of aligning higher education to labor markets. A final section summarizes the main findings and provides a conclusion.

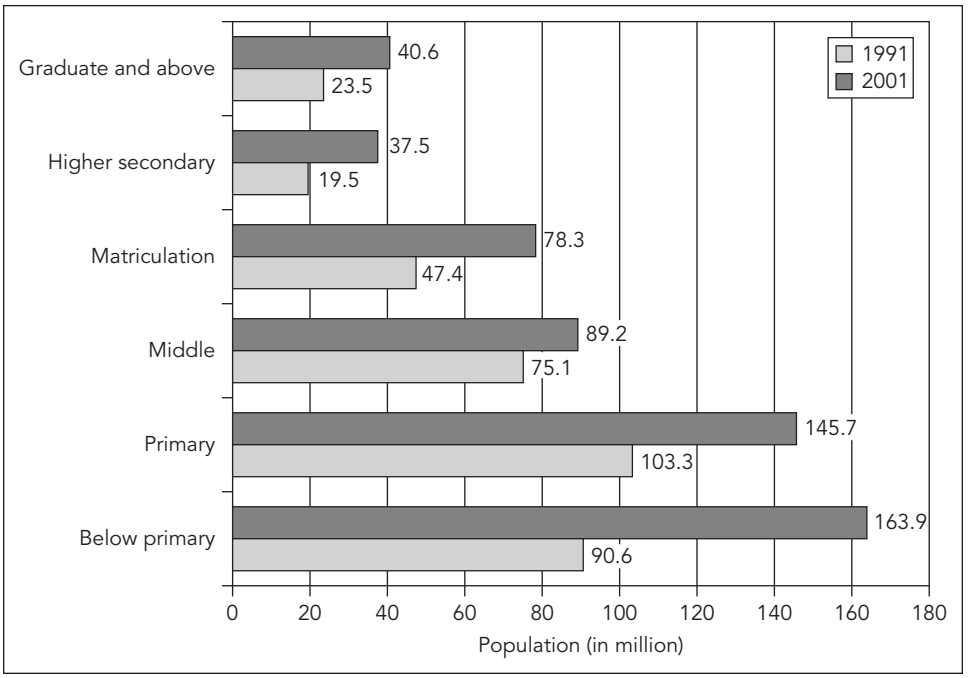
Higher Education and Training

In India, illiteracy levels are high. According to the 2001 census, 45.2 percent of Indians are illiterate. The proportion of educated persons has increased over time for males and females both in rural and urban areas. Among the literate population, only 6.7 percent are college graduates and a mere 0.7 percent have a technical diploma or certificate. The stock of graduates has increased both in absolute numbers and in percentage terms, but the increase has been rather slow. The total number of graduates—at about 40 million in 2001—is large and steadily increasing.

The country has a large English-speaking population. Although English is the mother tongue of just about 200,000 people, more than 90 million people know English as an additional language.

Figure 1 shows that, in absolute terms, population at all education levels grew between 1991 and 2001. In percentage terms, however, this increase occurred mainly

FIGURE 1
Population in India, by Level of Education, 1991 and 2001



Source: Ministry of Home Affairs (1991, 2001).

TABLE 1. Capacity in Higher Education in India, 1950–2007

Indicator	1950–51	1990–91	2003–04	2006–07
University-level institutions	25	177	320	371
Colleges	700	7,346	16,885	18,064
Teachers (thousands)	15	272	457	488
Students enrolled (millions)	0.1	4.9	9.95	11.2

Source: University Grants Commission.

at the higher levels of education, because a large number of people with primary education go on to secondary education, those with secondary education go on to higher secondary education, and so on.

Growth Pattern

India's university system has grown impressively since independence in 1947 (see table 1). Overall, the number of universities grew from 25 in 1950 to 371 in 2006, and the number of colleges grew from 700 to 18,064. Enrollment increased from a tiny base of 0.1 million to a whopping 11.2 million.

Over the past 60 years, while the country's population increased threefold, higher education enrollment rose 105 times. Possession of some kind of higher education has become a passport to a decent job. A college degree or certificate has become a norm for the middle class. There is huge unmet demand, including high demand for professional programs and intense competition for limited seats in reputable institutions. Demand is being met by the private sector and institutions in other countries, as a large number of students go abroad for studies. More than 150,000 students went aboard for higher education in 2004–05 (Agarwal 2006b).

There have been two distinct phases of growth. In phase 1, from 1947 to 1980, growth was steady. A large number of colleges were established, some affiliated with existing universities and some new. The government set up universities and colleges at places that did not have higher education facilities. Courses in new and underrepresented subject areas were created. This resulted in geographic dispersal of higher education facilities and broadened the base of higher education. In phase II, starting in 1980 and continuing to the present, expansion has been driven largely by private initiatives.

By the 1980s, improvements in the quality of school education, the need for a larger pool of people with the skills sought by India's changing economy, and the growing aspirations of individuals had resulted in a huge gap between supply and demand in higher education. Income levels had risen, and a larger proportion of people in the middle- and higher-income groups could now afford unsubsidized higher education. As a result, private higher education has grown rapidly and in a different direction than the private initiatives prior to independence.

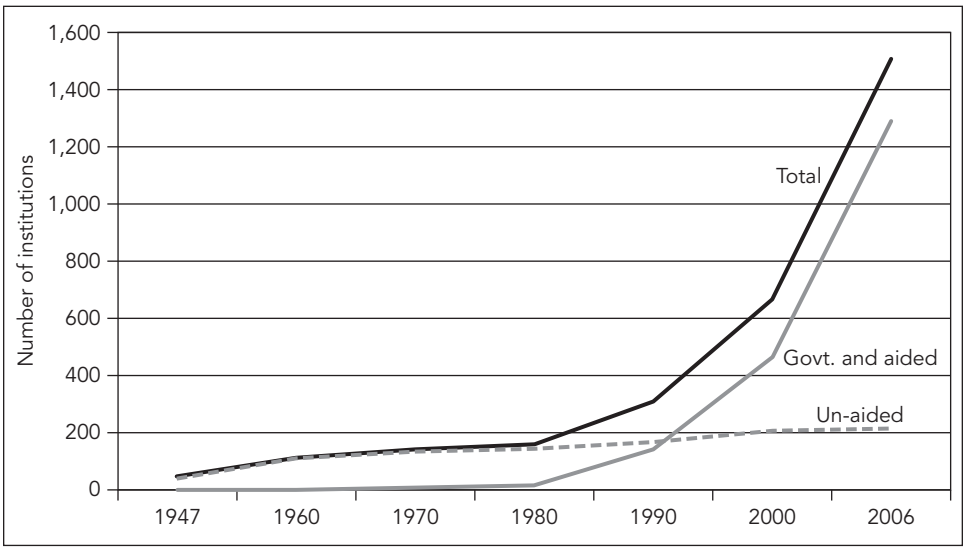
The new breed of private institutions is mostly de facto for profit. Now private higher education is seen more as a business. Entrepreneurs, businessmen, and politicians set up institutions, which earned income mostly from tuition fees. These institutions are often costlier than government institutions and are different from the small number of private institutions dating back to the era before independence.

At the same time, the number of institutions and the size of enrollment have stagnated in government as well as private aided institutions, while they have grown rapidly in the private unaided sector. This private growth is of recent origin. Currently, 43 percent of the number of institutions and 30 percent of enrollment are in private unaided institutions. Many of these institutions offer programs in professional courses of study. Private higher education is the most dynamic and growing sector of Indian higher education today, but it is often viewed with suspicion. While the actions of certain private operators are to blame for some of this suspicion, another factor is that the private higher education sector has developed largely in a policy vacuum, in which the judiciary intervenes routinely to resolve inconsistencies in existing legislation. This creates a climate of uncertainty affecting, among others, foreign private education and foreign investment (Agarwal 2007b).

The trend toward private professional institutions started in the southern and western regions of India. In the early 1980, the states of Karnataka, Maharashtra, Tamil Nadu, and Andhra Pradesh took a bold decision to permit private registered societies and trusts to establish and run professional institutions on a self-financing basis. As a result, a large number of private unaided colleges were created. The first institutions offered degree programs in engineering, followed by programs in architecture, pharmacy, management, hotel management, computer applications, medicine, nursing, dentistry, physiotherapy, and teacher education. This spread to other states over time.

Figure 2 shows the growth of degree-level engineering institutions. Private professional education has grown even more rapidly over the past five years across a range

FIGURE 2
Growth of Degree-Level Engineering Institutions in India, 1947–2006
number of institutions



Source: Compiled by the author based on data from the All India Council for Technical Education.

of disciplines. In the case of engineering, pharmacy, dentistry, and physiotherapy, growth has been high, and private institutions constitute as much as 90 percent of the total number of institutions. A few programs, like computer applications, management, and teacher education, grew in both the public and private sector. In the public sector, these were started as self-financing courses. In disciplines like architecture and hotel management, growth has been moderate.

Despite the growth of professional education, a large part of higher education is neither job oriented nor research oriented. Acquiring a degree or several of them is an end in itself. Higher education expansion was confined to undergraduate programs in the arts, sciences, and commerce in the prevailing tradition of liberal education, with hardly any connection to the economic and social requirements of society. The notable exception was the setting up of the Indian institutes of technology (IITs) and regional engineering colleges (later renamed national institutes of technology) for engineering education and the Indian institutes of management (IIMs) for management education.

IITs and IIMs were set up with the help of visiting scholars from advanced countries. These institutions introduced a whole new academic culture. Unfortunately, that culture remained confined to them, while the academic standards continued to deteriorate in the rest of the system. Although the number of elite institutions and the number of students enrolled in them have grown, these institutions enroll only a tiny fraction of students. Institutions at the top of the hierarchy are extremely selective in admissions. Several hundred thousand students undergo intense preparations to pass the high-stake tests for admission. Coaching classes have mushroomed, spurring competition and self-directed learning, which has helped to improve the base of knowledge of a large pool of students.

Size and Structure

The higher education and training sector consists of a large university sector and a large, complex nonuniversity sector. It involves both public and private institutions and formal and nonformal activities. The distinction between education and training is often blurred.

The university system has around 18,500 institutions. However, only 371 of them are universities, and the rest are affiliated colleges. Universities award degrees in India, while colleges award the degrees of the university to which they are affiliated. An affiliating university usually has a defined territorial jurisdiction and affiliates all colleges in its jurisdiction. All such colleges are under its academic control and supervision. Enrolling about 90 percent of students at the undergraduate level and 66 percent at the postgraduate level, affiliated colleges form the bulk of the higher education system. This system of affiliating colleges gives structural rigidity and is considered a bane on Indian higher education.

The country's system of higher education is highly fragmented. The average size of an institution is small.[1] Many institutions are not viable, being understaffed and ill equipped; two-thirds do not even satisfy the minimum norms of the University Grants Commission (UGC), the apex regulatory body for higher education in India.

TABLE 2. Stock, Enrollment, and Outturn of College Graduates and Above in India, 2005
thousands

Education level and subject	Enrollment, 2004–05	Outturn, 2004–05	Stock of students	
			2001	2005
Graduate level and above	10,430	2,654	37,670	51,140
General stream				
Number	8,556	2,095	30,015	40,490
Percent	82.04	78.94	79.7	79.1
Graduate other than a technical degree[a]	7,886	1,760	24,065	32,865
Postgraduate degree other than a technical degree	770	335	5,950	7,625
Professional stream				
Number	1,744	559	7,655	10,650
Percent	17.96	21.06	20.3	20.9
Management	100	50	800	1,050
Law	319	150	1,800	2,550
Engineering and technology	754	160	2,588	3,388
Medicine	330	60	769	1,069
Agriculture, dairying, and veterinary	77	20	127	227
Teaching	154	154	1,548	2,318
Others	10	5	23	48

Source: Enrollment for 2004–05 is from University Grants Commission (2005), the stock of students for 2001 is from Ministry of Home Affairs (2001), and stock (2005) and outturn (2004–05) are estimated by the author.

a. B.A., B.Sc., and B. Com.

The current gross enrollment rate in higher education is around 11 percent. Although low in comparison with that in other developing countries, it matches the occupational pattern of the country.[2] Total enrollment is 10.4 million, with an annual outturn of 2.65 million. As noted in table 2, nearly one-third of undergraduates go on for a postgraduate program or a second-degree program. The total stock of graduates in India is around 51.14 million.

The distribution of capacity across subject areas and at different levels is uneven. The majority of enrollment is at the undergraduate level, with 89 percent of all students enrolled in undergraduate programs and only 9.4 percent enrolled in postgraduate programs. Enrollment in doctoral programs is less than 1 percent. Of total enrollment, 45 percent of the students are in the arts, 20.4 percent are in science, and 18 percent are in commerce. The remaining 17 percent of students are enrolled in professional programs.

Enrollment in professional streams has been growing quickly, but the gap between supply and demand is huge, and graduates from the general stream will continue to form the bulk of graduates for years to come. As shown in table 2, four-fifths of the country's graduates are from the general stream. In absolute terms, their numbers will continue to expand rapidly, and providing employment to such graduates, who have little or no occupational focus, will continue to be a major challenge.

Funding and Governance

The government spends around 0.66 percent of the gross national product on higher education. This is about 18 percent of public expenditures on education at all levels. This percentage has remained stable, despite the growth in higher education. As a result, expenditure per student has declined, seriously affecting the quality of education. Of the total government support, only about one-fourth comes from the central government, and the balance comes from state governments. With most states facing budget constraints, there is a funding crisis in higher education.

Public funding is also skewed. Nearly one-third of the institutions do not receive government funds at all. Of the remaining, only about half receive funding from the central government. A small number of institutions that cater to less than 2 percent of the students receive 85 percent of central government funds; the rest receive an insignificant amount of central government funding. Fund allocation mechanisms are archaic, which promotes neither efficiency nor quality and instead perpetuates the status quo.

As enrollment has expanded, financing has shifted gradually from taxpayers to students and their parents. A study on the financing of 39 universities found that six were recovering as much as 50 percent of their recurring costs from fee income and another thirteen were generating 20 percent of the financing for their recurring costs. A recent study of more than 100 universities showed that, with a few exceptions, such as the central universities and state universities in Bihar and Uttar Pradesh, most of the institutions have raised their tuition fees in recent years (Tilak and Rani 2002). They internally generate a significant part of their revenue. Apart from higher tuition, self-financing courses and self-financing institutions have been set up.

In all, there is a significant amount of private spending on higher education and scope for more. Private spending is estimated to constitute as much as 50 percent of total expenditures on higher education (Agarwal 2006a). Most of the new universities and colleges are financially independent. This has made higher education increasingly expensive and beyond the reach of the poor, exacerbating inequity in access to higher education. Despite government's consistent support for equity and access over quality and excellence, financial aid to poor students is almost nonexistent.

There is a duality of control over universities and colleges. While the central government is expected to coordinate and determine standards through a plethora of organizations, a large part of the higher education system is owned and financed by the state governments. The colleges are under the academic control of their respective affiliating universities. Despite an elaborate system of regulation, provision continues to be substandard. There are gaps and overlaps. Regulatory arrangements lack transparency and are not predictable. These have not kept pace with the changes and are now obsolete; they do not address the challenges posed by new types of providers and new forms of delivery. Several judicial interventions over the past two decades and knee-jerk reactions of the government to them have added further confusion. On the whole, Indian higher education is overregulated and undergoverned.

The quality of higher education is extremely heterogeneous. There are a small number of high-quality institutions and a large base of institutions of indifferent

quality. The accreditation system is new. It is voluntary, with few benefits and limited coverage. Only about 15 percent of institutions have been accredited so far. Very few of them are private institutions. It is impossible for the country's three accreditation agencies periodically to accredit all institutions and programs in the country. As a result, accreditation has had a limited impact on academic standards.

The Nonuniversity Sector

There is a large vocational education and training sector outside the university sector. This comprises institutions imparting supervisory-level (diploma-level) training (1,200 institutions with around 300,000 seats), training for craftsmen (5,114 institutions with 773,000 seats), and apprenticeship training (158,000 apprentices in 254 industries in the formal sector). Over the past two decades, a major part of this capacity has been created through private initiatives. In the informal sector, there are several government initiatives and a large and dynamic private training sector catering to between 0.8 million and 1.0 million students. Vocational training is also provided to nearly 0.4 million students at the higher secondary level in the schools. Overall, training capacity is around 2.5 million seats. Although large in absolute terms, it is grossly inadequate.

The vocational education and training sector is independent from the university sector. It has no pathway to the formal system of higher education. It suffers from an image problem. Rather than aptitude, it is the academic performance that segregates those who opt for higher education from those who are forced into vocational education. In addition to limited capacity, the quality and relevance of vocational education are major bottlenecks.

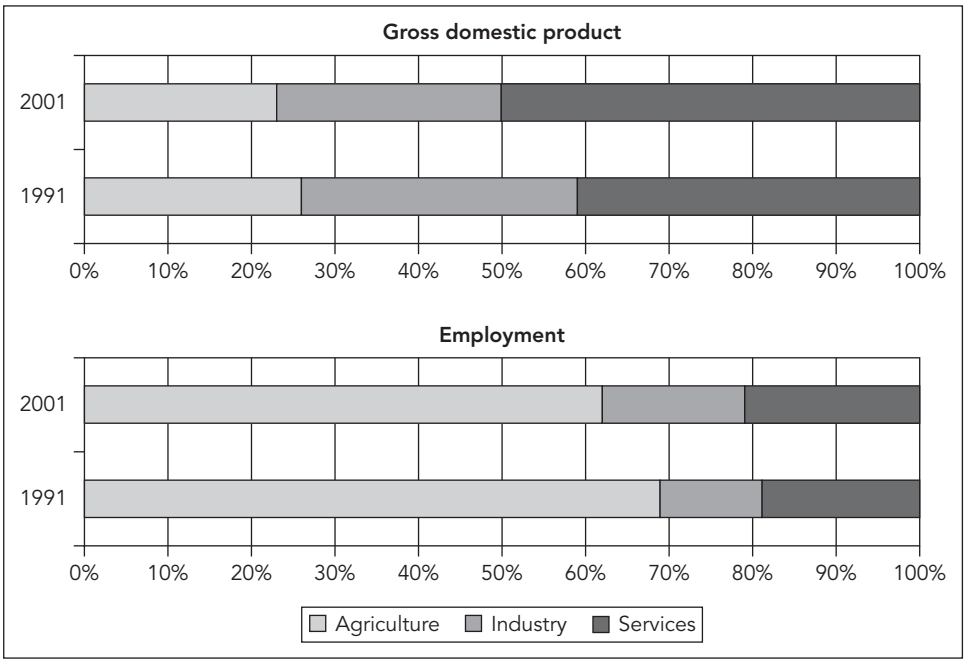
The private provision of training is increasingly popular. Many students pursue training courses along with their degree program, which enhances their employability. Students and their parents finance such training courses. Such courses respond in more direct and usually more effective ways to the needs of industry and the labor market. With the gap between training and education getting narrower, the traditional monopoly that universities have enjoyed in providing training and granting credentials has been eroding.

Employment Patterns

The majority of India's workforce is engaged in agriculture and allied activities and has low productivity levels. Many nonagricultural activities have low productivity and low wages. About 90 percent of the workforce is in the informal sector and must endure poor working conditions. Despite changes in economic structure, the employment pattern has remained broadly the same over the years.

The 2001 census recorded 402 million workers and 626 million nonworkers (Ministry of Home Affairs 2001).[3] Of the workers, 313 million are full-time workers and 89 million are part-time workers. Of the total number of workers, 127 million are farmers, and 106 million are agricultural laborers.

FIGURE 3
Share of GDP and Employment in India, by Economic Sector



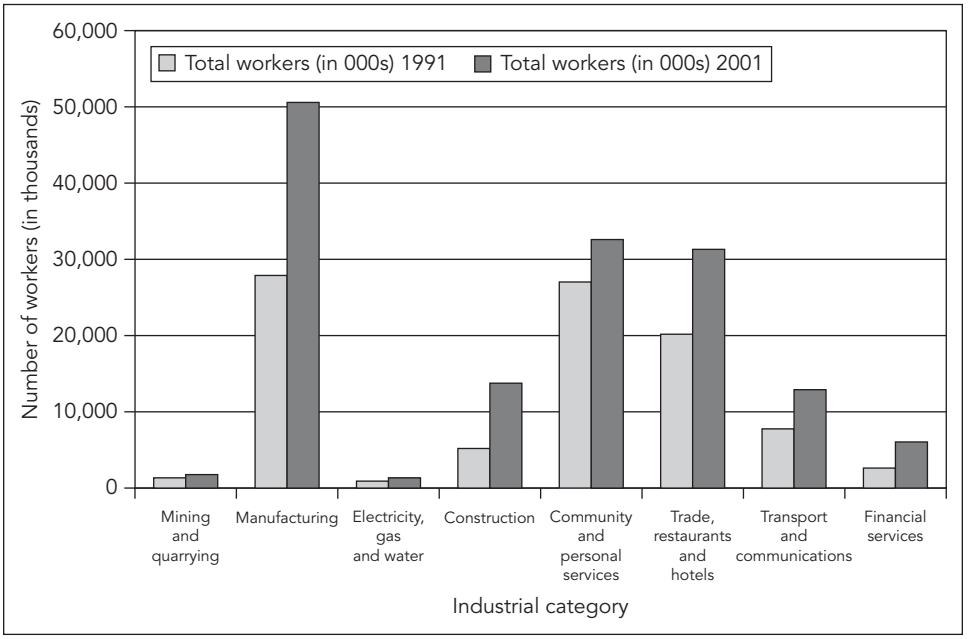
Source: Central Statistical Organisation; Ministry of Home Affairs (2001).

While agriculture contributes a little more than 20 percent of the value added to GDP, its share in employment is 61.6 percent. The services sector contributes almost 50 percent to GDP and employs a little more than 20 percent of the workforce. As seen in figure 3, although the contribution of services to GDP increased by about 10 percentage points between 1991 and 2001, its share of employment increased only marginally.

The decade 1991–2001 saw a marginalization of the agricultural workforce. While there was some decrease in the number of full-time workers in agriculture, there was a significant increase in the number of part-time workers. Growth in the agriculture sector did not keep pace with the growth in the labor force. As seen in figure 4, the nonagricultural sectors (except mining and quarrying) grew in absolute and percentage terms, for both full-time and part-time workers. This suggests a small shift in occupational patterns from agriculture to other sectors of the economy.

As mentioned in the introduction, the Indian economy is following a nontraditional pattern of development. First, in recent years, growth in services has preceded growth in manufacturing, and, within the manufacturing sector, skill-intensive work has grown faster than labor-intensive work. Second, the share of services in employment has grown much slower than its share in GDP. Services that accounted for more than 57 percent of GDP in 2006–07 contributed only about 28 percent of employment. Banga (2005) points out that, within the services sector, communications and business services are growing the fastest, and these sectors absorb less labor than the

FIGURE 4
Total Employment in India, by Industrial Category, 1991 and 2001



Source: Compiled by the author based on Ministry of Home Affairs (2001).

construction and transport sectors. As a result, India has experienced relatively jobless growth.

Many people have raised doubts about the sustainability of this growth. However, based on a detailed analysis, Hansda (2001) concludes that the services sector, with its backward and forward linkages, will induce growth in manufacturing and improve its productivity.

Another key feature of the Indian labor market is its very large informal sector. The informal sector in India comprises small, non-capital-intensive enterprises run by self-employed persons, often with family support or a few temporary hired workers. This also includes casual wage workers, contract laborers, and piece-rate home workers, constituting a large, fluid labor market. It employs 92 percent of the total workforce and contributes a mere 59 percent of GDP. In contrast, the formal sector employs only 7 percent of the workforce and contributes 41 percent of GDP.

Around 30 percent of the informal workforce is in the home-based segment, comprising mostly invisible workers. In the informal sector skills are passed from generation to generation or are acquired through apprenticeship with a master craftsman. According to the 1998 economic census, 94.2 percent of Indian enterprises employ between one and five persons.

Employment in the formal or the organized sector is not only small, but largely in the public sector (70 percent). Due to capital deepening and technology adoption, employment elasticity has been very low in the formal sector, at 0.066, compared with the informal sector, at 0.213 during 1993–94 to 1999–2000. Thus it is unlikely

that the formal sector will become a major employer in the near future. In fact, employment in the public sector has stagnated since 1994.

Under the competitive pressures of globalization, employers have turned to subcontracting, outsourcing, and casualization of work. Although the sixtieth round of the National Sample Survey shows that the share of self-employed workers has grown and the share of part-time workers has declined, the shift is small. The survey shows that the quality of jobs is also an issue: regular jobs are not being created, although the working conditions of the top cohort of self-employed workers matches those of regular workers.

India faces several challenges on the employment front. The country has a huge supply of surplus labor (130 million) in rural India and needs to find jobs for women and youth. The ratio of jobs to population is 50.5, which is worse than that of Brazil, Russia, and China, at 66. Another area of concern is that 93 percent of the workforce is in the informal sector. This is much higher than in Brazil, Russia, and China. Jobs are growing faster in the informal sector than in the formal sector (OECD 2007).

In all, more jobs are being created, but these are not necessarily better jobs. There are signs that employment is accelerating, but the growth in the informal economy is accompanied by a decline in real wages in some subsectors, leading to marginalization. Nevertheless, a recent World Bank report suggests that labor market outcomes in the 1990s were better than commonly perceived. Wages and labor productivity grew faster, and the workforce was deployed more efficiently (World Bank 2006b).

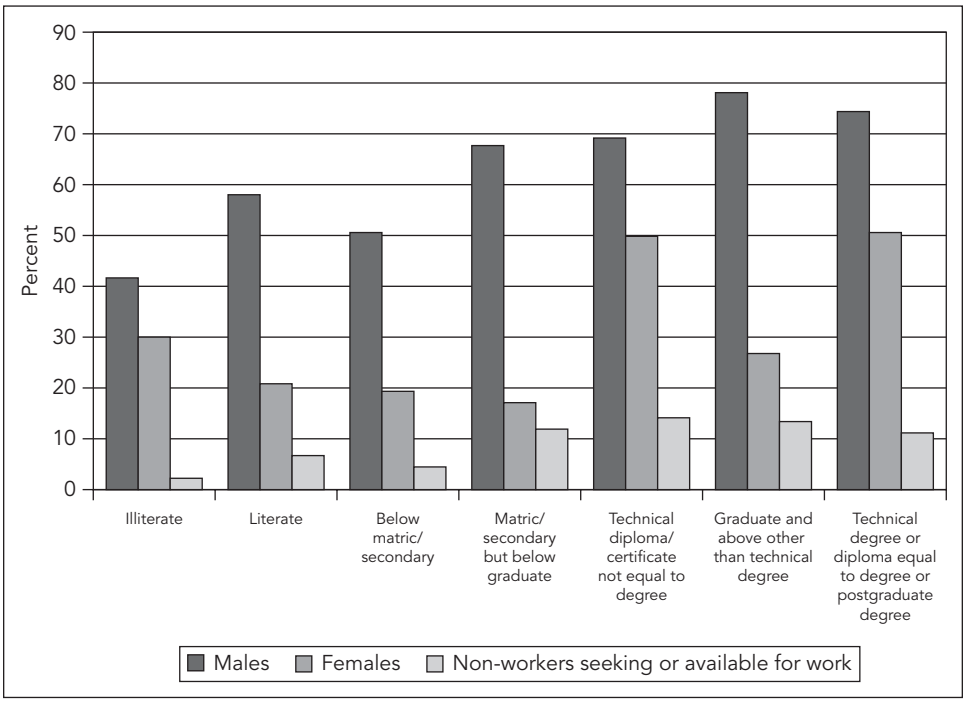
With its atypical pattern of growth and large informal sector, India must find a way to employ a growing unskilled labor force and manage increased wage disparity. In a recent study, Kochhar and others (2006) analyze the challenges and conclude that policies to boost the supply of skilled labor would be essential not only to further consolidate gains but also to attract investment in labor-intensive activities and reduce income gaps. The study suggests that skilled manpower is needed, both for the growing services sector and for the skill-intensive manufacturing sector, which makes a strong case for the need to expand the higher education and training sector.

Education and Skill Profile of the Workforce

India's workforce has low productivity because the level of education and skills is low. Although education enrollments are significant, more than 90 percent in primary classes, around 60 percent in middle classes, more than 30 percent in higher secondary, and about 10 percent in higher education, the percentage of people with marketable skills is woefully low. According to the National Sample Survey on employment and unemployment for 1993–94, only 10.1 percent of male workers and 6.3 percent of female workers possess specific marketable skills. The percentages are marginally higher in urban areas.

A recent survey shows that, out of 260 million people in the 15–29 age group, only about 30 million have received training of any sort, whether formal or informal (NSSO 2006). Only about 2 percent have received formal vocational training, while

FIGURE 5
Labor Force Participation in India, by Education Level, 2001



Source: Ministry of Home Affairs (2001).

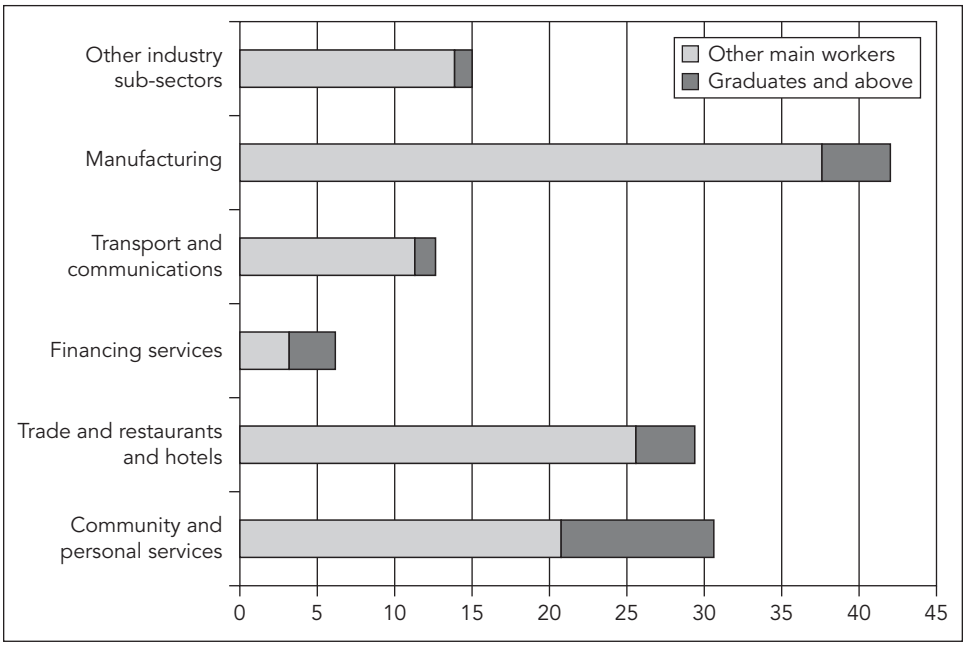
about 3.4 percent have received so-called hereditary training, which is learning the family trade. This mostly includes farming, fishing, and handicrafts. More than 3.8 percent of the surveyed age group have acquired training through other means, such as working with a skilled person in a factory.

The level of vocational skills compares poorly with that in other countries. Only 5 percent of the labor force in the age group 20–24 have received vocational training compared to 96 percent in Republic of Korea and between 60 and 80 percent in industrial countries. India's education system is excessively oriented toward general education, with little or no vocational training.

Figure 5 presents the labor force participation rates by level of education. As expected, participation rates rise with the level of education, although the pool of workers decreases sharply with increasing qualifications. The number of unemployed persons who are seeking work or available for work also rises by level of education. In percentage terms, more graduates and individuals with a technical diploma or certificate are seeking or available for work than individuals without qualifications, although in absolute terms their numbers may be small.

From among the graduates, more than 40 percent work in the community and personal services sector (see figure 6). This includes government, defense, education, and health services. More than 30 percent of the full-time workers in this sector are college graduates. The manufacturing sector employs the second largest number of graduates, but only about 10 percent of the total workforce is in manufacturing. This

FIGURE 6
Total Workers and Workers with a College Degree or Certificate in India, by Sector



Source: Ministry of Home Affairs (2001).

is not surprising, since about 40 percent of them (16.9 million out of 41.6 million) are in household industries and may not require higher education qualifications.

In the financial services sector, which includes insurance, real estate, business services, and scientific and research services, nearly half of the workers are college graduates. The 166 million workers in agriculture and allied activities are either agricultural laborers or subsistence farmers. Most of them do not have a college degree. Even among the other workers in this sector—around 9.7 million—only 3 percent have a college degree.

Employment Trends

Long-term trends provide a grim scenario of the employment situation. This is particularly true for college graduates. Between 1993–94 and 1999–2000, the rate of employment growth has slowed, from 2.1 percent to 1.6 percent a year, and is now below the growth of labor supply, which is around 2 percent a year. Wage inequality has increased, with real wages growing rapidly in the top two deciles between 1983 and 1999–2000 (World Bank 2006a).

In India, women are usually responsible for household activities not classified as economic activities, while men work outside the home. Therefore, male participation rates are roughly comparable to those in other countries, while female participation rates, at about 30 percent, are low and flat or declining over time. In India, as

in other developing countries, particularly in South Asia, women still work as unpaid contributing family workers or low-income workers; they work in the lowest-paying jobs, often in the informal economy, where they have insufficient legal protection (ILO 2007).

With technical change, there is, on the one hand, growth in the demand for analytical and managerial work like that of scientists, engineers, attorneys, executives, and perhaps economists; on the other hand, there is growth in the demand for service workers, such as security guards, truck drivers, housekeepers, waiters, and salespeople. Demand for "middle-skilled" white-collar jobs like secretaries, bookkeepers, insurance adjusters, bank tellers, and telephone receptionists, has collapsed. These changes have resulted in a *polarization of work:* the hollowing out of the distribution of job tasks, as noted by Autor (2006). In India, employment in both manufacturing and services is showing signs of this kind of dualism, with most jobs clustered at the low end of productivity and some growth taking place at the high end of productivity.

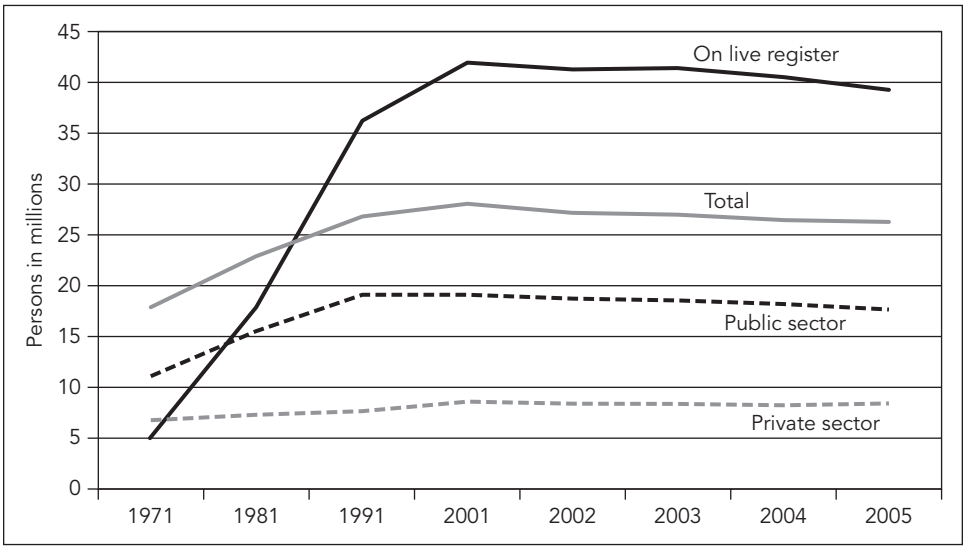
Overall, employment in manufacturing has changed little over the years. A generous depreciation rate for investment in machinery and equipment and rigid labor laws encourage firms to be capital intensive. The manufacturing sector is concentrated in small and large firms, with a missing "middle." International experience shows that this missing middle is the most enterprising and dynamic in generating employment. The 2000–01 Annual Survey of Industries showed that the formal manufacturing sector, which was dominated by large units, employed only 13.85 percent of the manufacturing workforce, while contributing more than three-fourths of manufacturing output.

In the services sector, jobs were created in trade, transport, hotels, and restaurants, with low productivity, and in financial and business services, with middle-level productivity, during the 1990s. After 2000, there was a surge in employment in information technology (IT) and IT-enabled services, creating high-skilled jobs with high productivity.

However, the overall quality of jobs is poor. The estimates of formal sector employment vary widely. The Directorate General of Employment and Training (DGET) collects data on employment in the public sector and in nonagricultural firms employing more than 10 workers. According to these estimates, the sector constitutes merely 7 percent of the total workforce. Other estimates put the figure somewhere between 11 and 14 percent. According to DGET data, presented in figure 7, employment in the formal sector has remained flat or even declined since 1990. While there has been a drop in public sector employment, private sector employment in the formal sector has grown marginally in recent years.

Despite declining job opportunities, a large number of people register themselves with employment exchanges. As on December 31, 2005, around 39.3 million persons were on the live register in 939 employment exchanges and waiting for a job. Around 5 million to 5.5 million job seekers register each year. The number of vacancies registered varies from 220,000 to 420,000, and placement is even lower, at 138,000 in 2004 and 173,000 in 2005. More than 80 percent of job seekers (4.2 million) during 2004–05 were educated, meaning that they had passed at least the tenth grade.

FIGURE 7
Trends in Employment and Live Registration in India, 1971–2005



Source: DGET data.

According to employment exchange statistics for 2006, a large majority of job seekers are educated, first-time workers, or inexperienced and do not possess employable skills. Of these, 56.2 percent have at least a tenth-grade education, 25.9 percent have a twelfth-grade education, and 17.9 percent are college graduates. The proportion of educated job seekers has increased, from 67.5 percent in 1995 to 72.3 percent in 2004. Of these, 72.5 percent are not classified by any occupation, and 70 percent are below the age of 29.

Overall, there is an acute problem of unemployment and underemployment. Based on workers' principal status, the number of unemployed persons in India grew from around 7.78 million in 1983 to 10.6 million in 1999–2000, placing the unemployment rate at around 2.8 percent. This counts only those people who spend more than six months in a given year looking for work. The other approach to measuring unemployment is to use current weekly status, which corresponds to the international definition of unemployment. Based on current *weekly* status, the unemployment rate was about 5 percent in 2004; based on current *daily* status, it was around 9 percent. Underemployment is estimated at 13 percent, on average, for all workers and at 25 percent for part-time workers.

In recent years, the open unemployment rate for India (9.2 percent) is comparable to that in the European Union (9.5 percent) and China (9.8 percent). Like India, there is substantial underemployment in China, which is estimated at 20 percent in 2003. While the countries in East Asia—Vietnam, Malaysia, Thailand, and Korea—have low rates of unemployment, the advanced countries such as Germany and Spain have high rates of unemployment.

According to the sixty-first round of the National Sample Survey conducted between July 2004 and June 2005, the labor force has increased annually at 2.54 percent

TABLE 3. Unemployment and Level of Education in India
percent

Years of education	Rate of unemployment			Distribution of underemployment		
	Male	Female	All	Male	Female	All
0	0.4	0.1	0.3	5.1	3.8	4.8
1–5	1.7	1.3	1.6	15.2	7.7	13.3
6–8	3.7	4.9	3.8	21.5	11.5	19.0
9–10	5.4	15.8	6.5	21.5	23.1	21.9
11–12	7.6	21.1	9.1	15.2	15.4	15.2
More than 12	8.5	27.0	11.3	21.5	38.5	25.8

Source: Reproduced from Ghosh (2004), based on data from NSSO (2000). Unemployed are persons ages fifteen years or more who are unemployed, according to usual principal status.

compared to annual employment growth of 2.48 percent (NSSO 2006). Despite faster employment growth, unemployment was higher at 3.06 percent of the labor force in 2004–05. The share of agricultural employment in total employment declined from 61.7 percent in 1993–94 to 54.19 percent in 2004–05. Construction and services helped to maintain this growth in employment.

In India education and unemployment as well as underemployment are positively related. Unemployment is lowest among individuals who are illiterate, but rises progressively with education, as seen in table 3. Individuals with more than 12 years of education have the highest rate of unemployment and underemployment. Persons with technical qualifications have the highest unemployment rate, suggesting a mismatch between labor market needs and the training provided (Mathur and Marmgain 2004).

The problem of unemployment and underemployment is more acute for college graduates. The unemployment rate of graduates—at 17.2 percent—is significantly higher than the overall rate of unemployment in the country. Nearly 40 percent of graduates are not productively employed. Of the total population of 44.5 million unemployed population, unemployed graduates account for 4.8 million, according to the 2001 census. This number is now estimated at 5.3 million.

Ghose (2004) points out that educated young people do not want to engage in low-productivity, low-income work in the informal sector. They look for white-collar work, preferably in the formal sector. The very fact that they have some education means that their families have some capacity to support them. This aggravates the problem of educated unemployment. Visaria (1998) notes that many of the educated unemployed perform poorly on examinations and have little aptitude or capacity for the type of work to which they aspire. In addition, industry sees many of the unemployed as being unemployable.

A classic study by Blaug (1973) shows that higher education in India expanded despite high levels of unemployment among college graduates, long waiting times for their first job, and first jobs that, when obtained, were not much more than the job of a high-level clerk. According to Blaug, this was due to even higher unemployment of people with a secondary-level education and to low tuition fees in higher

education. Many graduates accept lower-paid jobs that are incompatible with their qualifications.

In all, the country faces a formidable challenge in finding productive employment for the large pool of graduates. High rates of youth unemployment have contributed to a rise in the number of young people who go for a higher education. However, not all of them end up with employable skills.

Employment Prospects

Work participation rates and employment and unemployment data paint a rather grim picture. This is, however, based on past data. In recent years, companies across a range of sectors, such as finance, insurance, real estate, and services, are hiring people. The country is witnessing high GDP growth and an incipient investment boom. The OECD concludes that India outperformed Russia, Brazil, and China in creating jobs during 2000–05, generating 11.3 million net new jobs annually (OECD 2007). Real wages also rose (2.7 percent) during 1995–2000, although India's growth was slower than that of China and Russia.

Under the circumstances, the current employment prospects for college graduates may not reflect their future prospects. Many jobs are being created in the nonagricultural sectors, and the country is witnessing a virtuous cycle of growth. Several companies have ambitious hiring plans. While engineering graduates are getting placements a year ahead of course completion and receiving unprecedented salaries, other sectors are seeking skilled workers, such as retail, textiles, infrastructure, civil construction, pharmaceuticals, hospitality, hotel, travel, tourism, entertainment, and informal services.

Until about the mid-1980s, it was an employers' market. There was little job hopping; engineers, doctors, and civil services were most coveted. After that, until about 1995, job opportunities expanded as multinational corporations came in; receiving a master's in business administration became a middle-class dream. Between 1995 and 2000, there was a boom in the services sector; manufacturing shed jobs, and multinational corporations continued to hire workers. Since 2000, manufacturing has rebounded, exports are doing well, and the services sector is booming. Studies of employment potential suggest a large number of openings in a variety of sectors, including the automotive industry, entertainment, health care, and financial services.

There is a large and growing demand for qualified people. Further, globalization and technical and demographic changes give a distinct advantage to the country. In an emerging global occupational structure, the country has the potential to provide a workforce for the knowledge economy beyond the national borders. Recent developments have moved the country from "working power" based on supply of low-cost labor to brain power comprising a skilled and educated workforce. The country could possibly generate direct or indirect job opportunities for 10 million to 24 million people by providing an expanding array of services to advanced countries that currently face skill shortages. By servicing overseas consumers of medical, tourism, and educational services, an additional 10 million to 48 million jobs could be created (AIMA 2003).

With its large population and huge capacity to generate skilled professionals educated at home and abroad, out-migration of professionals is now seen as *an opportunity* and not a threat (Bhagwati 2004). In a global world, countries compete for markets by creating and attracting highly skilled people, and the advanced countries have a big appetite for them. A large part of such flow is through education abroad, and India sends a very large number of students to the United States and other developed nations. Freeman (2005) sees that India could threaten the North's monopoly in the high-technology sectors by producing innovative products and services. It could become a magnet economy attracting high-skilled and high-waged investment capital and offering high value added services to the rest of the world.

The country exhibits a strong revealed comparative advantage in services, particularly software services (World Bank 2004). It has leveraged its rich pool of human capital with good-quality educational institutions and large English-speaking population to achieve very high rates of growth in the information technology and IT-enabled services sector. India is now an international services hub. According to the latest figures of the National Association of Software and Services Companies (NASSCOM 2005), India's information services sector (including the domestic and exports segments) is growing at an estimated 28 percent. The aggregate revenue of this sector is expected to exceed $47.5 billion, nearly a tenfold increase over aggregate revenue of $4.8 billion reported in fiscal 1998. This sector directly employs 0.85 million people, 72 percent of whom are graduates, mainly engineering graduates. This number is likely to reach 1.5 million in the next four years. It also has created indirect employment for about 1.15 million people engaged in transport, catering, construction, security, and housekeeping. The large disposable income of a relatively young segment of people in the sector is fueling consumer demand and generating demand in other sectors.

In addition, there are signs of growth in other knowledge sectors, such as pharmaceuticals, biotechnology, and engineering design. The country's manufacturing has become competitive in niche areas such as the automotive sector. Many of these growth sectors need qualified, skilled people. Seen differently, growth in these sectors has been made possible by the existence of a large pool of qualified people. As Martin Carnoy (1999: 30–31) would argue, globalization "increases the pay-off to high-level skills relative to low-level skills . . . because interdependence between globalization and education presupposes competitiveness and efficiency, which is achieved upon the latest technology or knowledge accessibility of the system."

Although the growth of knowledge sectors might have a limited impact on employment overall, it has a significant impact on graduate employment. Industry in the knowledge sectors has a large appetite for qualified people. NASSCOM projects that the number of technology jobs will double to 1.7 million in the next four years. Several companies have undertaken major recruitment drives to augment their human resources. Tata Consultancy Services (TCS) plans to add 30,000 people over the next four years to its already large pool of 72,000. Other companies have similarly ambitious plans.

Although India has a cost and quality advantage as far as skilled manpower is concerned, turnover is high, which adds to the cost directly or indirectly. Companies are

on a hiring spree and are concentrating on numbers, while compromising on quality and cost considerations. If the trend continues, the cost and quality advantages between competing countries may soon disappear.

While the number of unemployed graduates vastly outnumbers the number of jobs available, several sectors of the economy face skill shortages. The industry routinely laments the acute shortage of qualified people, unacceptable attrition rates, and rising wage bills. The country, with its tiny high-quality education sector, cannot sustain its leadership in the global knowledge economy. A study based on the perception of human resource managers worldwide concludes that only one in four Indian engineering graduates is employable. The rest are deficient in English, ability to work in teams or deliver basic oral presentation, and technical skills.

Skill Shortages

Within this context, it is important to deconstruct the issue of skill shortages and examine it in an objective manner. Given India's pattern of growth, higher education clearly has been producing more professional graduates than before.

There were 23.6 million workers with a higher education in 2001, mainly in four sectors, as seen in table 4. Based on average sectoral growth over the past five years and assuming the same proportion of graduates, India had an estimated 33.3 million workers with a higher education in 2005. Using the projected sectoral growth over the next five years with the same proportion of graduates, this number will swell to 50.8 million in 2010. The estimates and projected figures are likely to be underestimations, since an increasingly large proportion of new jobs created in recent years require workers with a higher education.

TABLE 4. Estimated and Projected Labor Force with a College Education in India, by Sector
millions

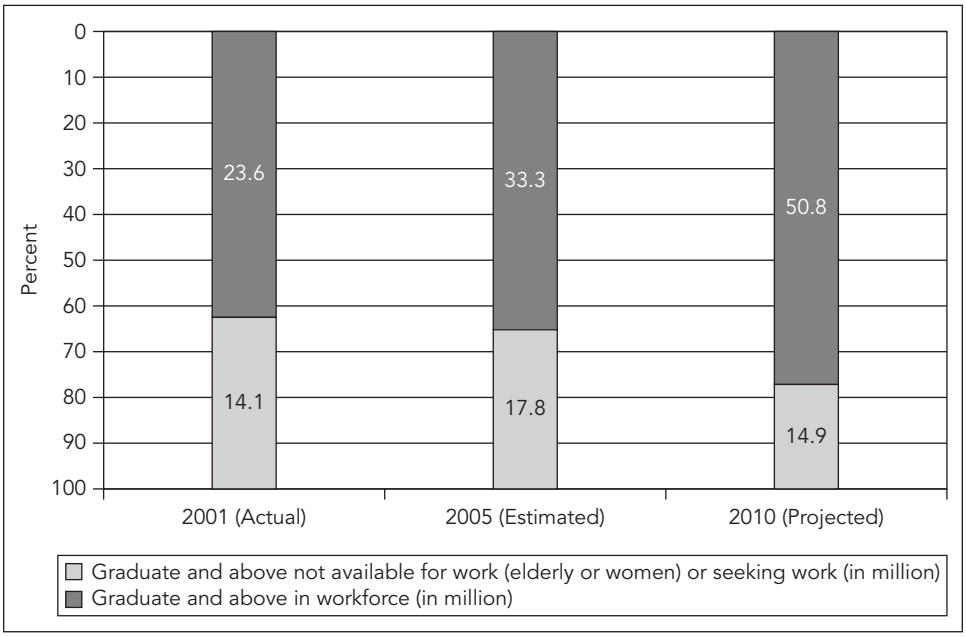
			Projected		
Sector	Actual, 2000–01	Estimated, 2005–06	Annual growth rate, 2005–06 to 2010–11	2010–11	Additional jobs created between 2005–06 and 2010–11
Community, social, and personal services	9.7	13.0	7.0	18.3	5.3
Manufacturing	4.3	6.0	8.0	8.8	2.8
Trade, hotels, transport and communications	3.7	8.2	11.0	14.5	6.3
Financial services	2.9	4.2	9.0	6.5	2.3
Others	1.7	2.1	8.0	2.7	0.8
Total	23.6	33.3		50.8	17.5

Source: Actual is based on Ministry of Home Affairs (2001); estimated, 2005–06, is based on actual growth rate in each sector; projected is based on growth rate projected on average growth rate for last five years.

With 33.3 million graduates in the workforce out of a pool of 50.7 million graduates, there seems to be a shortage of workers with the appropriate qualifications. However, a significant proportion of these workers are not available for work. While women constitute nearly 40 percent of the pool of college graduates, only about three out of 10 women are available for work. In addition, a sizable number of graduates are old people who are not available for work. In 2000–01, only about 46 percent of graduates were in the workforce, but this increased to 66 percent in 2005–06 and is likely to increase to 77 percent in the 2010–11. A sizable portion of the remaining potential workers comprise women and the elderly, who are not looking for a job or are seeking a job, but not finding one because they lack the requisite skills or are not sufficiently mobile.

While the number of college graduates is sufficient, growing job opportunities require employers to go deeper into the graduate pool, as seen in figure 8. The quality of college graduates is variable, with a small number of high-quality institutions at the top and a large number of institutions of indifferent quality at the base. Going deeper into the pool of college graduates would mean getting graduates of poor quality. This is seen in the recruitment of engineering graduates: 70 percent of engineering graduates are picked up by no more than 10 leading companies, most of them in the software sector. All other potential employees have to compete for the remaining 30 percent of jobs, and many engineering graduates at the bottom of the pile are not employable.

FIGURE 8
Persons with a College Degree Who are in the Workforce or Not Available for Work in India, 2001, 2005, and 2010



Source: Compiled by author from data in table 4.

The shortage of skills is not so much about numbers; rather, it is about quality. India's institutions of higher education have not adapted to the structural transformation of the Indian economy and have failed to produce graduates with the needed skills and competencies.

Analysis

India's employment structure has been impervious to economic growth and its changing structure. Despite the sharp decline in agriculture's share of GDP, agricultural employment remains high, continuing to employ more than 60 percent of the workforce.

The formal sector, which is dominated by the public sector, has a limited potential to generate employment. With the opening of the Indian economy, the employment pattern has begun to change. Many nonagricultural sectors have grown rapidly. Apart from information technology and IT-enabled services, there is growth in trade and transport services, financial services, construction, and health and education services. Many sectors require large numbers of skilled people. Having a large pool of English-speaking, skilled people initially enabled the country to enter this growth trajectory, but the country is running out of steam. It is felt that this vacuum may retard growth unless the supply side is better managed.

Evidence of large and growing unemployment and underemployment, particularly among the young and the educated, seems to suggest that such perceptions could be wrong and unnecessarily alarmist. Overall capacity appears to be adequate, and further expansion could amount to too much education, producing workers with a higher level of education than their job requires. Recent research, however, suggests that the gap between supply and demand for college graduates may be the result of restricted mobility and skill mismatches in the labor market. A larger pool of qualified people may facilitate the development of a competitive, dynamic knowledge-based economy (Büxhel, de Grip, and Mertens 2004).

This paper has shown that the shortage of skills is real and affects specific sectors and specific skills. Ideally, the supply of graduates has to adjust to the demand for skills in the job market. However, the link between higher education and the world of work is relatively loose, and the process of transition from higher education to employment is complex and protracted (Gibbons 1998). As a result, students' demand for higher education is often based on their aspirations and the expectations of society and parents; it is not necessarily based on market signals. Mismatch is therefore a primary concern. To address it, focus has to be on enhancing employability and aligning higher education with labor markets.

This apart, it is necessary for higher education to adapt continuously to the labor market. Adaptability has to be ensured, both at the systemic level and at the institutional level. At the systemic level, there are issues of capacity, diversity, and structure; at the institutional level, there are issues of continued relevance of curriculum and quality of the teaching-learning process. New institutional arrangements may be required to expand the pipeline of high-quality graduates in the country.

In India, affiliating colleges form the bulk of the higher education system. They follow curriculum and offer courses set by the affiliating universities. They hardly have any flexibility to innovate and experiment, setting the standards to the lowest common denominator.

The large public sector that grew in the first four decades after independence provided education in a general stream. General stream graduates hardly have any employable skills. Students acquire degrees for their symbolic value. Although some of them get jobs that require generalized skills, such as those required in government organizations or teaching, the number of such jobs has been decreasing. This has resulted in a large pool of unemployable graduates.

However, industries where technology is changing rapidly need workers with general, rather than vocational, skills. General course work can improve students' mental flexibility and enable students to adjust to and deal with new situations. There is substantial evidence from the past 15 years on technology-skill complementarities, making a case for general higher education.

Generalized skills enable workers to develop and implement new technology more quickly. In contrast, vocational education based on narrow skills is useful when technology is changing less rapidly. Therefore, good-quality general higher education, rather than becoming less relevant, is likely to become more relevant in the future. Generic skills that provide flexibility, adaptability, and opportunities for life-long learning will provide young people with the best basis for a career in any area. The large capacity in the stream of general education may turn out to be a blessing in disguise. However, it is important to assure quality. Several companies have started to recruit general graduates for jobs that traditionally went to professional graduates.

A majority of universities and colleges use archaic teaching methods and outdated and heavily theoretical curriculum. With emphasis on rote learning, graduates know little about their field of study and even less how to relate that knowledge to the outside world. They lack "key," "core," "transferable," or "generic" skills, such as communication, numeracy, and information technology, which are required in many jobs today. The institutions have inertia of their own; courses once started cannot be easily discontinued; faculty once recruited on permanent tenure cannot be removed and are difficult to retrain; and putting infrastructure and facilities to alternative uses has its own limitations. Much more flexibility is needed in creating and shutting down departments and programs, and innovative processes are needed to respond to the needs and opportunities of a fast-changing country.

Aligning higher education to the workplace typically includes modifying the content of existing courses (sometimes in response to employer suggestions), introducing new courses and teaching methods, and expanding the provision of opportunities for work experience, all intended to develop skills that enhance employability and to ensure that the acquisition of such skills is made more explicit. In some cases, university departments have sought to "embed" the desired skills within courses; in other departments, students are offered "stand-alone" courses in skills, which are effectively bolted onto traditional academic programs. Usually a mix of embedded and stand-alone teaching methods is used.

Sometimes structural adaptation policies, such as integrating the university sector with the nonuniversity sector, are used to improve efficiency and effectiveness of the system as a whole. Short-cycle courses are also introduced. Apart from structural adaptation of the system, the curriculum and content of courses have to change continually to accommodate new knowledge.

While most universities have not changed their curricula for decades, a few have sought to restructure curricula and incorporate vocational content in an effort to make the curriculum job oriented. Such efforts are few and far between, and the process of changing curricula in India's universities is painfully slow. The colleges that enroll nearly 90 percent of students have no freedom to change curricula and are at the mercy of their affiliating university.

In many cases, the universities do not have dynamic leadership or capacity to initiate changes. Creating communities of academia across the nation for sharing good practices and providing incentives to champion such changes can accelerate this process.

Effective industry-academia partnerships are one approach to addressing the shortage of skilled workers. Industry is already finding ways to address this concern. For example, the Talent Transformation Program of TCS is training science graduates to be industry-ready information technology professionals. TCS then hires them at salaries lower than the salary of an engineering graduate. TCS has accredited 350 colleges for the purpose and plans to hire 2,000 science graduates during the year.[4] Under its Campus Connect Program, in 2004 Infosys began to work with 334 universities and colleges to produce industry-ready recruits, providing courseware for industry-specific subjects, projects for students, and sabbaticals for professionals and holding seminars in colleges. The CISCO Network Academy Program is present in 46 universities and 110 engineering colleges, teaching advanced skills in the areas of network security and new areas like Internet protocol telephone and wireless networking.[5] The Wipro CodeZap Guru Program helps to develop the code-writing skills of final-year engineering students and supports them with training materials. Accenture has a Campus Corridor Program that helps the company to hire from select colleges and supports them in areas such as curriculum development, faculty training, student seminars, and sponsorships.

Public funding is inadequate and skewed, and the funding mechanism is ad hoc. In real terms, unit costs have fallen, and expenditure on critical inputs has fallen sharply. While a small number of institutions are well funded, most receive very little funding. As a result, public institutions are usually underfunded and must address the problems of deteriorating infrastructure and facilities, large vacancies, and falling standards. The funding mechanism fails to ensure quality and instead perpetuates the status quo.

The country has a tiny sector of high-quality institutions, and this is considered a major bottleneck. An interesting fallout is that competition is fierce for entry into these institutions, which has raised the overall standards by promoting self-directed learning and encouraging a large number of Indian students to study abroad. This is now seen to be building a strong base of high-quality human resources, both within and outside the country.

Overall quality is uneven. As industry recruits a larger number of graduates, quality falls sharply. By 2010, 77 percent of people with a college education and above will have to be in the workforce, compared with 62 percent in 2001.

The country has a small capacity for education at the doctoral level. A person who obtains a doctorate from a reputable university can find a job anywhere in the world. However, the salaries paid in Indian universities lag behind those paid in universities elsewhere in the world and in the Indian private sector, which has sharply curtailed the supply of good researchers and teachers who are willing to work in universities. The best teachers and researchers are leaving universities or not joining them at all. This not only affects the quality of teaching but also creates a shortage of faculty.

The country has a large and growing private sector. The private sector has grown rapidly over the past 20 years, making private higher education the most dynamic sector of higher education today. Private institutions are confined mainly to the professional stream. However, quality and accountability in private higher education are often uneven. An accreditation system is in place, but its reach is limited. With poor coverage, accreditation has failed to create incentives to enhance quality.

Competition among providers has the potential to enhance quality, but distortions persist due to large supply-side constraints and information asymmetry. Burdensome regulatory arrangements and poor compliance have erected barriers to entry for new providers and prevented existing ones from being creative and improving quality.

Private institutions that depend primarily on tuition fees have to cater to students' demand, which makes them far more adaptable than public institutions. Within the private sector, the nonformal training providers are even more flexible since no regulatory framework binds them. They respond to the changes taking place in the job market far more quickly. This makes a case for offering a mix of public and private as well as formal and nonformal opportunities for education and training, each fulfilling a different need.

Manpower forecasting is weak and based on assumptions of the past. Disjointed efforts to provide long-term forecasts and post mortems are of little use. Assessing the supply, dynamics, and need for skills must be done with an eye to the future. Dissemination of such information would enable the system of higher education and training to create new facilities or adapt existing ones. A system is needed that is capable of taking charge, creating, and motivating the entire supply chain of skills.

In all, there is a need to enlarge the adaptive capacity of the higher education system so that it is more responsive to the changing world of work and meets the diversified needs of the economy, both domestic and global. For that purpose, diversification of the higher education and training system is a worthy goal. Special initiatives are required to enhance employability. Curriculum and content have to be renewed continually through teaching and learning support networks, such as a specific skill development network. Collection, analysis, and dissemination of data on job market trends are important.

More than 40 years ago, when Professor D. S. Kothari submitted the Report of the Education Commission on June 29, 1966, he noted, "It is characteristic of a world permeated by science that in some essential ways the future shape of things is unpredictable. This emphasizes all the more the need for an educational policy that contains a built-in flexibility so that it can adjust to changing circumstances. It

underscores the importance of experimentation and innovation." He added, "The single most important thing needed now is to get out of the rigidity of the present system. In a rapidly changing world of today, one thing is certain: yesterday's educational system will not meet today's, and even less so, the need of tomorrow." This prophetic statement is equally and perhaps more relevant today in the context of the enormous changes taking place in the society and economy (Agarwal 2007a).

Conclusions

This paper has tracked the growth of higher education and developments in the market for college-educated workers in India. It calls for intervention to make the connection between higher education and the labor market a more efficient means for reducing the unemployment and underemployment of college graduates, on the one hand, and addressing the shortage of skills, on the other.

While the absolute number of college graduates may not be a serious problem, their uneven quality is. This is aggravated by the large appetite of industry in recent years, the result of the country's rapid economic growth, investment boom, and structural changes.

Higher education has several inherent problems. The system is not geared to ensure accountability and attract talent. Public education needs systemic governance reforms. It needs greater competition so that students have effective choices. This competition requires opening up the sector to all kinds of institutions. The public system has to be better funded and move away from a model that emphasizes standardization, homogenization, and the lowest common denominator.

The country faces the challenge of improving the quality of its higher education and enhancing access while maintaining equity. To realize the economic, personal, and social aims of higher education within the limits of available resources and competing priorities, both the purposes and the nature of higher education have to be examined critically and realistically. The continuously changing relationship between higher education and subsequent employment should be reflected both in the institutions and in individual choices. Creative ways of doing so have to be found.

Notes

1. Average enrollment in an institution is 546. However, this average has little meaning, since several institutions have more than 10,000 students, and many have fewer than 100 students.
2. In India, the gross enrollment rate is twice the percentage of skilled people in the total workforce as in developing and developed countries.
3. Nonworkers broadly constitute students not participating in paid or unpaid work, persons engaged in household chores, persons not even helping, unpaid work in family cultivation, and dependents (infants, the elderly, pensioners, beggars, vagrants, prostitutes, persons living on remittances and rent, and so forth).
4. Reported in the *Times of India,* November 23, 2006.
5. Reported in the *Times of India,* February 25, 2007.

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Comment on "Higher Education and the Labor Market in India" by Pawan Agarwal

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The world is facing unprecedented challenges arising from the convergent impacts of globalization, the increasing importance of knowledge as an engine of growth, and the information and communications technology (ICT) revolution. The nation's competitiveness, which is defined as a country's share of world markets for its products, comes less and less from abundant natural resources and cheap labor and more and more from technical innovations and creative use of knowledge, or a combination of both (Porter 2003). The ability to produce, select, adapt, commercialize, and use knowledge is critical for sustained economic growth and improved living standards. The study conducted by Solow (2001) illustrates the striking differences in GDP between countries resulting from investment in knowledge.

The government has a responsibility to put in place an enabling framework and infrastructure to encourage institutions to be more innovative and responsive to the need to improve the nation's competitiveness. However, the higher education system, as well as individual institutions, is not adequately prepared to play this role and to meet such high demands.

Nevertheless, opportunities are emerging from these challenges. The role of higher education in the construction of knowledge is stronger than ever. Its contribution to knowledge-driven economic growth and poverty reduction is carried out through the capacity to (a) train a qualified and adaptable workforce, (b) generate new knowledge to increase the nation's competitiveness, and (c) access and adapt global knowledge to local use.

Development of Higher Education

The development of higher education is considered to be instrumental in contributing to the economic development and competitiveness of a nation. It is therefore very

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Annual World Bank Conference on Development Economics 2008, Regional

important for higher education institutions to keep pace with science and technological developments and to stay relevant to economic needs within the local setting as well as in the global arena. Institutions can do this through, among others, (a) contributing to the creation of knowledge; (b) reducing dependence on foreign experts; (c) developing capacity to exploit natural resources sustainably; (d) developing the needed technology for local and national industries; (e) developing import substitution and improving the added value of export products; (f) improving health and social well-being, and (g) developing qualified researchers.

Higher education institutions offer highly skilled human resources in various disciplines and thus are expected to undertake high-caliber research, education, and services. In order to capitalize on this capacity, each institution must determine its niche and focus.

In light of its chosen niche, each higher education institution may decide to focus on excellence in teaching or excellence in research. Another possible direction is to focus on functionality, as introduced in the Latin American context. There are four classes of functions: (a) academic leadership, (b) professional development, (c) technological training and development, and (d) general higher education (Castro and Levy 2000).

Due to rapid technological and market changes, any nation will have to deal with the challenges posed by a volatile labor market. The life cycle of required skills will be shorter and highly variable. In the future, workers will have to be able to improve and change their skills rapidly. Higher education should be prepared to cope with such challenges by providing more flexible modes of accessing knowledge, such as distance learning, short courses, modular curriculum, and other means of allowing workers to access knowledge without losing employment.

Communities and industries should become closer partners of educational institutions. They can do this by contributing financially and by providing access to learning facilities such as industrial laboratories. Such closer links will improve the relevance of education and benefit the nation's competitiveness.

Provision of Knowledge and Skills

The current world of work requires university graduates to accomplish their tasks and responsibilities using creativity and initiative, in addition to academic training. Universities will have to develop a learning system capable of helping graduates to learn beyond their skills and expertise. The system must seek to balance the short-term needs of the labor market for specialized experts and the long-term needs of the nation for "soft skills" (World Bank 2000). In addition to the present emphasis on cognitive ability, the creative capacity to deal with uncertainty must be given an important place. The learning system has to bring into the classrooms not only factual knowledge or hard skills, but also soft skills derived from experiential knowledge.

Since the nation's competitiveness depends on the availability of highly skilled labor, the enrollment rate in higher education will have to be raised. However, it will be difficult to expand higher education without compromising quality. Expanding the provision of private education could shift the burden from public resources to private, provided that the acceptable standard of quality could be met.

The demand for access to higher education has far exceeded the capacity of the system. The demand for more access is not limited to those in the school-age bracket of 19–24; it also includes mature or employed students who wish to pursue in-service training, specialize in a particular field of industry, or undertake life-long education. In addition to the traditional modes of training, distance education could help to ease the pressure of increasing demand. In many cases, an individual's knowledge of recent scientific and technological advancements is more important than an academic degree.

An effective distance education program should have a well-designed method of delivery that is suitable for a well-targeted segment of the population; it also needs to have a rigorous quality assurance mechanism. The segment chosen should be clearly stated in the objective of the program. The materials should be adequately prepared, and the methodology should be properly designed. The advancement of ICT has enabled a variety of new schemes for carrying out distance education.

Excellence

It is difficult to deny that excellence requires adequate resources. Given the relatively low level of public funding for higher education, stakeholders should seek greater public funding for higher education. In return, institutions and the system as a whole should continuously improve their efficiency and effectiveness.

The economic downturn has challenged the government's effort to increase the rate of participation in higher education. One way to approach this dilemma is to encourage institutions to emphasize producing high-quality human resources rather than merely larger numbers of graduates. Expansion should only be justifiable if there is a clear demand from the market. Each institution will be urged to demonstrate the quality of its graduates.

In order to excel, it is important to adopt methods of delivery that are suited to the learning objectives set by the institutions. Such methods include shifting from a teaching-centered to a learning-centered approach, balancing academic excellence, functionality, and the needs of students, and adopting more flexible approaches to learning.

Stakeholders should facilitate the development of the triangle of learners, which consists of students, lecturers, and professional communities. Both students and university lecturers could improve their soft skills by taking advantage of the continuing education programs established by industries. Furthermore, establishing partnerships between universities and industrial communities will make education more relevant.

Existing Conditions

In most of the developing countries, a majority of the student population (as high as 90 percent) is in the academic stream. Most of them have been successful in finding a job either as an employee or as an entrepreneur, although many of them are working

in fields unrelated to their field of study. They are successful due to their intellectual capability and soft skills, as most students who are admitted to reputable universities are the cream of the crop. After graduation, they are employable regardless of their previous training and background because they are flexible and able to adjust to the circumstances.

Although most graduates are employable, an increasing number of graduates are finding it difficult to obtain a job due to a mismatch in quality or standards between the university product and the labor market needs. In developing countries, the workforce is dominated by elementary school graduates, with higher education graduates constituting less than 2 percent. The number of skilled workers is very small, which compromises the nation's competitiveness. A major breakthrough is needed to improve the education level of the workforce.

Entrepreneurship is considered as a means to improve the employability of college graduates, and some higher education institutions have implemented an entrepreneurship program in the curriculum. The graduates are expected to create job opportunities or be self-employed and able to develop small or medium-size enterprises. However, the development of small and medium-size enterprises tends to be stagnant: the existing ones are struggling to survive, and some will have to be closed. Despite the promise, the role of graduates in developing small and medium-size enterprises is still limited.

There is a mismatch between the objectives of higher learning and the demand of users—namely, the productive sectors. Universities can argue that they need a guarantee of recruitments for designated fields of study so that they can prepare graduates who are ready to work. Industries can argue that they will recruit graduates who are ready to work since they do not want to provide training prior to employment. This mismatch happens in all countries and is impossible to resolve altogether. However, it is possible to minimize the damage. One solution is to provide students with soft skills.

University and Industry Collaboration

Relevance in higher education can be improved by creating collaborations between the university and industry. Industry needs the expertise from the university to pursue research and development, while the university needs support from industry in the form of research and development funds as well as exposure to the latest developments in science and technology. Strong collaboration between university and industry can help to minimize the current mismatch between supply and demand. This is an idealistic case, and many factors are beyond the control of either the university or industry. One of them is economic growth, which is difficult to predict and control.

Developments in science and technology move much faster than the study period for students in higher education institutions; therefore, it is very difficult for institutions to keep pace with the changes. The knowledge taught in institutions becomes obsolete even before a given cohort of students leaves and enters the workforce.

Close collaboration between university and industry may relieve this problem by enabling the exchange of knowledge and information. However, it is unreasonable to expect the educational process to keep pace, as the business cycle is shorter than the cycle of curriculum development.

Strategic Approach

Students who graduate with a university degree should gain basic knowledge and skills, have a level of social and personal maturity, have a strong foundation in a given field, and have skills and creativity that allow them to continue learning. With this in hand, when they enter the world of work, they will be able to adjust quickly as circumstances change. In turn, the university should listen to the labor market, as doing so will help it to determine the kind of basic knowledge and hard skills that students will need in order to excel in the workforce.

Quality higher education requires a high level of investment and an adequate operational budget; a low level of investment and an inadequate budget will sacrifice quality and eventually burden the nation with the inability to compete internationally. More public resources for higher education are needed. It is important to advocate for more public spending and, at the same time, work to improve the efficient and effective use of public funds (Brodjonegoro 2003).

There is a long-standing debate as to whether higher education is a public or private good or even both. An interesting trend is toward increasing community participation in financing higher education through, among others, a reasonable tuition rate, private donations, and university-industry collaborations. An institution, in return, needs to be accountable for its promise to deliver and should provide financial assistance to those in need. These contributions should only be accepted as long as they do not conflict with academic norms and values.

As far as public resources are concerned, a carefully designed funding scheme must be developed. The primary aim of such a scheme is twofold, to make funding more efficient and cost-effective and to make higher education institutions stronger and healthier. In particular, a financing scheme must cover the cost of maintenance. In many cases, the legacy of previous strategies has been the overinvestment in physical and human resources, beyond the institution's capacity to use and maintain them.

Conclusions

Implementation of a market economy in the pure sense, without an adequate institutional framework or legal infrastructure to protect underprivileged groups and prevent unfair competition, is never recommended and should be avoided (Stiglitz 2001). A tiered competition, by grouping institutions at a similar stage of development, type, or focus, is more appropriate.

Managing a higher education institution is a complex operation, with multimillion-dollar turnover. Universities receive large sums of public resources, but many also

generate significant funds from other sources. Managers must attend a vast range of requirements, from ensuring cost-effectiveness and efficiency to assuring the highest academic standards.

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Comment on "Higher Education and the Labor Market in India" by Pawan Agarwal

SHARIFAH HAPSAH SHAHABUDIN

Knowledge has become the key factor in socioeconomic development. Many countries in the world are pursuing policies and strategies to shift to the knowledge economy, which is bringing dramatic changes in the nature of work and the role of higher education in nurturing the talents required for this new economy. Amid the challenges of globalization, liberalization, and advances in technology, Agarwal has proposed a plan of action in higher education for India, which has undergone a nontraditional pattern of development and growth in employment in which the services sector precedes manufacturing. The objective of this comment is to compare the experiences of India with those of Malaysia, which has followed a more traditional path, to identify key factors of success and share insights on how public policies have affected the link between higher education and the labor market.

India

The nontraditional pattern of economic development and growth in India has seen growth in the service sector (21.1 percent of workers in 2001), usually associated with the knowledge economy, preceding growth in manufacturing, while the agricultural sector remains almost unchanged (61.6 percent of workers). The growth in services, accounting for more than 57 percent of GDP, is attributed to information technology (IT) and IT-enabled and business services. Beginning with voice and data, the industry has expanded to all knowledge sectors, such as pharmaceuticals, biotechnology, engineering design, and logistics for delivering from remote locations (off-shoring and outsourcing), thus making manufacturing skill intensive. IT has created indirect employment opportunities in other sectors as well, such as transport, catering, and construction, among others. The large disposable incomes of relatively young people in these

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Annual World Bank Conference on Development Economics 2008, Regional

sectors have fueled the demand for consumer goods and services, putting parts of urban India into a virtuous cycle of growth. Although manufacturing is becoming skill intensive, India still attracts labor-intensive investments in manufacturing. Further, manufacturing is concentrated in very large-scale and very small-scale firms; missing is the dynamic middle that generates greater employment and entrepreneurship.

The services sector contributes only 28 percent to overall employment in 2006–07 (relatively jobless growth). A significant share (about 50 percent) of workers in this sector have a tertiary education. Manufacturing has about a 17 percent share of workers, but only 10–12 percent have a tertiary education. Agriculture saw a decline in the number of full-time workers and a significant increase in the number of marginal workers, suggesting some shift from agriculture to other sectors. Most agricultural workers have low skills and earn low wages; only 2.2 percent have graduated from high school. The formal sector (7 percent of employment), 70 percent of which are public sector workers, is likely to remain the same or even decline in size. College graduates form 41.2 percent of the public sector.

Key factors in India's success are the sizable number of engineers and scientists, English proficiency of the majority of the population, presence of high-quality educational institutions, return of highly qualified and experienced IT professionals, expansion in the use of IT to all knowledge sectors, the presence of off-shoring and outsourcing, the virtuous cycle of growth (young people with disposable incomes demanding consumer goods), and employment opportunities in other knowledge-related sectors.

Although millions of jobs have been created and are expected to be created in manufacturing and services, which include the automotive, defense equipment, tobacco and tobacco products, food, financial, construction, health care, media and entertainment, retail, tourism, and transport industries, the country is still facing the problem of employing a growing unskilled labor force and managing increased wage disparity. Agarwal concludes that the trends reflect the bleak employment scenario in the country, despite a World Bank (2006) report suggesting an improvement in labor market outcomes in the 1990s. Jobs have to be provided for the 8 million entrants to the labor force annually over the next decade, and earnings have to be increased for the more than 100 million workers who live in poverty. In addition, gender, caste, and regional disparities have to be addressed.

Malaysia

Malaysia's pattern of development has followed a more traditional path, moving from agriculture into manufacturing and progressively into services. Industrialization, which started in the 1960s (about two decades before India), harnessed two important drivers of globalization—foreign direct investment and trade—to enable the economy to create new jobs capable of absorbing an expanding supply of the labor force. Creating a larger share of employment is the main goal of Malaysia's poverty eradication and restructuring of society. From 1985 to 1995, the economy generated almost 2.3 million new jobs, which grew at an annual rate of 3.5 percent, mainly in manufacturing, construction, and the services sectors (see table 1), and the

TABLE 1. Share of GDP and Total Employment in India, by Industry of Origin, 1970–2010
percent

	1970		1990		2000		2005		2010	
Sector	**GDP**	**Employment**	**GDP**	**Employment**	**GDP**	**Employment**	**GDP**	**Employment**	**GDP**	**Employment**
Agriculture, forestry, livestock, and fishing	29.0	53.5	16.3	26.0	8.9	15.3	8.2	12.9	7.8	11.1
Mining and quarrying	13.7	2.6	9.4	0.5	7.3	0.4	6.7	0.4	5.9	0.4
Manufacturing	13.9	8.7	24.6	19.9	31.9	27.7	31.4	28.8	32.4	30.0
Construction	3.8	2.7	3.5	6.3	3.3	8.1	2.7	7.0	2.4	6.4
Services	36.2	32.5	46.8	47.3	53.9	48.5	58.1	52.6	59.2	52.1
Import duties less bank service charges	3.4	n.a.	0.7	n.a.	−5.3	n.a.	−7.2	n.a.	−7.7	n.a.

Source: Government of Malaysia (1966, 1999, 2006b).
n.a. Not applicable.

labor force grew from 6.0 million to 8.3 million, at an average annual rate of 3.0 percent. The government also contributed directly to the growth in new jobs, although its share in total employment was only 11.0 percent in 1995. During this same period, unemployment fell from 6.9 to 2.8 percent, and the economy shifted from labor surplus to labor shortage. This led to the use of unskilled and semiskilled foreign labor in the same sectors that were creating jobs. During the Asian financial crisis of 1997, unemployment rose when the economy contracted and has remained at 3.5 percent for the last three years as the economy recovers.

In less than four decades industrialization has substantially transformed the economic structure of the country. From 1970 to 2005, the share of agriculture and forestry in GDP has dropped from 29 to 8.2 percent, the share of manufacturing has more than doubled from 13.9 to 31.4 percent, and the share of services has increased progressively from 36.2 to 58.1 percent (table 1). With regard to employment, the agricultural sector shrank from 53.5 percent in 1970 (which is less than the share estimated for India's agricultural sector for the period 2000–04) to 21 percent by 1995 and to 12.9 percent by 2005. In contrast, the share of employment in manufacturing and services expanded from 8.7 and 32.5 percent, respectively, to 28.8 and 52.6 percent, respectively, in 2005. The service sector's larger share of the economy is accompanied by a larger share of employment as well, unlike the case of India.

Education has always been an integral part of the transformation, and Malaysia's economic performance reflects the overall success in the use of publicly provided education to promote human capital formation. The level of investment in education continues to be high (2.6 percent of GDP), forming 10.2 percent of the development expenditure in the Ninth Malaysia Plan (2006–10), and the share of investment in higher education has risen to 40 percent. Private and transnational education is encouraged to widen access and choice and is regulated to assure quality and standards. Improved access to education is reflected in the educational attainment of the labor force (see table 2). From 1985 to 1995 the share of the population with no formal education dropped from 14.1 to 8.7 percent, and the share with secondary or tertiary education grew from 46.2 to 63.3 percent. The share of the labor force with tertiary education alone increased from 6.8 to 11.1 percent.

For Malaysia to continue growing in the long term, the country will need to maintain its competitiveness in scientific fields, move up the technology chain to produce higher value added technology-intensive products, and address the shortage of qualified workers with scientific and technical skills.

TABLE 2. Educational Attainment of the Labor Force in Malaysia, 1985–2004
percent

Level of education	1985	1990	1995	1996	1997	1998	1999	2000	2001	2004
No formal education	14.1	9.8	8.7	7.9	7.3	7.0	6.5	6.2	5.7	4.0
Primary	39.7	34.6	28.0	23.4	27.9	27.4	2.6	26.4	24.1	19.1
Secondary	39.4	46.8	52.2	51.7	52.0	52.4	54.3	53.5	64.9	57.6
Tertiary	6.8	8.8	11.1	12.0	12.8	13.2	13.2	13.9	15.3	19.2

Source: Malaysia, Department of Statistics (various years).

TABLE 3. Educational Attainment of the Unemployed in Malaysia, 1990–2004
percent

Level of education	1990	1996	2004
No formal education	4.5	5.2	3.0
Primary	17.3	19.1	13.2
Secondary	75.3	65.9	62.9
Tertiary	2.8	9.8	20.9

Source: ASLI (n.d.).

Employment of Skilled Workers

Despite the differences in their development and growth paths, Malaysia and India share the common need for skilled human resources for the knowledge economy, whether in services, manufacturing, or agriculture. India has the added problem of finding ways to employ a growing unskilled labor force, mainly in agriculture and labor-intensive industries, and to raise their earnings. Both share a common problem of unemployment among persons with a tertiary education. As shown in table 3, the percentage of unemployed with tertiary education in Malaysia has grown from 2.8 percent in 1990 to 20.9 percent in 2004. Since the overall unemployment rate in Malaysia is quite low, the increase in graduate unemployment may imply a decrease in the employability of those with tertiary education rather than an overall shortage of jobs.

In India nearly 40 percent of graduates are not productively employed, and their unemployment and underemployment (17.2 percent) is higher than unemployment overall (9.2 percent). There is a positive correlation between unemployment and level of education, a phenomenon not observed in Malaysia (on the contrary, table 3 suggests an apparent improvement in employability in all the other categories of educational attainment). Agarwal suggests that one of the reasons for unemployment among persons with a higher education may be that India's higher education system has not kept pace with the needs of a rapidly growing global knowledge economy. In other words, there is a mismatch between the skills of graduates and the skills demanded by industry.

Role of Higher Education

As in India, Malaysia is concerned about the role of education in increasing labor productivity as well as in satisfying the labor demands of a country that is shifting from a production-based to a knowledge-based economy. In his action plan, Agarwal focuses on the issue of making higher education more relevant to the workplace and reducing the mismatch between the skills of graduates and the skills demanded by industry. The main challenge is not simply to ensure that graduates find employment, but rather that they find employment that best uses their education.

Many of the initiatives discussed by Agarwal are relevant to Malaysia and most parts of the world as well. It is generally agreed that higher education should prepare students for a career in any area (become employable) and should equip them with generic skills that would help them to adapt to the changing environment and unforeseen needs of the future (remain employable or become self-employed or entrepreneurs). It is incumbent on higher education to make explicit the "key," "core," "transferable," or "generic" skills and to provide teaching-learning experiences for students to develop those skills. Such skills include communication, numeracy, IT, problem solving, teamwork, understanding the world of work through university-industry collaboration and entrepreneurship courses, English proficiency, and learning how to learn.

Public Policy Issues Related to Education and the Labor Market

While Agarwal's paper focuses on higher education and the labor market, education should not be seen as a panacea for unemployment and underemployment or as a means simply to tailor students to meet the specific requirements of industry (work readiness). Industry should invest in training and not attempt to shift the private costs of training onto the public budget. There should be longer-term policy priorities to encourage more efficient labor markets that will improve the labor market outcomes for graduates.

Higher education should serve the wider socioeconomic perspective and should make significant contributions to the advancement of knowledge through research to fight poverty, solve environmental problems, be prepared for disasters, and understand global issues. In Malaysia education is also the means for fostering patriotism, national unity, and social cohesion as well as for preserving the cultural heritage of the country.

To improve the overall quality of teaching and student learning, the focus should not be exclusively on academic programs but should encompass measures such as (a) effective governance with increasing university autonomy and full accountability to nurture a climate that upholds academic values, scientific inquiry, freedom of expression, collegiality, and integrity, (b) financing models that incorporate performance-based budget allocation mechanisms to provide managerial and financial incentives for greater responsiveness and innovation, (c) faculty management, and (d) stronger research and integration of universities into the national innovation strategy.

To address the overall labor market needs, public policy should also address (a) the articulation of primary and secondary schooling with university education, (b) the balanced growth of university and other educational institutions, such as those for vocational education, (c) the expansion of private higher education, (d) the need for stronger quality assurance mechanisms to ensure standards (for example, use of qualifications frameworks) and promote transparent and open communication about all aspects of institutional performance, and (e) the need to deal with politics effectively.

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ISBN 978-0-8213-7123-7

SKU 17123

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