Carnegie-Rochester Conference Series on Public Policy 40 (1994) 251-257
North-Holland

Reply to Alwyn Young

Howard Pack
University of Pennsylvania, Philadelphia, PA 19104
and
John M. Page, Jr.
The World Bank, Washington, D.C. 20433

There are two different sets of questions raised by Young's comments, one economic and the other includes econometric issues and the choice of variables. We consider each in turn.

1 Economic issues

Young attempts to demonstrate that the high-performing Asian economies have achieved their current high levels of per capita income mainly by the accumulation of physical capital financed by growing rates of domestic saving. For some reason the Asian countries have been unable to avail themselves of the potential technical progress implied by the ability to adopt international best-practice technology and thus rely entirely on capital accumulation. In this view all countries are on an identical, freely available international production function, and Korea and Taiwan in 1960 were on the same production function as the United States or Sweden. They had the same knowledge about agricultural and industrial technology and could use it equally well. This despite the fact that both had little industrial history except in the few sectors permitted during the Japanese colonial occupation, a tiny number of engineers, and an industrial sector primarily producing low-quality products in tiny, dimly lit, and dirty workshops. Such an assumption contradicts a number of studies that show that total-factor productivity in Korea has been increasing relative to that of the United States. Thus, Christensen, Cummings, and Jorgenson (1980) and more recently Pilat (1993) have found that there has been a convergence towards U.S. total-factor productivty. Comparisons of total-factor-productivity levels in Japan and the United States show considerable differences and reversals over time in the pattern of leading in-

SSDI 0167-2231(94)00009 B

dustries. (Jorgenson and Kuroda, 1990). Studies of best-practice production frontiers within and across countries demonstrate that many firms, particularly in developing countries, utilize much more labor and capital per unit of output than the most efficient ones.[1] This strand of research simply does not support the assumption of all countries operating on an identical production function along which accumulation is the sole source of growth.

In the case of the Asian NICs, particularly Japan, Korea, and Taiwan, Young implies that despite extensive direct foreign investment, substantial fees paid for technology licenses, growing domestic education and R&D, and the return of foreign-educated engineers and scientists, these countries have achieved little growth in total factor productivity, having achieved their current economic status mainly by capital accumulation. Improving macroeconomic policy, growing liberalization of the foreign-trade regime, and the great growth in exports all had little impact on productivity. Moreover, even if Young were correct in viewing investment as the driving force, given that many countries such as India have raised their investment rates in recent years and have achieved much slower growth, it still would be important to focus on the reasons for the greater payoffs in the Asian NICs, particularly Korea and Taiwan.

Consider the implications if all of the growth in output per person were due to capital deepening along a given production function. Assume a Cobb-Douglas, $Q = AK^{\alpha}L^{1-\alpha}$. The rate of growth of the marginal product of capital, F_K^* is $A^* - (1-\alpha)(K^* - L^*)$ where an asterisk denotes rates of growth. Data from Young (1994a) on rates of growth of capital minus labor in Korea (about 12 percent) for the period 1960 to 1980 and his estimate of labor share (about .65) imply that F_K declined by about 8 percent per year over a twenty-year period or 81 percent in total if A^* was close to zero. Similar results can be derived for Taiwan.

In the presence of such a remarkable fall in the rate of return on capital, it is difficult to understand why businesses would have maintained the high levels of investment which occurred. This decline in F_K due to sharply decreasing returns is only avoided if TFP grew over the period. Even if the upper ranges of TFP values that have been estimated for Korea — 4 to 5 percent per year — are employed, F_K would have declined given Young's estimates of the rate of capital deepening. Either the estimates of capital deepening are too high, which undercuts the accumulation argument, or TFP was much higher than Young's preferred value, 1.2%.

[1]For a review and citations see Pack (1988). For detailed micro studies of Kenya and the Philippines see Pack (1987) and for sectoral studies in Egypt see Handoussa, Nishimizu, and Page (1986).

2 Statistical issues

Many of Young's differences in results may stem from his use of the period 1970–85 rather than 1960–85 which was our focus. Moreover, his results differ from ours and others employing the Summers-Heston data because he constructs a capital stock series from the investment data and employs this for the 1970–85 period rather than the investment-GDP ratio as is done in all other studies. While the use of capital stock rather than the investment-GDP ratio makes eminent sense given that the same I/GDP figure yields divergent values of K^* for different initial capital-output ratios, the question is whether the stock constructed leads to plausible results. His conclusion is that "one now suddenly finds that economies such as Burma, Bangladesh, and Uganda evince a performance comparable to that of the bulk of the HPAEs."

Totally autarchic and corrupt Burma exceeds the TFP growth of South Korea! (Young, 1994b, Table 1). Bangladesh, the site of the Indo-Pakistani war of the early seventies, the separation of West from East Bengal, and devastating cyclones, has greater TFP growth than Japan as does Uganda, dominated for much of the period by Idi Amin, incessant civil war, and the killing of much of the educated population. Afghanistan, despite the Russian invasion in the late 1970s and the ensuing civil war, does better than Singapore. These results strain credulity and severely undermine the claim, based on Young's capital stock, that the HPAEs were simply run-of-the-mill countries in the period from 1970 to 1985. They contradict the findings of many other efforts to estimate TFP growth for a broad cross-section of countries. For a sample see Edwards (1992), Elias (1991), and Fischer (1993). All yield broadly similar results with respect to the international pattern of rates of productivity change, and none yield results comparable to Young's estimates.

Young questions the sensitivity of the regressions including the ratio of manufacturing exports to GDP to the inclusion of the Asian NICs. Our paper presents an extensive discussion of why manufacturing exports may help to correct imperfections in the international market for technology and allow countries that start on lower-production functions to shift to higher ones. There is thus nothing arbitrary about including them in a regression. Since the paper of Levine and Renelt (1992), it has been clear that all of the cross-country results employing slightly different variations of a basic model are very sensitive to alternate specifications. We view our regressions as pointing the way to a need for systematic microeconomic investigation of the sources of productivity growth in such countries as Hong Kong, Korea, and Taiwan and have presented a brief survey of the existing microeconomic evidence. Clearly if capital accumulation explains everything, economists can simply advise Bolivia, Chad, and Nepal to save and that is the end of the story.

Were it only so simple!

Young cites Pack (1988) to support his argument that the evidence on the TFP growth of the Gang of Four was not definitively better than that of import-oriented countries. At the time that paper was completed, mid-1986, few of the studies of the NICs contained time series for more than a dozen years, and it was possible that some of the then-available estimates of TFP growth reflected growing capacity utilization, the productivity gains from rapid reallocation of factors among sectors, and scale economies. In the longer time series now available for thirty years, it is unlikely that these could be continuing sources of TFP growth. Indeed, Young's 1994a paper which analyzes some of these data finds productivity growth which is positive.

Finally, some definitional questions. Young at several points suggests that a major issue is the use of population growth rates employed by us rather than the labor-force growth rate, the relevant variable in the neoclassical model. He has much greater confidence than we do in estimates of national labor-force participation rates. Definitional questions of who is counted as part of the labor force on self-owned farms in developing countries and the degree of inclusion of urban informal sector participants leave us more comfortable with population growth rates. Similarly he is concerned with the omission of depreciation and technical progress employed in the Mankiw-Romer-Weil (1992) paper. But the depreciation rates used in all such studies have not been calculated endogenously from production functions as they should but often reflect ad hoc decisions of tax authorities. Moreover, economic depreciation will differ across countries depending in part on the relative cost of skilled manpower needed to maintain and repair capital.

With respect to the export variable employed, the one on which we agree that the measurement is correct, the average share of manufacturing exports relative to total exports, yields the results expected. The ratio of manufactured exports to GDP is faulty in Young's view and we have some doubts as well. Nevertheless, the publicly available series from the World Bank data files and its components are the ones that have been employed in all previous studies. Rather than engage in changes country by country, we chose to stick with it given the similarity of results with both variables.[2]

Finally, most fundamentally, we view the cross-country regressions as providing clues about the potential sources of different performance among countries. The regressions cannot sort out the true sources of different performance as they are reduced forms and employ proximate rather than fundamental variables. Thus, it is possible that technical change introduced from abroad led to high rates of return to educated graduates which in turn led to increased enrollments. The increasing stock of graduates then increased

[2]Indeed, one of the reasons for not "correcting" the series was that these adjustments strengthened our results.

the marginal productivity of capital above what it would have been, and stimulated further investment which itself embodied new technology and facilitated the reorganization of production. These and many other complex strands are important issues for understanding the development process. To fine-tune the weak national input measures, completely ignore problems in measuring output that remain even after the Summers-Heston efforts, and then to claim that we now possess the recipe for growth, capital accumulation, is to abdicate the effort to obtain a serious understanding of the growth process.

References

Christensen, L.R., Cummings, D., and Jorgenson, D.W., (1980). Economic Growth, 1947–73: An International Comparison," J.W. Kendrick and B. Vaccara, (eds.), *New Developments in Productivity Measurement*, Chicago: University of Chicago Press.

Edwards, S., (1992). Trade Orientation, Distortions and Growth in Developing Countries, *Journal of Development Economics*, **39: (1)**: 31–57.

Elias, V.J., (1991). The Role of Total Factor Productivity on Economic Growth, Background paper for *World Development Report, 1991*, The World Bank, Washington, D.C.

Fischer, S., (1993). Macroeconomic Factors in Growth, given at World Bank Conference, "How do National Policies Affect Long-Run Growth?".

Handoussa, H., Nishimizu, M., and Page, J.M., Jr., (1986). Productivity Change in Egyptian Public Sector Industries after the 'Opening,' 1973–79," *Journal of Development Economics*, January/February, **20**: 53–74.

Jorgenson, D. and Kuroda, M., (1990). Productivity and International Competitiveness in Japan and the United States, 1960–85, C. Hulten, (ed.), *Productivity Growth in Japan and the United States*, Chicago: University of Chicago Press.

Levine, R. and Renelt, D., (1992). A Sensitivity Analysis of Cross-Country Growth Regressions, *American Economic Review*, **82**: 932–63.

Mankiw, G.N., Romer, D., and Weil, D., (1992). A Contribution to the Empirics of Economic Growth, *Quarterly Journal of Economics*, **152**: 407–37.

Pack, H., (1987). *Productivity, Technology, and Industrial Development*, New York, Oxford University Press.

Pack, H., (1988). Industrialization and Trade, Hollis B. Chenery and T.N. Srinivasan (eds.), *Handbook of Development Economics*, Amsterdam: North Holland.

Pilat, D., (1993). Comparative Productivity of Korean Manufacturing: 1960–89, University of Groningen, the Netherlands, unpublished working paper.

Young, A., (1994a). The Tyranny of Numbers: Confronting the Statistical Realities of the East Asian Growth Experience, NBER Working Paper No. 4680. Boston, Mass.: National Bureau of Economic Research.

Young, A., (1994b). Comments on Pack and Page, *Carnegie-Rochester Conference Series on Public Policy*, this issue.