The Global Economy
Professor David Backus

Practice Midterm Examination 1

Revised: December 14, 2011

You have 75 minutes to complete this exam. Please answer each question in the space provided. You may consult one page of notes and a calculator, but devices capable of wireless transmission are prohibited.

I understand that the honor code applies: I will not lie, cheat, or steal to gain an academic advantage, or tolerate those who do.

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(Name and Signature)

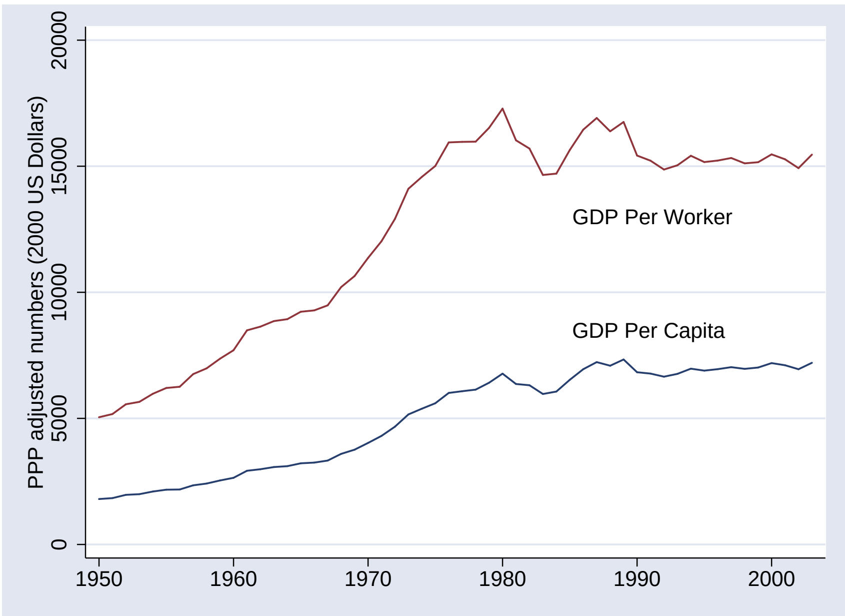

Figure 1: GDP Per Capita and GDP Per Worker in Brazil.

1. *Brazil.* As a successful European investment banker, you happen to have lunch with Rupert Murdoch. Looking for a mutually beneficial topic of conversation, you mention the limitless opportunities of Brazil, which you've seen first-hand while arranging mergers between Brazilian and European companies. Murdoch calls your bluff, and asks why you see Brazil as an opportunity, when its recent

Year	POP	Y/POP	Y/L	K/L
1950	53,443	1,802	5,045	8,559
1980	122,958	6,776	17,285	39,064
2003	182,033	7,205	15,462	37,604

Table 1: Aggregate Data for Brazil.

growth experience has been modest. You change subjects after promising to send him a short memo the next day.

Back in the office, you ask your assistant to download some Brazilian data. She collects the information in Table 1 and Figure 1. In the table, POP is population, Y is real GDP, L is employment (the number of people working), and K is the stock of physical capital (plant and equipment). Population is reported in millions; the other numbers are PPP adjusted, reported in 2000 US dollars. All come from the Penn World Tables, version 6.2.

Using this data, you do a few quick calculations. Since the figure suggests a sharp change in 1980, you decide to look separately at the periods before and after 1980.

(a) You compute growth rates of GDP, GDP per capita, and GDP per worker for the two periods. What are the important differences? (15 points)

(b) Since GDP per capita and GDP per worker are similar, you decide to focus on the latter and decompose its growth in each period into components due to capital per worker and total factor productivity. Which component accounts for the difference between the two periods? (15 points)

(c) You are looking for a positive tone to your memo. What exactly can you claim is growing in Brazil? (10 points)

Solution:

(a) We compute continuously-compounded growth rates the usual way. The results are summarized in below. With both measures, growth effectively halted in 1980. [Caveat: this answer is only as good as the data that produced it. There's been some controversy about whether this dataset ("PPP adjusted") measures real GDP appropriately. There's no question growth rates have fallen, but the magnitude may be overstated here.]

Period	Y	Y/POP	Y/L	K/L	A
1950-1980	7.2	4.4	4.1	5.1	2.4
1980-2003	2.0	0.3	(0.5)	(0.2)	(0.4)

(b) The usual growth accounting exercise. First we compute TFP (A): 247 in 1950, 509 in 1980, and 462 in 2003. Apparently TFP growth has disappeared. The growth rates of the various components are listed above. Our decomposition of the growth rate of output per worker is

$$\gamma_{Y/L} = \gamma_A + \alpha\gamma_{K/L}$$

with $\alpha = 1/3$. For the two periods, we get

$$\begin{aligned} \text{1950-1980:} \quad 4.1 &= 2.4\ (\text{A}) + 1.7\ (\text{K/L}) \\ \text{1980-2003:} \quad -0.5 &= -0.4\ (\text{A}) - 0.1\ (\text{K/L}). \end{aligned}$$

(c) Anything sensible is fine. Here's an attempt: Although GDP per capita and GDP per worker are not growing, GDP is, since there are more people, and more people working. You have no way of knowing this, but there's also a difference between the PPP-adjusted numbers reported in the Penn World Tables and Brazil's official "real GDP" data. Which you trust more is hard to say. Despite all this, it's hard to avoid concern about the Brazilian economy. Going beyond what's in the exam, I would add that Brazil now has a reasonably stable political environment, with several changes of government without major changes in economic policy. Long-term, that's a good thing, and could lead to much better performance in the future.

2. *Vietnam.* Since 1991, Vietnam's per capita GDP has been growing at an average rate of 6.75%, positioning the Southeast Asian economy among the fastest growing in the world. According to analysts, an obstacle to even speedier growth will likely be removed shortly when Vietnam joins the World Trade Organization.

   Some facts. In 2005, manufacturing and construction accounted for 41% of GDP (up from 38% in 2001) and services for 38% (from 27%), whereas agriculture dropped to 21% (from 23%). Employment is divided among the three sectors in the following proportions: 17%, 25%, and 57%, respectively (the service figure includes 10% in state employment). Female labor force participation is high by world standards, with women accounting for 49% of the labor force. According to the World Bank, school enrollment rates are 100% in primary school, 70% in secondary school, and 10% in university.

   The most notable immediate effect of WTO membership will be the scrapping of US quotas on garment imports from Vietnam. While these quotas limit Vietnamese exports to the US, some analysts warn that their removal may have a relatively modest effect: the EU's decision to waive its import quotas this year had only a small effect on shipments, probably because of strong competition from other producers, particularly China. A further difficulty is the spate of strikes in foreign-owned factories, which led the government to raise the minimum wage paid by foreign firms by 40%. See the attached article in *The Economist*.

(a) In which broad sectors is Vietnam likely to shift its production in the next five years? 20 years? Why? (10 points)

(b) To comply with the conditions for WTO membership, the Vietnamese National Assembly recently passed two pieces of legislation that may have a substantial impact on the economy. The Anti-corruption Law, which comes into effect June 1st, is intended to improve the detection and prevention of public official corruption. The Law on Investment, also expected to come into effect in mid-2006, allows investment projects worth less than \$1m to proceed without registration, and projects valued at less than \$19m will need to be registered but will not require licenses.

Describe — concretely — how each of these changes are likely to effect the economy's total factor productivity. (10 points)

(c) In your view, what government policies are likely to be most effective in raising the living standard of the Vietnamese people over the next 25 years? Why? (10 points)

Solution:

(a) In recent times, agriculture has fallen as a fraction of GDP, and the other two sectors have increased their shares. We'd expect that to continue for two reasons. One is that this is a standard pattern for developing countries, including the US 150 years ago: people move off farms. Another is that this reflects the (admittedly crude) productivities implied by the GDP and employment shares: 17% of the workforce produces 41% of GDP in manufacturing and construction, whereas 57% of the workforce produces only 21% of GDP in agriculture. Some of this might reflect differences in skill level and capital per worker across industries, but it's likely that productivity is lower in agriculture, and that market forces will reallocate people from agriculture into manufacturing — and maybe services, too.

(b) Each of these changes should reduce the cost of running a business, which will increase TFP directly. The investment law, in particular, should make it easier to start new businesses, which should facilitate the reallocation described above. As the economy shifts resources to more productive sectors, overall TFP will increase. It's the same argument we used with international trade.

(c) There are lots of sensible answers. We'd stress flexible labor markets; competitive product markets, including competition from abroad; and a legal system that enforces property rights.

3. *Miscellany.*
   (a) *Bridge to nowhere.* In the context of our production function, would the construction of an economically useless bridge in Alaska lead (once it's completed) to a change in total factor productivity? Please explain your answer. (10 points)
   (b) *Labor markets and trade.* An analyst at the OECD commented that the difficulty Italy has had adapting to increasing international trade was a reflection of its rigid labor markets, which discourage Italian businesses from the restructuring needed to compete in global markets. Do you find this argument persuasive? Why or why not? (10 points)
   (c) *Off-shoring.* The term *off-shoring* refers to the relocation of work from one country (the US, say) to another (India, for example). Greg Mankiw, Bush's former economic advisor, suggested that such trade in labor services was no different than trade in goods: the goal remains for countries to perform those tasks it does relatively efficiently. Do you agree? Why or why not? Would your answer change if you viewed the issue from the perspective of the in-shoring country? (10 points)

Solution:

(a) TFP falls. The production function is

$$Y = AK^{\alpha}L^{1-\alpha}.$$

A new bridge increases the capital stock K. If it leads to no additional output (it's "useless") then A must fall.

(b) Sounds right to me. Rigid labor markets make it difficult for the Italian economy to shift people from their current low-productivity jobs to others.

(c) Almost all economists, even liberal ones, would agree with Mankiw: have people do the jobs at which they are relatively most productive. In the long run, that produces a higher standard of living. That's as true for one country as it is for the other. Of course, individuals may be concerned with the disruption that might generate in their own lives, but there's little question where the greater good lies.

Trouble at the mill
Jan 26th 2006 — HANOI
From The Economist print edition

Strikes and pay rises afflict the new South-East Asian tiger

FACTORY workers in Vietnam have an extra reason to celebrate Tet, the lunar new year holiday that begins this weekend. Their government recently decided to raise the minimum wage in foreign-owned factories by up to 40%, starting on February 1st. Pay packets in Hanoi and Ho Chi Minh City will now start at $45 a month, the first mandated rise in several years. Experienced workers can expect an extra 7% increase on top of that.

What is especially unsettling for investors is how the workers got their extra dough. Since late December, wildcat strikes have swept through the industrial zones surrounding Ho Chi Minh City. Tens of thousands of workers joined the protests over wages and conditions. Some of these turned violent, and machines were wrecked at one Taiwanese-owned plant. Bosses claim that outside agitators stoked the protests, distributing notes at factory gates while police stood idly by.

Apparently caught off-guard, the government issued a decree earlier this month raising the minimum wage in foreign-owned factories. Most strikers have now returned to work, but some have not, and investors are fuming over production stoppages and a higher wage bill. The European Chamber of Commerce has gone so far as to write a tart letter to the prime minister, Phan Van Khai, reminding him that investors set up shop in Vietnam precisely because “the workforce is not prone to industrial action.”

At least, not until now. Workers in Vietnam have staged walkouts before, particularly over alleged mistreatment by foreign managers, but the scale and co-ordinated nature of the latest strikes are, well, striking. Some observers find it implausible that they could occur without the prior knowledge of the ruling party, which forbids independent trade unions. As in China, workers are allowed to join only a pliant, party-affiliated union.

Most of the affected factories are owned by East Asian companies, the biggest investors in Vietnam. At Song Than industrial zone, on the outskirts of Ho Chi Minh City, 80% of the factories are owned by Taiwanese, producing clothing, shoes, furniture and bicycles for export. They grumble that higher wages will drive away foreign investment, running at $5.8 billion last year, and give warning that Vietnam needs to stay competitive. “Chinese wages are higher. But the quality and efficiency are also higher, said Chen Chi Young, an official at Taiwan’s de facto embassy.

So why didn’t Vietnam crush the illegal strikes? One reason, say observers, may be internal jockeying ahead of the party congress in April, a five-yearly affair. The aim could have been to embarrass the provincial officials where the unrest began, or to burnish the leadership's credentials, or both. The factories most affected may also be a clue: Vietnam and Taiwan both claim ownership of the Spratly Islands, along with several other countries. On December 15th, Taiwan said it was building a landing strip on one of the islands.

Or perhaps the workers were simply fed up with low pay and stingy bosses, and were too numerous to repress. Vietnam has one of the world's fastest growing economies. Now it is learning that higher output means higher expectations.

The Global Economy
Professor David Backus

Practice Midterm Examination 2

Revised: December 14, 2011

You have 75 minutes to complete this exam. Please answer each question in the space provided. You may consult one page of notes and a calculator, but devices capable of wireless transmission are prohibited.

I understand that the honor code applies: I will not lie, cheat, or steal to gain an academic advantage, or tolerate those who do.

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(Name and Signature)

1. *Mexico and Turkey.* Flextronics is an original equipment manufacturer of electronics, making products around the world that are sold under other brand names. It is currently looking for a location to produce the next generation Xbox for Microsoft. They would be sold (primarily) in the US and Europe. Your mission: to provide a quick assessment of the productivity and labor market conditions for two countries on the short list, Mexico and Turkey. Mexico, of course, has both proximity to the US and access to the US through NAFTA. Turkey has proximity to Europe.

   Recent data for the two countries includes

	POP	Y/POP	L/POP	K/Y	Education	Hours
Mexico	104.3	7938	0.423	2.53	7.4	1871
Turkey	71.3	5633	0.477	2.03	5.4	1918

   POP is population (millions), Y is GDP (2000 US dollars), K is capital (2000 US dollars), Education is years of school, and Hours is annual hours worked per employed person. Y and K are PPP-adjusted. Education and Hours are from the OECD's *Employment Outlook*; the other variables are from the Penn World Tables.

   The World Bank's Doing Business website includes these measures of labor market flexibility:

   - Mexico: difficulty of hiring workers (33), rigidity of hours (40), difficulty of firing workers (70), and cost of firing (52 weeks of salary).

- Turkey: difficulty of hiring workers (44), rigidity of hours (40), difficulty of firing workers (30), and cost of firing (95 weeks of salary).

Low numbers indicate greater flexibility in each case.

(a) Which country has higher total factor productivity? (15 points)

(b) Which country holds more risk of labor issues? (15 points)

(c) All things considered, which country do you think is the better prospect? Why? (10 points)

Solution:

(a) Calculations below.

Country	Y/POP	Y/L	K/L	TFP (A)
Mexico	7.938	18.77	47.48	5.18
Turkey	5.633	11.81	23.97	4.10
Mexico/Turkey	1.41	1.59	1.98	1.27

(NB: I shifted the decimal point to make the numbers look more reasonable.)

TFP is computed the simplest way: from the production function

$$Y/L \quad = \quad A(K/L)^{1/3}$$

If you look at the numbers, you see that Mexico has substantially higher output per worker. But that reflects, in part, a large disparity in capital per worker (98%). Once that's taken into account, we see that there's only a 27% difference in total factor productivity. Since we'd expect Flextronics to bring the same amount of capital to both locations, this is the relevant comparison. There are, of course, many reasons why TFP might differ, so it might be worth more thought.

(b) Both countries have some labor market issues. The biggest difference seems to reflect firing: the indicators suggest that it's easier to fire workers in Turkey, but more expensive. Cost, quality, and flexibility of the labor market are likely to be central issues to this decision.

(c) This part is up to you.

2. *Investing in China and India.* You work at a British asset management company and have been asked to assess the potential of starting a country fund: a mutual fund for UK investors that would invest in China or India. You realize that both countries are growing rapidly, China more so to date than India, but you

Indicator	China	India	UK	Source
GDP per capita (USD)	5,300	2,700	35,300	CIA Factbook
GDP growth (%)	11.2	8.4	2.9	The Economist
Competitiveness	4.6	4.3	5.4	WEF
Regulatory quality	4.8	4.9	9.8	Governance Matters
Rule of law	4.6	5.8	9.3	Governance Matters
Investor protection	5	6	8	Doing Business
Financial sophistication	3.3	4.9	6.2	WEF
Macro stability	6.0	4.2	5.2	WEF
Control of corruption	3.8	5.3	9.4	Governance Matters

Table 2: Measures of performance and institutional quality in China, India, and the UK. Competitiveness index is an overall measure of institutional quality.

wonder whether there are important differences in the institutional environment that might also be relevant.

Your summer intern collects the data in Table 2 and explains what each of the indicators means. In addition, she points out that the World Economic Forum (WEF) collects survey responses about the biggest problems faced by businesses. In China they are: access to financing, bureaucracy, corruption, and policy instability. In India: infrastructure, bureaucracy, labor regulations, and corruption. And in the UK: taxes, education of workforce, and bureaucracy.

Based on this information and your own experience, which country would you recommend? Why? (30 points)

Solution: This is a relatively unstructured question, there's no single best answer. A good answer probably touches on the following points:

- Country performance. The guess is that returns will reflect country performance. To the extent China is growing faster, it's probably the better bet.

- General institutions. Institutions are helpful for predicting future performance, and for indicating whether that growth will be claimed by the people who produce it. If you look at "competitiveness," the WEF's overall measure of institutional quality, China ranks (slightly) higher. Most measures will find little difference between them, this one favors China by a small amount. Corruption is an issue in both places, although there's some indication that India controls it better. Bureaucracy is an issue in both countries. Political instability is mentioned as an issue in China, and could be relevant in the sense that changing regulations are difficult to deal with.

- Investment-specific institutions. There are specific institutions that pertain directly to financial markets; as we've seen, it takes a lot of regulatory infrastructure to make financial markets work well, even in developed countries. Here India looks somewhat better than China. Overall regulatory quality is better, as are investor protection, rule of law, and financial sophistication. Access to financing is an issue in China, but that's irrelevant to this endeavor.

- Bottom line. Your call. It looks to me like India has, in some respects, more developed institutions for capital market activity. It's partly a matter of history, partly of how the countries have evolved over the last 20 years. It takes a fairly sophisticated set of institutions to get bond and equity markets to work effectively, and China probably has further to go in this dimension right now.

Grading: 30 points for an articulate well-reasoned argument that hits these points or otherwise makes a persuasive argument with the information given in the question. Partial credit for other answers.

3. *Miscellany.*

   (a) *Jobs.* Senator Joe Lieberman once said something like: "The only way to increase jobs is to make hiring attractive to businesses." Use an analysis of the minimum wage to argue for or against his statement. (10 points)

   (b) *Infrastructure.* An article posted on the discussion board suggested that infrastructure investments (highways, ports, telecommunications) not only increase the stock of capital, they can also increase productivity. Do you agree? Why or why not? (10 points)

   (c) *Trade balance.* Some have suggested that the US trade deficit ($NX < 0$) reflects inadequate saving, while others have suggested that investment is excessive. In what sense does each claim contain a grain of truth? What evidence would you use to support one claim over the other? (10 points)

Solution:

(a) Sounds right to me. The problem with the minimum wage is that it makes hiring people less attractive to firms (more expensive), so they do less of it.

Grading: 10 points for clear elucidation of this point and effective use of supply and demand diagram.

(b) Infrastructure is clearly investment (new capital goods), so it increases the stock of capital K, which increases output Y. It could also increase TFP through a number of routes: perhaps a bottleneck makes particular investments worth more than the production function suggests. Or it allows more efficient production through some other means: roads allow producers to sell to a larger market and exploit economies of scale; telecommunications might make use of efficient IT possible; and so on.

Grading: 5 points for a clear argument that recognizes the distinction between capital and productivity, 5 for a good argument that infrastructure might raise productivity.

(c) The grain of truth comes from the flow identity:

$$S = I + NX.$$

If $NX < 0$, that could come from low S or high I. If you look at this for the US, you see that I has been stable for 50 years, but S has fallen over the last 25 years. In that sense, it's the change in S that is associated with the change in NX.

Grading: 7 points for noting the connection with the identity, 3 for adding something to it that makes sense for the US.