Capital and Its Complements in Economic Growth

J. Bradford DeLong

We economists are professionally required by our discipline to be of at least two minds on every issue: on the one hand, but on the other hand. This sense of detached objectivity prompted Harry S. Truman's oft-repeated remark that he desperately wished to find a one-handed economist. Usually, however, the "on the one hand, on the other hand" structure of economic argument is more of a pose than a reality. It is pro forma to give the arguments on both sides of an issue, but one of the hands usually is strong and capable, while the other one is palsied. The mind behind one hand is strong, confident, and loud; the other whispers "but what if?" in the deep recesses of our brain.

Yet on today's issue—capital and its complements, the role of saving, investment, and international capital flows in modern economic growth—the "on the one hand, on the other hand" structure of the argument is definitely not a pose. On this topic economists today should be and must be of at least two minds, while vigorously gesturing with two if not three hands, as they try to assess what is going on in the global capital markets and what impact this has had and will have on modern global economic growth. This mode of proceeding has its benefits: we are genuinely uncertain, and we are genuinely confused. It has costs as well: the thread of the argument is hard to follow, if indeed there is a dominant thread, or a coherent, sustained argument to be advanced. After all is said and done, one ends up confused—but at least one's confusion has been raised to a more sophisticated, subtle, and complex level.

This paper will therefore present a wide-ranging and rambling look at the issue of capital and its complements in promoting economic growth. The analysis proceeds in five stages:

- Historical patterns: what has been the relationship between capital and growth in the past, and what economists have thought about that relationship.
- The capital accumulation gradient: the increasing difficulty, as industrialization proceeds, that poor developing countries have in raising their capital intensities to levels that allow use of the most modern productive technologies.
- The neoliberal bet: the hope so confidently and widely shared a couple of decades ago that international capital mobility would greatly aid in helping poor countries climb up the capital accumulation gradient—that heightened capital mobility would be able to produce rapid industrialization and growth throughout the world.
- The unexpected reversal: the fact that international capital mobility over the past two decades has expanded much more rapidly than almost anybody had predicted, but has expanded in the wrong direction. The poor have not been borrowing from the rich to finance their investment and industrialization; instead, the rich have on net been borrowing from the poor to finance their own consumption.
- What is to be done?: the conclusion is the least confident part of the paper, because it is not at all clear what is to be done.

Think of this paper's discussion as a classically structured five-act tragedy. The tragic flaw is the assumption that the relationship between capital flows, investment, and growth today and tomorrow would be the same as it had been in the past—specifically, in the late nineteenth century, when capital flows to capital-scarce but resource-rich regions had powerfully fueled industrialization and development. The critical reversal of fortune comes when the unblocking of the barriers to large net capital flows sees the flows proceed at an unexpectedly large intensity—but in a large and destructive way. The dénouement has yet to be written; in fact, it will be our job over the next decades to write it.

Act I: Capital, Growth, and History

Let's begin with economic history by reviewing what professional economists have thought about the capital stock and its importance for economic growth over the past two centuries, starting with Adam Smith, the founding father of modern economics, and his magnum opus, *An Inquiry into the Nature and Causes of the Wealth of Nations* (1776). For Smith and his successors up until 1950 or so, capital was absolutely essential for economic growth. At the foundation you needed good institutions: "security of property and tolerable administration of justice," as Smith called it in 1776, little more than which was required, in his view, to raise a country's economy to the maximum feasible heights of prosperity. If these fundamental institutions were right, then landlords, merchants, and manufacturers would invest and improve their assets. In investing and improving, they would add to the nation's capital stock:

> In all countries where there is a tolerable security [of property], every man of common understanding will endeavour to employ whatever [capital] stock he can command, in procuring either present enjoyment or future profit.... A man must be perfectly crazy, who, where there is a tolerable security, does not employ all the stock which he commands, whether it be his own, or borrowed of other people. (Book II, Chapter I)

And a larger capital stock would mean thicker markets, a finer division of labor, and a more productive economy. A society that has a sophisticated division of labor would have very high productivity, and that process was how you got to the wealth of nations.

Reverse the process and you had the poverty of nations, a result that Smith believed he saw in the Asia of his time:

> In those unfortunate countries, indeed, where men are continually afraid of the violence of their superiors, they frequently bury or conceal a great part of their stock, in order to have it always at hand to carry with them to some place of safety, in case of their being threatened with any of those disasters to which they consider themselves at all times exposed. This is said to be a common practice in Turkey, in Indostan, and, I believe, in most other governments of Asia. (Book II, Chapter I)

Over the first 175 years of the economics profession, Smith and his successors viewed capital as absolutely essential for any episode of sustained

economic growth. We economists were by and large capital boosters, and our mantra was that thrift, saving, investment, and wealth accumulation is the magic formula that gets us to where we want to be. The last and fullest expression of this line of thought came in 1960 with W.W. Rostow's *The Stages of Economic Growth: A Non-Communist Manifesto*. In Rostow, a nation's key to joining the industrial economies and triggering self-sustained modern economic growth came when the economy (and the polity) reached the point where it could suddenly—over a decade or a little more—double its private and national savings and investment rate. That, and of course, the sociological, political, and other economic processes that triggered that doubling and sustained it, was what was most needed.

It was in large part because this line of thought elevating the overwhelming importance of capital had been so dominant—essentially unquestioned—that the work of Solow (1956, 1957) and Abramovitz (1956) came as such a shock and had such great influence. They made the assumption that the social marginal product of capital is well captured by the individual returns that corporations and other businesses earn as profits and that savers and investors receive as income. Essentially, they each said: "Wait a minute. Under that assumption, capital is not that important after all." Looking at the sources of productivity growth and increases in living standards in the United States over the twentieth century, both Abramovitz and Solow calculated that something like 75 or 80 percent did not come from increasing the capital-output ratio—at least not if the private marginal product of capital was taken as an indicator of the social marginal product. Instead, the keys to growth and development appeared to be things other than a rise in capital intensity as measured by the capital-output ratios: skills, education, technology broadly understood, and improvements in organizational management.

Then in the 1990s there came a partial reaction against the conclusions of Abramovitz and Solow. Mankiw, Romer, and Weil's very influential 1992 cross-country growth study found, in its final and preferred specification, as capital's half-share α in the Cobb-Douglas production function, signs that capital was more important in growth the further down the income scale you looked. Profit share-based estimates had produced estimates of α in the range of one-third to one-quarter. It makes a

significant difference whether output per worker is linear in the savings-investment rate, as Mankiw, Romer, and Weil's coefficients suggested, as opposed to the alternative of growing with the square or cube root of the savings-investment rate.

DeLong and Summers (1991) found that the post-World War II cross-country dataset contained an extraordinarily strong correlation between growth and *private* investment in machinery and equipment. Public investment by state-owned monopolies did not do it. Investment in structures did not do it. The correlation was very strong in OECD-class and middle-income economies. And it appeared to remain even when you looked far down at the very bottom of the cross-country income distribution—high-investment low-growth Tanzania and Zambia being neutralized in the dataset by still higher investment and extraordinarily rapid growth in their neighbor Botswana. The correlation appeared to arise whether the high rate of equipment investment was driven by a high domestic savings rate, large capital inflows, or low relative prices of machinery and equipment that translated a moderate savings effort into a substantial investment outcome.

At the conceptual level, this makes considerable sense. A lot of what we economists think of as total factor productivity is, in one way or another, embodied or has essential requirements in the shape and magnitude of the collective capital stock. It is not unreasonable to think that simply piling up more capital without having better organizations or better technology does not do much good. Yet it is also not unreasonable to think that a high level of capital is an essential complement to accomplishing the things that really do matter—and that the things that do matter the most matter the most only if capital is not a significant constraint. In the framework of Rodrik (2004), a shortage of capital can be but not must be a binding growth constraint: a place where "the biggest bang for the reform buck can be obtained" if it is "the most significant bottleneck in the economy." But if this is not the case, then a lack of capital is not the main problem.

From this perspective, large estimated coefficients in cross-country growth regressions found either for investment in the aggregate capital stock, as shown in Mankiw, Romer, and Weil (1992), or for investment in the machinery capital stock, as in DeLong and Summers (1991), means

three things: first, that high investment serves as a marker that other binding constraints to growth are absent. Causation thus runs both ways: a rich country where things are going well, profits are high, and property is secure will be a natural place to invest. High investment is a cause of prosperity and also a signal of prosperity, showing that things are going right. Second, policies aimed at spurring investment may well prove unsuccessful and counterproductive if there are other binding constraints to growth—and if investors are smart enough to recognize that these other binding constraints mean that the rate of private return on investment is not likely to be high. Third, in a significant fraction of times and places a shortage of new capital is the binding constraint on growth, and that relaxation of this constraint does indeed reveal a very high marginal social product of capital.

Act II: Population, Relative Price Structures, and Growth

There are several steps to argue that a shortage of capital is frequently an important binding constraint on growth in developing countries. The first step is to note that poor countries are still, for the most part, rapid-population-growth countries. China and India either are approaching zero population growth, or would be approaching zero population growth if not for the enormous momentum currently embedded in the age structure. But there are still a huge number of countries—and not just the countries in Africa—where populations are growing rapidly. This is because countries with low levels of prosperity and low levels of literacy are countries where people find it advantageous, for private insurance reasons, to have relatively large numbers of children. High mortality rates mean that only ample reproduction can now ensure that one is outlived by one's descendants. And low education levels mean that children soon turn from mouths into hands, and so add to the household's productive potential in the relatively short run. These facts of life mean that population and labor force growth is relatively fast, which means that unless domestic savings in these countries goes through the roof, domestic capital-output ratios will be relatively low.

When, as in Mexico today, your population is growing at between 2 and 3 percent per year, it requires a huge domestic savings effort to

increase your capital-output ratio—unless, that is, you can ship a huge share of that increase of the labor force north over the border and lessen your own domestic problems of growth. Thus rapid population-growth countries will be relatively poor countries, which will be rapid population-growth countries.

The second step is to take a look at relative poverty and real investment, as depicted in two interesting figures from a paper by Chang-Tai Hsieh and Peter Klenow (2003). Figure 5.1 shows investment rates as a share of GDP plotted against GDP per worker, using a purchasing power parity concept and common international prices worldwide. Figure 5.2 shows the same investment rates at domestic prices. While Figure 5.2 is flat, Figure 5.1 shows a sharp rise from 5 percent to 25 percent of GDP as you move from the poorest to the richest countries in the world.

Relative to the price of output, the price of capital broadly understood, according to Hsieh and Klenow, varies by a factor of five and varies systematically with income. If you are Tanzania or Mali or even Bangladesh, it takes 4 percent of GDP devoted to national savings and domestic

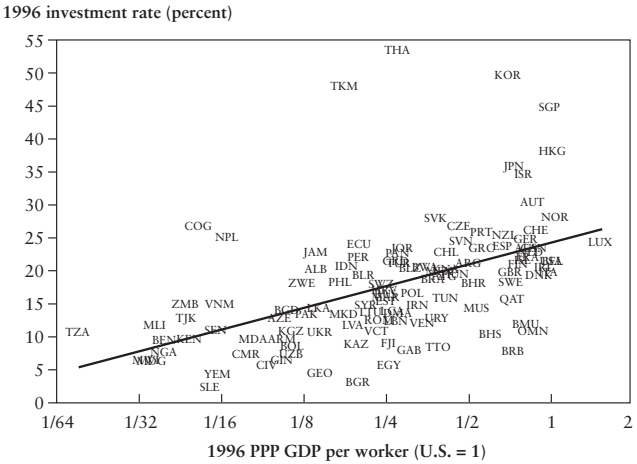

Figure 5.1
Investment Rates at International Prices
Source: Hseih and Klenow (2003).

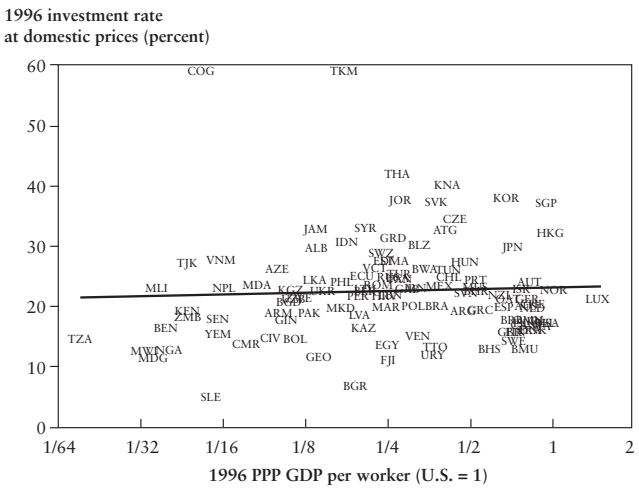

Figure 5.2
Investment Rates at Domestic Prices
Source: Hseih and Klenow (2003).

prices to produce a 1 percent real investment share of GDP when real investment is measured at standard international prices. This implies an extraordinary tilting of relative price structures against the poor countries of this world: it requires enormous domestic savings efforts to get even tolerable amounts of real capital to use for development.

If we are right in our guess that capital is close enough to being a composite commodity such that we can talk about capital and labor, and still make coherent sense looking all the way across the world's income distribution, then for this reason alone a relatively poor country is going to find it next to impossible to achieve a reasonable capital-output ratio solely through its domestic savings, because of this tilting effect of relative price structures. This is a much stronger disadvantage of backwardness than the crowding of markets for primary products stressed by the original statements of the price-structure-and-underdevelopment thesis in, for example, Prebisch (1959). It also points out a defect in the thesis that holds that one reason poor countries are poor is that their citizens or their leaders or their governments have by and large chosen to consume rather than to save. That is simply not the case: savings rates on a national level have little or no partial correlation with prosperity. It is relative price structures, and thus real investment shares of GDP as measured in international dollars, that have this high correlation.

The reason for this striking association is clear. Modern transportation via container ships makes the cost of transporting durable commodities across oceans essentially zero. Thus the nominal prices of tradeable manufactured goods will be close to the same all across the globe. What will not be the same are the nominal prices of services provided by unskilled labor: those will be roughly proportional to the product of the real wage—for which read "real labor productivity"—and the equilibrium real exchange rate. Any exchange rate that balances trade will thus produce a very high price of manufactured goods in terms of services and unskilled labor in poor countries. And that is the tilt of the relative price structure against investment, which is heavily weighted toward the price of manufactured tradeable goods.

Act III: The Neoliberal Bet on International Capital Mobility

Thus for poor countries to bootstrap themselves by their own efforts alone into rapid sustainable growth is very difficult. Hence the neoliberal bet: the hope that international capital mobility would come to the rescue, first by relaxing this binding capital constraint imposed by the tilt of relative price structures, and second, by reducing the scope for corruption and rent seeking via the economic controls imposed to prevent international capital mobility. Courtesy of Christopher Meissner and Alan Taylor at this conference, we have already heard about the historical precedent: Britain before 1914. According to Meissner and Taylor, Britain's net foreign assets in 1913 were equal to 20 months' GDP. Net foreign assets in 1913 equaled 60 percent of Britain's domestic capital stock.

A huge amount of industrialization before 1913 in the resource-rich, temperate periphery was financed by the willingness of British investors to commit their capital overseas—not just to build up Britain's capital stock, but to build up capital stocks abroad as well. (Let's ignore the fact that the British investors in the Erie Railroad found that Jay Gould

stole two-thirds of their money, not least by taking a huge leveraged long position in the stock and then announcing his retirement from the company. He retired, the stock price boomed, and he pocketed something like 50 percent of the present discounted value of the fact that he would no longer be around to loot the company.) The point is that this pattern of British foreign investment between 1870 and 1913 worked according to the textbook expectation that capital would flow to regions where it was scarce and boost growth there. Thinking that we would learn from history, and that this history would repeat itself at the end of the twentieth century and the start of the twenty-first, has proven to be the tragic flaw of the contemporary era of globalization that we are now witnessing.

Fifteen years ago I certainly shared this neoliberal belief that international capital mobility was perhaps the best thing that could help the world economy. It held the promise of allowing the relatively rich core to fund the industrialization of the poor periphery. Back in 1993 at then-current exchange rates, China's entire capital stock was $2 trillion, at a time when the capital stock of the United States was $20 trillion. All that you would have had to do to double the capital stock of China through international capital mobility was to gradually, over the course of a decade, move 10 percent of the capital stock of the United States across the Pacific. That would have done truly wonderful things.

Thus the neoliberal hope at the start of the 1990s was essentially to place a large economic policy bet on capital mobility: to trust that very large and very poor labor forces across the world would turn out to be very attractive to global capital free to flow. If relatively small amounts of technology transfer could be used to make such labor even a small fraction as productive as industrial core labor, the incentives for capital to flow toward the periphery like a mighty river would be overwhelming. Before 1914 it was natural resources that had provided the irresistible incentive for international capital mobility toward a periphery composed of economies like Australia, Canada, New Zealand, and the United States, but also Argentina, Chile, Hong Kong, Kenya, Malaysia, Singapore, South Africa, and Uruguay. The hope was that, in some respects, this pre-1914 process could be replicated. That would cut at least a generation off the time needed to make a truly humane and prosperous world economy.

Act IV: The Unexpected Reversal

But that is not what has happened. We know the unexpected outcome: the current situation of global imbalances. Yes, there have been large flows of capital going both ways around the world. But the huge increase in gross flows is not the big story. The big story is that the expected large net flow of capital from the rich to the poor countries of the world seeking high profits from reducing disequilibria between the wages and the relative productivity of labor has simply not happened. Instead, the principal thing that occurred was an enormous flow of capital from the periphery to the core, a flow perhaps best tracked in real time by Brad Setser of the Council on Foreign Relations, which is available on his weblog, http://blogs.cfr.org/setser/.

Personally, I first saw this reversed trend at work in 1994, when I was sitting at the Treasury, blithely writing memos about the North American Free Trade Agreement (NAFTA). This agreement promised to provide Mexico with guaranteed tariff-free access to the largest consumer market in the world. Thus, we modeled that there would be an extra $20 to $30 billion a year of capital outflow from the United States to Mexico as companies sought to take advantage of Mexico's new long-term comparative advantage as a manufacturing production platform. The expectation was that capital inflow into Mexico would support a relatively high value of the peso for a substantial time—and hence produce immediate benefits from NAFTA to Mexico in terms of an investment boom and a higher level of real consumption because American imports would be available on easier terms. Hence, I argued, the late Rudiger Dornbush was almost surely wrong when he worried in the early 1990s about the state of the Mexican peso and the possibility of yet another Mexican devaluation crisis.

Well, as so often happened, Dornbusch proved smarter than me. It turned out that $20 billion to $30 billion of capital a year did flow from the United States to Mexico as American firms sought production platforms. But it also turned out that what looked to be $30 billion to $40 billion a year of capital flowed from Mexico to the United States. Relatively rich Mexicans took a look at the country's monetary and

political instability. They decided that in the event that something went really wrong from their perspective in Mexico and they had to flee across the Rio Grande in a rubber boat, it would be much better to get to Texas and have a large dollar-denominated asset account waiting for them in New York, rather than run the risk of having all of one's money back in Mexico in the wake of whatever political instability led one to flee in the first place.

In addition, there was and is a belief, stronger outside the United States than within it, that the marginal product of capital within the United States is high, that there is a capital-technology complementarity, and that investing in the United States is the way to take advantage of this differential and make a profit from this special relationship. It is indeed the case that U.S. labor productivity is now 35 percent higher than it was back in 2000, with, as best as we can see, real wages remaining exactly the same. That difference represents a huge shift of income in the direction of capital. These ratios represent huge potential profits, which attract foreign investment. It is not just political risks of investing abroad that are driving the long-term inflow of capital to the United States, but attributes in the American economy that make it attractive for foreign capital investment.

Yes, there are benefits to international capital mobility. But for most of the past generation and looking into the future for the next, the market's message is that those benefits do not include a relaxation of the capital constraint and thus an acceleration of growth in the global periphery. The dominant factor is not that the periphery does not offer an attractive labor force from which capital can profit. The compelling attraction is that the core—especially the United States—offers a form of protection for capital against unanticipated political disturbances. Since 1990 global investors have valued the American-provided political risk insurance that they can obtain by placing their money in the United States more than U.S.-based companies have liked the idea of producing abroad in places where the wages of labor are lower.

Dwarfing whatever private insurance against political risk was purchased by the inflow of private capital to the United States was the public purchase of political risk by emerging market governments, especially the government of China. Such large inward capital flows are a very good

thing for China's state council: 300 million Chinese people living on the coast, largely in the cities, and 900 million people, most of whom are still desperately poor, residing in the interior. There are enormous pressures to move China's workers into more productive urban and nonagricultural occupations as fast as possible. The only guaranteed way to do this is to put them to work in coastal manufacturing and in supporting occupations.

This development strategy requires that somebody be willing to buy the products of China's manufacturing sector. Who is the world's importer of last resort? The United States. What would the consequences for China be if it could no longer think of increasing its exports by 25 percent or more per year? With its current rates of internal migration, there would be extraordinary economic, extraordinary social, and probably extraordinary political consequences as well if this export growth were curtailed. Inward capital flows are good for the world's rich, who are diversifying their portfolios into the core in a major way. The rich in the periphery can now sleep soundly, knowing that they have assets in a safe place, in case they have to flee the country in a rubber boat. Or, if their great-grandchildren might want to live in the United States, having lots of property in the United States now is a good way to get a senator to write a supporting letter to the Immigration and Naturalization Service. But as the record of the last two decades has shown, contrary to prior expectations, global capital mobility does not appear to be a good way to relax whatever aggregate capital shortages serve as severe growth constraints on emerging markets.

Yet recognition of these facts came relatively slowly.

At first the consensus was that the inflow of capital to the United States was largely due to cyclical factors. The 1990s, now an eternity ago, saw U.S. Treasury Secretary Lawrence Summers attribute the pattern of capital flows to imbalances in the business cycle, and warn that the world economy had to get the business cycle back into balance and could do so either "by balancing up or balancing down." In Summers's view, the U.S. current account deficit could not be long sustained at its then extraordinary level of $200 million a year for very long. 2007 saw an American current account deficit nearly four times as large as the one that Secretary Summers had said was about to become unsustainable nearly a decade before.

Then the consensus shifted to believing that the large net capital inflows to the United States were mostly the result of policy mistakes that had recreated the large U.S. budget deficits of the Reagan era. Somebody had to buy the newly issued debt of the U.S. Treasury, and foreigners were a natural set of people to buy and hold it. Then the consensus shifted to seeing the capital inflow as the result of the U.S. housing bubble—the fact that all of my neighbors in California have been using their houses as gigantic automatic teller machines to pull out huge amounts of equity to then spend on the style to which they would like to become accustomed.

Those who warned—most aggressively, economist Dean Baker of the Center for Economic and Policy Research—that the housing price appreciation of the 2000s was not entirely the result of what Ben Bernanke termed the global savings glut, but was instead a bubble that would prove a dangerous source of financial instability, have been proven correct. In retrospect it is difficult to imagine what those who approved adjustable-rate low downpayment mortgages were thinking. There were always large tail risks involved in such mortgages coming either from employment or interest rate changes, and it would have been proper for these risks to have been much more thoroughly diversified. Doctors living in suburban San Francisco should not be in the business of bearing such risks. Neither should highly leveraged investment banks, which have an originate-and-sell business model.

But does this mean the low interest rate policies of the United States in the early 2000s were a policy mistake? Would we really have a better world if interest rates had not been lowered so much in the early 2000s, and all the labor structurally displaced from the dot-com and telecommunications busts had gone into unemployment? I do not believe so—although one has to grant that financial regulators would have served the public better had their communications strategies placed more emphasis on the inappropriateness of individuals bearing idiosyncratic financial risk, and both low downpayments and adjustable-rate mortgages are large sources of idiosyncratic risk.

The net flow of capital into the United States has been good for American consumers, who have been able to borrow very cheaply and spend $90,000 on a kitchen renovation. But is this easy feeding of America's appetite for consumption truly a good thing? Shouldn't the United States's domestic savings rate be higher? The old Solow model's golden rule of thumb is that national savings rates should be equal to capital shares. Moving to a framework that, appropriately, allows for greater time discounting, either through more steeply declining marginal utility of wealth or pure time preference, reduces that prescription somewhat, but still leaves America more likely than not to be in a situation in which it is short of savings.

This influx of capital to the core has been good to savers and governments abroad seeking insurance and—so far—better investment returns. It may well have been good for the core by offering it capital to fund consumption on favorable terms at low interest rates. But it has not been so good for labor in the periphery. The hopes of seeing capital flowing from the rich core to the poor periphery, producing higher capital-output ratios out on the periphery, and transferring technology and boosting real wages for those who are not at the top of the income distribution, have really not been realized.

And there remain today the risks of sudden stops and reversals in international capital flows that could make the subprime crisis of 2007–2008 look like a Sunday afternoon picnic in Battery Park.

Act V: Remains to be Written

This brings me to the final act: what is to be done? That is for us to decide. And I have no answers, in part because the causes that have led us to this somewhat unexpected point are complex in origin, and so must be the solutions. I will, however, suggest three things that must be considered as we grapple with the situation we now face. First, we need to recognize that the core is not a net capital provider to the periphery in the current generation, there is no sign that it is going to be, and that is a bad outcome. Second, even though net international capital flows are going the wrong way, there are still substantial gross capital flows outward. We can hope that the gross outward capital flow from the core to the periphery will carry along with it the institutions and managerial expertise that have made people so wealthy in the advanced economies. Third, we need

to worry about tail risks, sudden stops, and why financial markets have not been appropriately pricing the risks generated by large-scale persistent inflows of capital to the core of the world economy.

In 2008 the global economy is developing magneto trouble, as John Maynard Keynes put it 75 years ago. What it needs is a push—more aggregate demand. In the United States, the weak dollar will be a powerful boost to net exports, and thus to aggregate demand. But from the perspective of the world as a whole, net exports are a zero-sum game. So we will have to rely on other sources of aggregate demand to fuel the global economy.

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Comments on "Capital and Its Complements in Economic Growth" by J. Bradford DeLong

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I approached this question from almost the opposite end as Brad, but ended more or less in the same place as he does. The equalization of the capital-labor ratio, which is depicted in the first slide of Brad's presentation, is the idea that the capital-labor ratio varies a lot across the world. Wouldn't it be nice if capital moved to those countries that had less capital, and equalized the capital-labor ratio? Well, the fact is that everything we know in development economics says that capital just does not move in this manner. Let's forget about capital flowing from the United States to India, and instead talk about how fast capital moves within a developing country. I'll spend some time making this point.

One way of looking at the cost of capital mobility is to compare lending and deposit rates within the same sub-economic region. This answers the question of what is the cost of moving capital from someone who has money to someone who needs money. The examples I will cite will usually be within the same town or same region, and often even within the same marketplace.

Another way to consider this matter is to compare lending rates for different borrowers by asking, what would be the additional cost of moving capital from borrower A to borrower B? Let me just give you some facts. One of the biggest reports on this topic was financed by the Asian Development Bank. The study was conducted in many countries, and I'll come back to the overall results, but for now I will concentrate on a subreport for India (Dasgupta 1989). For a variety of significantly sized nonbank intermediaries, it examined the difference between deposit rates and lending rates. The differential is on the order of 25 to 30 percent, when the base deposit interest rate is 10 to 12 percent. So the gap

between the lending rate and the deposit rate is much bigger than the deposit rate itself. This is a scenario where inflation rates average 5 percent and are pretty stable, not a scenario where there is a huge amount of inflation risk. The figures are very similar for Pakistan—in a very well-known study by Irfan Aleem (1990), the average interest rate charged by lenders was 78.5 percent, while the opportunity cost of capital to these lenders was 32 percent. These lenders were already borrowing money at very high rates. If the average Pakistani put his or her money in the bank, s/he would have earned a 10 percent interest rate. These gaps reflect huge orders of magnitude, and under these conditions capital is not moving to those people who are saving money at a 10 percent interest rate. In principle, household savers could be lending to those guys who are paying 78.5 percent, but that is not what is happening.

Many of these cross-country studies report similar facts about different borrowers. Once again, from the report on India by Dasgupta that I mentioned earlier, you see interest rates on term loans for less than a year vary between 48 percent annually and 5 percent per day. Five percent per day is 16,000 percent per year. For longer loans the variation is less, but still enormous. In the Asian Development Bank study I mentioned, the mean interest rate was 78 percent, while the standard deviation was 38 percent. So, if you do standard division, the mean was between 2 percent and 150 percent. This wide divergence is not just some South Asian perversion of financial markets; it is also true of other countries located elsewhere in the developing world. In Thailand, the interest rate differentials go from 2 percent to 7 percent per month, so that's an enormous difference. I could go on and on. Suffice it to say that this is a very established fact of micro-level development economics: interest rates within very small markets are not equalized.

A common first reaction to this idea often assumes that this inequality of rates is due to huge default risks, but default risk plays a very small role. In the Indian study I cited, while the handloom financiers and the financial companies have big differences in their default risk, this only explains 7 percent of the total interest cost. But since the total interest cost is 70 percent, this default risk only explains about 5 percent of the interest cost. So default risk really does not explain anything. In terms of default rates, the study from Pakistan documents a median default rate of 2 percent.

A second response is to ask if the market is competitive. The study by Aleem was conducted in 1980–1981 in exactly one semiurban marketplace in Pakistan with 14 professional moneylenders, all of whom individually calculated the cost of lending. The study found that the cost of lending essentially explained the interest rate, and there was no obvious evidence of excess profits. So why is moving capital between subregions so costly? There is very little actual default but a very high risk of default. I think that this risk is not emphasized enough. Passive default is very important. Small businesses often have very poor cash management practices and these firms often do not deal very well with risk. Active default can also take place; assets can vanish overnight. People can just walk away. Courts can take forever to rectify such situations, so all of these risks make collecting loans very hard. So, the obvious answer is that lending rates are high because preventing default is costly.

Why is preventing default so costly? One of the things necessary to understand is the economics of preventing default. I think at the core of this concept is one idea, which I will call the monitoring multiplier. It goes the following way: when the cost of monitoring goes up a little bit, the interest rate goes up to cover that cost. When the interest rate goes up, of course default becomes more likely, so then you have to monitor a bit more to deal with this extra increased default risk. In turn, this raises interest rates a little bit more, so eventually that multiplier can become very large. You can sort of compute that multiplier on a specific model and that multiplier can be very large. So, the default multiplier says that small difference in monitoring costs can lead to large difference in interest rate.

Another very key fact is the fixed cost of monitoring. For example, someone has to go and check addresses to make sure you know where the borrower lives—that's a fixed cost. The smaller the loan, the greater is the burden of the fixed cost. So, one might ask, why don't you just make large loans. Well, big loans carry the opposite risk. If you allow someone to borrow a hundred times more than he may need, his incentives to use the money properly go down. In sum, a potential lender is between a rock and a hard place. You don't want to lend a lot to people because of the collective default risk, but if you lend only a little, then the margin costs kill you. Between these two alternatives, it is not hard to understand why interest rates behave this way in developing countries.

Consequently, we observe the behavior that these observations predict. First, lots of funds can't borrow because they are the wrong scale. You've already seen that certain funds are willing to pay interest rates of 50 or 60 or 70 or 80 percent. These are not small funds. These finance companies essentially lend to large traders. We did a study where we use the fact that there was a policy change in directed lending to a particular set of funds in India, and estimated a marginal product of capital from that change. We found that these loans were made to very large firms in the 95th percentile of the fund size distribution. The funds that are affected by this particular manipulation have a 90 percent marginal product of capital. This does not mean that every firm in India is earning 90 percent on their capital investments because if you look at the increment of capital output ratio (ICOR) and invert it, you get an upper bound on the marginal product of capital. If you take that upper bound, you find that it is less than 25 percent, so some funds must have very low returns on capital as well. This is exactly what you would expect to find in a situation where capital is immobile. If you happen to have money, you keep it to yourself. If you happen not to have money, you don't get it. Hence, the marginal product of capital varies enormously. I think the core consequential fact for growth is not that India is incredibly productive economically, but that there are huge gaps in productivity between those who have access to capital and those who do not.

We also looked at the specific fact that in India we get what I call a poor match between talent and money. We looked at family firms connected to cash-rich families. If you happen to be from a family that has lots of cash resources, what does your firm look like in terms of size? Your firm is enormously large. It has a scale that is three times bigger than your competitors, and by every measure your productivity is much lower. If you happen to be cash rich, you go into this business because you want to use the money, and that choice does not generate the right selective use of capital.

So, the first thing I want to say is that this misallocation of capital exacts an enormous productivity cost. Hsieh and Klenow, who Brad mentioned, have another paper where they fit the production function to India and China and conclude that total factor productivity could double if capital and labor were officially allocated within four-digit industries.

So just within the four-digit industries, reallocated capital and labor productivity would double.

Speaking to global imbalances, the conference topic at hand, every problem that afflicts within-country lending is worse for cross-border lending. Lenders often are unfamiliar with the legal system in another country. They may be unable or unwilling to participate in extralegal systems of enforcements. In India, at some point Citibank took to doing what many Indian lenders do, sending somebody around to check on borrowers and mildly threaten people to deliver. Of course, this practice was immediately reported by the newspapers, and Citibank had to retract that policy. In fact, they stopped lending in that sector very quickly. Internal monitoring is harder given local business practices, so all of this makes lending in developing countries problematic and hard. How can these constraints be overcome? Well, I think that there are three strategies. One is agency. You basically get someone to set up a lending subsidiary there, but this must be a monitoring-intensive business. The agent must be able to provide verifiable support for his lending decisions, and only well-organized and formally documented borrowers can get these loans. Another strategy is to trade credit in a specific form, which is a very standard way of lending. Merchandise is often produced, and credit provided to the suppliers, using the carrot of new contracts to get them to repay the loan. This method works well in countries that are part of an established supply chain, but it is much less effective where the buyer is footloose. In China trade credit works well—you can give credit to your suppliers because you are going to be there for a long time. In Ghana you are less likely to do this because you are not sure that your firm is going to be there much longer. Moreover, the suppliers are not sure that you are going to be there, so this mutual commitment does not exist. As another strategy, foreign direct investment is really interesting, and I think it works well if foreigners are willing to spend lots of time in the country. This is less of a problem if the investors are returning émigrés or are living in countries that are attractive to foreigners. What is interesting about this strategy is that something noneconomic is at play here, which is potentially a big problem for Africa and for smaller countries.

My concluding message is that it is hard to imagine that the worldwide imbalances in the allocation of capital will be fixed by the world's

capital markets. It seems particularly implausible that most small countries in the developing world, and countries in Africa, many of which are politically fragile, will manage to attract much foreign capital, even with substantial institutional improvements.

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Comments on "Capital and Its Complements in Economic Growth" by J. Bradford DeLong

Lixin Colin Xu

In the standard international trade model between two countries, capital and labor are perfectly mobile within a country or region. Thus, in theory, free trade would lead to the equalization of factor prices, including rental prices of capital. Without distortions (such as tax rate differences), the marginal product of capital (MPK) should be equal in all locations. But we observe widely differing MPK both across countries, and across regions within a country. Based on a recent World Bank investment climate survey in China, we find that the interquartile range of MPK is almost 6. In 2004, the per capita GDP in Shanghai was 42,818 renminbi, but was 4,082 renminbi in the rural province of Guizhou, a ten-fold difference in income. In terms of the inflow of foreign direct investment (FDI), Shanghai attracted 362 U.S. dollars of FDI in 2004, while the province of Gansu attracted only 1 dollar. These observations suggest that capital/labor intensity and capital productivity not only differ greatly between countries, but within countries as well. What explains the huge variations in MPK and capital flow across regions in China? In this short note I will discuss what recent studies, based on the World Bank Investment Climate Surveys (mostly those that I've been conducting with my co-authors), have found to augment Brad DeLong's discussion on capital and its complements.

Existing Evidence

Substantial regional protectionalism is the first reason for MPK and capital inflow differing within China. There are trade restrictions between regions, and there might be price differences between regions. Various

regions may not charge the same prices for the same product. The reasons for such protectionism include the desire to keep large firms within a region in order to collect more taxes to improve local infrastructure and to keep the jobs local.[1] Indeed, there is evidence that local Chinese leaders get rewarded if the local economy performs well (Li and Zhou 2005). Regional protectionalism can manifest itself in many ways. Local governments, for instance, can impose quantity quotas for outside manufacturers, can charge higher taxes or offer local producers tax breaks for selling locally, and can impose different technical standards for outsiders. Regional protectionalism explains why each region has its own car and refrigerator manufacturers instead of the scenario that efficiency could dictate: larger, more nationwide car and refrigerator producers.

The second reason is the well-known one regarding differences in human capital in different localities. Complementarity of physical and human capital in the production function essentially leads to differing technology for different regions, thus violating the standard Heckscher-Ohlin assumptions. There used to be an explicit Hukou (or household responsibility) system that prohibited formal employees from moving to different locations. This restriction was loosened over time, especially for unskilled workers. However, for skilled workers, such restrictions are still in effect. Moreover, given the large wage differences across cities—as one can imagine that would exist with the huge differences in GDP per capita—high-skilled workers tend to stay in more developed regions, such as Shanghai, Beijing, and Shenzhen. The complementarity between human and physical capital suggests that there would be more capital attracted in cities with more skill endowment. Table 5.1 reports the share of employees with college education in 120 Chinese cities in 2004 based on the World Bank Investment Climate Survey. Beijing tops all cities with a share of 42 percent, and Sanming is only about 8 percent.

Do we have evidence that skill-intensive cities have higher MPK or attract more capital inflow in China? In a word, yes (later I shall present evidence that MPK is higher in firms located in cities with more college graduates).

The third reason that MPK and capital inflow differ within China is due to regional differences in infrastructure or geography. An important aspect of infrastructure is transportation, which the investment climate survey quantifies as the share of sales due to losses, theft, and breakage during transportation. This measure captures partly the efficiency of the transportation sector. This ratio ranges from less than 1 percent in Hangzhou to almost 10 percent in Leshan and Ningbo. In studies of FDI inflow into Chinese cities using the World Bank Investment Climate data, Clarke and Xu find that sales losses due to infrastructure problems do not really lower foreign equity ownership, as shown in Table 5.2. Poor infrastructure in China thus does not hinder capital inflow to some Chinese regions.

Table 5.1
Cities and the Shares of Employees with University Education

Anqing	0.119	Guiyang	0.287	Liuzhou	0.191	Taizhou	0.140
Anshan	0.153	Haerbing	0.376	Luoyang	0.180	Tangshan	0.116
Baoding	0.200	Haikou	0.298	Maoming	0.142	Tianjin	0.273
Baoji	0.172	Handan	0.141	Mianyang	0.200	Tianshui	0.179
Baotou	0.180	Hangzhou	0.261	Nanchang	0.289	Weifang	0.130
Beijing	0.421	Hefei	0.285	Nanjing	0.222	Weihai	0.118
Benxi	0.126	Hengyang	0.164	Nanning	0.240	Wenzhou	0.129
Cangzhou	0.120	Huanggang	0.113	Nantong	0.155	Wuhan	0.356
Changchun	0.290	Huhehaote	0.229	Nanyang	0.159	Wuhu	0.151
Changde	0.149	Huizhou	0.132	Ningbo	0.123	Wulumuqi	0.268
Changsha	0.289	Huzhou	0.112	Qingdao	0.175	Wuxi	0.145
Changzhou	0.131	Jiangmen	0.169	Qinhuangdao	0.192	Wuzhong	0.091
Chengdu	0.312	Jiaxing	0.054	Qiqihaer	0.186	Xiamen	0.169
Chenzhou	0.108	Jilin	0.179	Quanzhou	0.096	Xian	0.363
Chongqing	0.209	Jinan	0.231	Qujing	0.104	Xiangfan	0.180
Chuzhou	0.108	Jingmen	0.139	Sanming	0.080	Xianyang	0.250
Dalian	0.255	Jingzhou	0.178	Shanghai	0.231	Xiaogan	0.174
Daqing	0.193	Jinhua	0.124	Shangqiu	0.106	Xining	0.180
Datong	0.149	Jining	0.154	Shangrao	0.107	Xinxiang	0.170
Deyang	0.133	Jinzhou	0.220	Shantou	0.127	Xuchang	0.095
Dongguan	0.122	Jiujiang	0.119	Shaoxing	0.130	Xuzhou	0.209
Foshan	0.146	Kunming	0.202	Shenyang	0.305	Yancheng	0.121
Fushun	0.192	Langfang	0.179	Shenzhen	0.175	Yangzhou	0.108
Fuzhou	0.155	Lanzhou	0.193	Shijiazhuang	0.201	Yantai	0.190
Ganzhou	0.125	Leshan	0.143	Suzhou	0.210	Yibin	0.101
Guangzhou	0.259	Lianyungang	0.157	Taian	0.239	Yichang	0.182
Guilin	0.236	Linyi	0.157	Taiyuan	0.243	Yichun	0.110
Yinchuan	0.183	Yuxi	0.129	Zhengzhou	0.209	Zhuzhou	0.248
Yueyang	0.183	Zhangjiakou	0.117	Zhoukou	0.179	Zibo	0.209
Yuncheng	0.141	Zhangzhou	0.133	Zhuhai	0.150	Zunyi	0.187

Source: World Bank Investment Climate Data.

Table 5.2
Determinants of FDI Inflow across Chinese Cities

Dependent variable = share of foreign ownership in a district						
	(1)	(2)	(3)	(4)	(5)	(6)
ln(L)	0.014	0.018	0.027	0.014	0.014	0.014
	(1.31)	(1.65)*	(2.47)**	(1.35)	(1.35)	(1.36)
age	–0.079	–0.075	–0.077	–0.076	–0.076	–0.076
	(3.76)***	(3.46)***	(3.48)***	(3.68)***	(3.68)***	(3.71)***
ln(city pop)	–0.000	0.007	0.017	0.010	0.010	0.009
	(0.01)	(0.43)	(1.23)	(0.60)	(0.60)	(0.56)
Ln(GDP PC)	0.077	0.092	0.088	0.072	0.072	0.074
	(3.13)***	(3.90)***	(3.79)***	(3.09)***	(3.09)***	(3.21)***
Dist. to port	–0.007	–0.009	–0.009	–0.006	–0.006	–0.006
	(2.08)**	(2.76)***	(3.10)***	(2.10)**	(2.10)**	(1.92)*
Ln(city average wage)	–0.084	–0.039	–0.077	–0.102	–0.102	–0.110
	(1.85)*	(0.97)	(1.82)*	(2.49)**	(2.49)**	(2.48)**
open city	0.105	0.125	0.093	0.072	0.072	0.071
	(1.55)	(2.38)**	(1.80)*	(1.13)	(1.13)	(1.14)
Mean share of employees with college edu.	0.111	0.102	0.101	0.111	0.111	0.106
	(1.42)	(1.27)	(1.26)	(1.47)	(1.47)	(1.42)
Ln(road/pop)	0.017			0.021	0.021	0.021
	(0.93)			(1.19)	(1.19)	(1.21)
ln(city phone per capita)	0.014			0.009	0.009	0.011
	(0.76)			(0.50)	(0.50)	(0.60)
Mean ln(days passing customs)	–0.128			–0.102	–0.102	–0.104
	(5.18)***			(4.16)***	(4.16)***	(4.12)***
Mean index of property rights protection		0.064		0.004	0.004	0.008
		(1.75)*		(0.12)	(0.12)	(0.22)
Mean share of loans need bribes		–0.201		–0.126	–0.126	–0.134
		(3.26)***		(2.06)**	(2.06)**	(2.24)**
Mean tax/sales		–0.992		–0.583	–0.583	–0.602
		(3.01)***		(1.97)**	(1.97)**	(2.04)**
Air quality			0.228	0.108	0.108	0.105
			(4.63)***	(2.15)**	(2.15)**	(2.08)**
Restaurant density			0.137	0.133	0.133	0.132
			(3.07)***	(2.94)***	(2.94)***	(2.89)***
Mean share of loss of sales due to transportation						1.126
						(1.42)
Mean share of loss of sales due to electricity						–0.034
						(0.19)
City GDP growth						0.000
						(0.69)
industry shares for the district	yes	yes	yes	yes	yes	yes
Observations	916	916	910	910	910	910

* significant at 10%; ** significant at 5%; *** significant at 1%. White-corrected error, and clustering at the district-year level.
Source: From Clarke and Xu (Ongoing). Based on investment climate survey in China, World Bank. Unit of observations is by districts within a city.

The fourth reason for MPK variations among different regions is the inefficiency of China's financial system. Ideally, an efficient financial system should carry out the role of channeling capital into locations with higher MPK. If the financial system works well, then there should not be the huge variations in MPK across regions. But the Chinese financial system has many well-known problems, such as favoring the state sector at the expense of the booming private and TVE sectors (Brandt and Li 2003; Cull and Xu 2000, 2003; Allen, Qian, and Qian 2005), and state-owned enterprises (SOEs) not using loans productively (Cull and Xu 2000). Yet there is also evidence that there might be mechanisms at work to compensate for the inadequacies of the formal finance system in China (Allen, Qian, and Qian 2005). Cull, Xu, and Zhu (2007) find, for instance, that SOEs may act as secondary financial intermediaries to channel bank loans into private firms. In particular, SOEs without good growth opportunities are found to be more likely to extend trade credit when these firms have access to bank loans, while the SOEs that grew faster tend to extend less trade credit when they have access to bank loans.

The importance of finance in affecting capital allocation is also demonstrated in international comparison. An ongoing investigation finds that the significantly higher growth of business firms in China (relative to India) is largely due to the significantly higher capital growth in China (see Mengistae, Xu, and Yeung 2006). Although Chinese firms have less access to finance in terms of the share of firms claiming access to bank loans (or line of credit), the same access translates into a much higher total factor productivity (TFP) level in China than in India.

Our recent surveys find that Chinese regions differ greatly in effective tax burdens. Sales taxes range from 0.038 in Jiangmen (a city in Guangdong) to 0.179 in Yuxi (Yunnan), and 0.163 in Jinzhou (Liaoning); see Table 5.3. In general, inland and more backward regions feature higher effective tax burdens, perhaps because these lagging areas have smaller tax bases, yet the demand for public sector jobs there tends to be higher. If we assume constant returns to scale, perfect competition, and profit maximization by firms, local firms then maximize$(1 - t)Lq(k) - wL - rk$, so we would have $q'_k = r/(1 - t)$. Then we should observe a negative correlation between the local tax burden and local FDI inflow. Indeed,

Table 5.3
Differences in Effective Tax Rates and Foreign Direct Investment Among Chinese Cities

City	Foreign	Effective Tax Rate	City	Foreign	Effective Tax Rate	City	Foreign	Effective Tax Rate
Anqing	0.078	0.098	Jining	0.067	0.116	Wulumuqi	0.036	0.146
Anshan	0.040	0.148	Jinzhou	0.110	0.163	Wuxi	0.173	0.126
Baoding	0.061	0.114	Jiujiang	0.073	0.127	Wuzhong	0.000	0.128
Baoji	0.015	0.120	Kunming	0.046	0.107	Xiamen	0.561	0.086
Baotou	0.056	0.126	Langfang	0.160	0.100	Xian	0.076	0.128
Beijing	0.265	0.114	Lanzhou	0.024	0.130	Xiangfan	0.058	0.138
Benxi	0.039	0.133	Leshan	0.034	0.118	Xianyang	0.050	0.114
Cangzhou	0.043	0.123	Lianyungang	0.202	0.111	Xiaogan	0.064	0.166
Changchun	0.141	0.125	Linyi	0.130	0.088	Xining	0.035	0.121
Changde	0.060	0.135	Liuzhou	0.071	0.131	Xinxiang	0.049	0.120
Changsha	0.080	0.151	Luoyang	0.010	0.144	Xuchang	0.041	0.139
Changzhou	0.118	0.139	Maoming	0.129	0.126	Xuzhou	0.075	0.153
Chengdu	0.126	0.115	Mianyang	0.057	0.118	Yancheng	0.051	0.138
Chenzhou	0.031	0.153	Nanchang	0.099	0.096	Yangzhou	0.114	0.120
Chongqing	0.059	0.135	Nanjing	0.211	0.138	Yantai	0.192	0.097
Chuzhou	0.067	0.115	Nanning	0.080	0.136	Yibin	0.009	0.147
Dalian	0.441	0.094	Nantong	0.184	0.104	Yichang	0.106	0.109
Daqing	0.013	0.182	Nanyang	0.033	0.130	Yichun	0.041	0.182
Datong	0.056	0.140	Ningbo	0.209	0.140	Yinchuan	0.042	0.091
Deyang	0.044	0.138	Qingdao	0.203	0.090	Yueyang	0.053	0.087
Dongguan	0.807	0.081	Qinhuangdao	0.194	0.098	Yuncheng	0.013	0.175
Foshan	0.348	0.125	Qiqihaer	0.014	0.097	Yuxi	0.079	0.179
Fushun	0.079	0.142	Quanzhou	0.486	0.139	Zhangjiakou	0.107	0.104
Fuzhou	0.390	0.116	Qujing	0.035	0.149	Zhangzhou	0.395	0.100
Ganzhou	0.299	0.128	Sanming	0.078	0.136	Zhengzhou	0.066	0.115
Guangzhou	0.459	0.106	Shanghai	0.413	0.123	Zhoukou	0.039	0.101
Guilin	0.082	0.150	Shangqiu	0.009	0.082	Zhuhai	0.692	0.093
Guiyang	0.071	0.137	Shangrao	0.027	0.134	Zhuzhou	0.051	0.173
Haerbing	0.083	0.111	Shantou	0.274	0.119	Zibo	0.073	0.110
Haikou	0.226	0.149	Shaoxing	0.078	0.132	Zunyi	0.028	0.138
Handan	0.047	0.174	Shenyang	0.210	0.141	Jilin	0.073	0.125
Hangzhou	0.254	0.112	Shenzhen	0.674	0.075	Jinan	0.057	0.124
Hefei	0.205	0.101	Shijiazhuang	0.059	0.129	Jingmen	0.115	0.125
Hengyang	0.006	0.105	Suzhou	0.666	0.082	Jingzhou	0.058	0.130
Huanggang	0.071	0.184	Taian	0.070	0.103	Jinhua	0.053	0.157
Huhehaote	0.056	0.098	Taiyuan	0.019	0.156	Weifang	0.105	0.116
Huizhou	0.696	0.081	Taizhou	0.056	0.158	Weihai	0.167	0.079
Huzhou	0.106	0.121	Tangshan	0.124	0.113	Wenzhou	0.051	0.176
Jiangmen	0.586	0.038	Tianjin	0.294	0.134	Wuhan	0.108	0.118
Jiaxing	0.190	0.119	Tianshui	0.027	0.151	Wuhu	0.101	0.143

Source: From Clarke and Xu (ongoing). Based on investment climate survey in China, World Bank. Unit of observations is by districts within a city.

this is what we find in China (Clarke and Xu, ongoing): the higher the district-level average tax burden, the lower the foreign direct ownership in the district.

The cross-country literature has emphasized the role of property rights protection in ensuring investors' rights and their willingness to invest. Keefer and Kanck (1997), for example, find that developing countries with better institutions grow and converge faster than similar countries with bad institutions. Fan et al. (2006), using a subsample of low institution countries, find that FDI inflow per capita is positively related to government quality and expected growth. Similarly, research done within China also finds the importance of property rights for firms' decision to reinvest. Cull and Xu (2005) use firm-level evidence, coupled with city-level variations in property rights protection, and find that the reinvestment rate increases with government's contract enforcement mechanisms (as proxied by the percent of disputes resolved via courts), and decreases with government expropriation (as proxied by the lack of government helpfulness in firm-government interactions, and informal payment as a share of sales).

A final factor that I consider for MPK differences and capital inflow is the differences in livability. Some cities simply are more attractive, featuring such amenities as nice beaches, fewer traffic jams, better quality of air and water, and so on. Not surprisingly, many of these cities, such as Dalian, Qingdao, and Shanghai, also attract much more FDI than other cities. This is not surprising since the amount of FDI is often associated with the expatriates working for multinational corporations who live in the investment destinations, as better amenities would be more attractive to them. Indeed, Clarke and Xu (ongoing) find that FDI inflow are larger in districts that feature better air quality and a higher restaurant density, holding constant the usual suspects like the level of development, infrastructure, wage rates, tax burdens, and the protection of property rights.

New Evidence

To further shed light on why firms differ in their MPK, and what is the role played by the various usual suspects and unusual suspects,

I directly estimate the determinants of MPK in the following equation:

$$MPK_{ijt} = f(K/L, M/L, L; X).$$

Here K/L is the capital-labor ratio, M/L is the material usage per capita, and L is the number of employees. X represents the other determinants of MPK and includes the firm's effective tax rate, the amount of corruption, protection of property rights, managerial time costs in dealing with government regulation and other burdens, access to finance, the corruption of the financial sector, judicial efficiency, customs efficiency, local leaders' age, tenure, and the owners' promotion from within. (This list can be derived from the standard Cobb-Douglas production function in which the technical efficiency part depends on the local business environment, broadly defined to include those market-supporting institutions [finance, court, customs], direct government expropriation [tax, time burden, corruption], managerial ability, and time horizon [age, promotion from within, and average tenure of the past three top local leaders].)

The data we use to calculate MPK is the most recent World Bank Investment Climate Survey, which contains information from 120 cities in almost all the Chinese provinces. These cities jointly account for 70 to 80 percent of China's GDP, and are thus quite representative of China as a whole. The MPK is derived from the estimates of the firm-level Cobb-Douglas output-capital-labor-material production function.[2] In the estimation we allow for firm fixed effects and industry-specific coefficients of factors. As illustrated in Table 5.4, the results suggest that marginal product of local Chinese firms is very sensitive to how the local economy is governed:

1. MPK is not related to the region's tax rate or amount of corruption, contrary to conventional wisdom.
2. The time costs of dealing with regulators and officials also do not affect MPK.
3. Market-supporting institutions matter a great deal:
   a. Banks: Access to finance increases MPK, while corrupt banks reduce MPK. Thus inefficiency in the financial sector may partly account for the large variations in MPK across regions.

Table 5.4
Determinants of Marginal Product of Capital in Chinese Firms: Y = log(MPK)

log(K/L)	–0.793 (184.44)***	–0.794 (183.72)***	–0.798 (184.15)***
ln(M/L), M=material	0.458 (85.71)***	0.450 (82.25)***	0.448 (81.75)***
ln(L)	0.015 (3.89)***	0.024 (6.13)***	0.015 (3.83)***
mean effective tax burden	0.042 (0.22)	0.093 (0.47)	0.121 (0.62)
mean entertainment/travel costs in sales	–0.963 (1.24)	–0.886 (1.16)	–0.839 (1.11)
mean share of managerial time in dealing with four specific gov't bureaus	–0.290 (0.80)	–0.153 (0.42)	–0.151 (0.42)
mean share of managerial time in dealing with government officials	–0.114 (0.59)	–0.165 (0.86)	–0.153 (0.79)
mean share of loans needing bribes	–0.392 (4.45)***	–0.334 (3.82)***	–0.343 (3.89)***
log(court time to resolve commercial disputes)	–0.175 (4.05)***	–0.186 (4.27)***	–0.185 (4.23)***
mean share of college-educated employees	1.035 (13.40)***	1.089 (14.40)***	0.987 (12.85)***
mean access to loans	0.247 (7.40)***	0.261 (7.78)***	0.269 (8.02)***
log(mean days passing customs)	–0.161 (10.70)***	–0.127 (8.35)***	–0.127 (8.30)***
dummy: city secretary internally promoted	0.038 (2.92)***	0.036 (2.79)***	0.038 (2.90)***
ln(city secretary age)	0.175 (2.26)**	0.140 (1.81)*	0.138 (1.79)*
avg tenure of city secretary	0.009 (1.50)	0.010 (1.56)	0.009 (1.46)
log(firm age)		–0.031 (4.81)***	–0.038 (5.77)***
collective ownership		0.155 (6.23)***	0.156 (6.31)***
legal-person ownership		0.198 (10.39)***	0.194 (10.20)***
domestic private ownership		0.133 (7.11)***	0.130 (6.90)***
foreign ownership		0.289 (12.11)***	0.278 (11.73)***
CEO years of schooing			0.030 (11.96)***
CEO experience in this firm			0.006 (5.87)***
ind, year dummies	yes	yes	yes
Observations	25315	25303	25276
R-squared	0.78	0.78	0.78

* significant at 10%; ** significant at 5%; *** significant at 1%. White-corrected error, and clustering at the district-year level.
Source: From Clarke and Xu (ongoing). Based on investment climate survey in China, World Ban.

b. Judicial/Legal System: if courts are not efficient, as measured by long times needed to resolve a commercial dispute, this leads to lower MPK.

c. Customs: a long customs delay is associated with lower MPK.

4. Human capital matters: Cities with a higher share of college graduates have higher MPK. This finding is consistent with a common explanation for cross-country variations in capital intensity.

5. The characteristics of chief executive officers (CEOs) matter: MPK is higher when CEO schooling and CEO experience increases.

6. A city's leadership matters: MPK is higher for firms located in cities whose top leaders are more experienced, are promoted internally within the city, and have long tenure.

7. Ownership matters: In China, MPK is highest in foreign-owned firms, followed by legal-person ownership, private and collective firms, and finally state-owned firms. This difference again indicates that within China there is room for improvement in capital allocation, mainly for state-owned firms.

Conclusion

The evidence from China suggests that regional variations in inflows of FDI and marginal productivity of capital can readily be explained by some of the usual suspects as well as ones that are surprising. These include a region's tax burden, level of corruption, expected growth rate, infrastructure, access to financial services, the efficiency of customs and the judicial process, and quality of life. Given the vast variations in all these aspects among in various regions in China, due to the country's decentralized nature and geography, the large variations in capital-labor ratio and marginal product of capital are not too difficult to reconcile. The fact that MPK depends on ownership, local leadership, and financial services suggests that allocative inefficiencies may well play a part in these regional variations. The fundamental causes of these differences—their relative importance, and how important is the magnitude of inefficiency—requires further investigation.

Notes

1. It is assumed that it is easier to collect taxes from larger firms than from small firms (Gordon and Li 2004).

2. In particular, the MPK is derived as follows. Let technology be $y = AL^{\alpha}k^{\beta}m^{\gamma}$, where y is output (as proxied by sales in constant value) per worker, k is capital-labor ratio, m is material expenditure per employee, and L is the number of employees. Then MPK = $\beta AL^{\alpha}k^{\beta-1}m^{\gamma}$. Capital is measured as the net value of fixed assets, the only proxy we have for capital. The production function is estimated industry by industry, allowing for firm fixed effects.

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