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**Lecture 10: Growth and Development**

I do not see how one can look at figures like these without seeing them representing possibilities. Is there some action a government of India could take that would lead the Indian economy to grow like Indonesia's or Egypt's? If so, *what* exactly? If not, what is it about the “nature of India” that makes it so? The consequences for human welfare involved in questions like these are simply staggering: once one starts to think about them, it is hard to think about anything else.

—Nobel Prize Laureate Robert Lucas “On the Mechanics of Economic Development.” *Journal of Monetary Economics*. July 22, 1988, pp. 5. [Original emphasis]

1. Growth Changes Everything
   1. If you’ve ever been to a developing country, the differences between it and the United States (and other wealthy countries) are profound. You might often find the following:
      1. The tap water is not safe to drink.
      2. Roads and buildings with poor upkeep.
      3. Poor sanitation and no indoor plumbing.
      4. Many people with exhausting and/or dangerous jobs, if they have a job at all.
      5. Irregular or no electricity.
      6. Poor nutrition and scant medical care.
   2. This list is not exhaustive the severity of each item will change based on where you go. But the overarching theme can be summed up as:

Poverty is misery. Poverty kills.

* 1. And it is not a small problem. Over a billion people live on less than $1.25 a day. Billions more live in substantially diminished conditions.
     1. In contrast, the average American lives on $76.80 per day.[[1]](#footnote-1)

1. The Solow Model
   1. Recall we typically measure wealth by GDP, or Y.
      1. What causes Y to increase? More labor (L), the skill level of those workers (e), technology (A), and capital (K).[[2]](#footnote-2)
      2. In other words, Y = F(A, K, eL)
   2. Let us focus on physical capital. The more tools each person has at her disposal, the more productive that person can be.
      1. In the short-run, it’s tricky to increase education levels, population, and technology. But capital can change readily through different levels of investment.
      2. So this model starts by holding everything else constant.
   3. Each additional unit of capital has less and less of an impact on productivity. This is called the *diminishing marginal productivity of capital*.
   4. One way to capture this idea is with the equation,
      1. More K means more Y (the line slopes up).
      2. But each additional unit of K means Y increases at a slower and slower pace (the line is concave).

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Y

K

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* + 1. Recall that there are two things that can happen to output: consumption (C) and investment (I). Because savings = investment, our MPS is the portion of output that goes to capital. Let γ, or gamma, be our MPS. Suppose γ = 0.5. Thus:

Y

K

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* 1. The other side of this model is *depreciation*—the tendency for capital to break down. All capital breaks down—machines wear out, roads develop potholes, harbors become silted, etc.
     1. Depreciation is symbolized by δ, or delta.
     2. It’s expressed as a fraction, such as 0.2. That means 20% of this country’s capital wore out.
     3. Depreciation is a complex idea—different machines have different rates, the depreciation for each machine is not constant—but we’ll assume it’s a constant value for all capital to illustrate the idea the model is showing us. Let’s assume depreciation is ¼. That means if the economy has four units of capital, one unit will fall apart.

Y

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δ = ¼

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* + 1. So some of an economy’s production must be dedicated to replace capital that fell apart. We can capture this idea by combining this with the other graph. (For simplicity, our y-axis will just be labeled Y, for GDP; that is what we care about, after all.)
  1. Thus we have the Solow Growth Model:

Y

K

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δ = ¼

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* + 1. When investment > depreciation, the capital stock is growing. In the next period (month, quarter, year), the output will be bigger.
    2. When investment < depreciation, the capital stock is shrinking. Machines are breaking down faster than people can replace them.
    3. When investment = depreciation, the capital stock and the output are constant in each time period. This is what Solow called the steady state. Here, our steady state is 4 units of K, producing 2 units of output. One of those units goes to consumption, and the other goes to investment. That investment exactly replaces the one unit we lost to depreciation.

1. Shifting
   1. Recall earlier that we suspect A (technology) and eL (labor, adjusted for skill) should increase output as well. Increasing either of these shifts both Y and I up.

Y

K

δ

I

Y

I’

Y’

K\*

K\*’

I\*

I\*’

Y\*

Y\*’

* + 1. At our new steady state, K\*’, we have more capital. We have to spend more on investment (I\*’) but it’s worth it because we have a much higher output (Y\*’).
  1. Similarly, we can fiddle with depreciation. Perhaps better technology, rather than making capital more productive, makes it last longer.

Y

K

δ

I

Y

K\*

K\*’

I\*

I\*’

Y\*

Y\*’

δ'

* + 1. Note that even though we ended up with the same amount of capital, we’re not as wealthy as when we shifted Y. The best thing for long-term growth is to shift Y. And because labor suffers from its own problem of diminishing marginal productivity, Solow concluded the ultimate source of growth is technology.

1. Good News on Growth
   1. The good news is that it does not have to be this way.
      1. Economic growth solves most of the problems of the developing world. Greater material wealth can pay for better roads, sanitation, electricity, education, and so on.
      2. South Korea is a good example of this. In the 1950s, it was an incredibly poor country. Now it is one of the wealthiest countries in the world (with incomes comparable to that of the average of the European Union).
   2. Growth is not a *zero-sum game*: if one group becomes wealthier, other groups don’t have to become poorer.
      1. This is because long term growth comes from greater efficiency, primarily through technology, not from reallocation.
   3. But growth is messy
      1. Because it’s not a zero-sum game, we want all economies (both rich and poor) to grow.
      2. But we’d also like stable growth. Long run growth is great, but that’s in the long run. In the meantime, people would like to keep their jobs and live lives stable enough so they can plan.
      3. Uncertainty is misery, too.
   4. Not only is growth not a zero-sum game, we don’t need a lot of growth to make a big difference.
      1. *Rule of 70*—the number of time periods it requires to double a value roughly equals 70 divided by how fast it’s growing.
      2. Suppose an economy’s GDP grows at 7% a year. That means it takes (70/7=10) 10 years for the GDP to double.
      3. China’s growth rate in 2012 was 7.7%, and that was a relatively low growth rate.
      4. The US economy grew at 2.8% in 2012; how long would it take our GDP to double at that rate?
   5. There’s yet more good news: poor countries have an easier time growing quickly compared to rich countries.
   6. It all boils down to decreasing marginal benefit. The benefit in this case is productivity.
      1. Labor in rich countries tends to have a lot of capital and thus their workers are quite productive (it’s one of the reasons wages are high). Giving them more capital increases their productivity, but not by much.
      2. But labor in poor countries has little capital and thus cheap labor. Just a small amount of capital creates huge productivity gains. Investment and efficiency follow.
      3. It’s the difference between getting your first laptop and getting your eighth; which makes you more productive?
   7. As capital flows into the developing country, wages rise and the marginal productivity of capital falls. Eventually, poor countries catch up to rich countries.
      1. China’s the current poster-country of the theory of convergence. Its growth rate has been tremendous but lately wages have been increasing. It’s no longer the low hanging fruit of production.
      2. There are other examples of countries coming up quickly from very low levels of wealth: Germany and Japan after WWII and South Korea, Hong Kong, Singapore, and Taiwan after the Korean War.
      3. So why aren’t all countries equally wealthy? That leads us to…
2. Beyond the Solow Growth Model
   1. The theory that poor countries will catch up to rich countries is a consequence of a standard growth model in economics called the Solow Growth Model.
   2. But that conclusion is puzzling. Why do we have so many poor countries? Shouldn’t they have caught up by now?
   3. Economists have looked at possible missing elements with the unfortunate conclusion that growth is hard.
3. Investment
   1. If investment is so valuable in developing countries, why not just invest? If private hands won’t do it, foreign aid can. A relatively small amount of money can have a huge impact, after all.
      1. Dams, roads, bridges, power plants, and other sorts of big infrastructure projects popped up (and still pop up) all over the developing world, especially during the Cold War.
   2. But there’s a reason no private hands have touched this profit opportunity. Remember, capital tends to depreciate over time. Capital requires maintenance and that maintenance requires educated labor, a regular stream of money, low corruption, and supplies.
   3. Moreover, taking full advantage of the capital requires spillover industries to emerge. It’s not very valuable to provide cheap electricity if no one knows how to run a factory.
4. Education
   1. Another interesting conclusion of the Solow Growth Model is that capital can only do so much for growth. The man behind the model—Nobel Prize Laureate Robert Solow—concluded that technology, not investment, is the key to growth.
   2. So there is some truth to the idea that more education—a particular type of investment—is what’s missing. Rather than developing physical capital, poor countries need to develop their *human capital* or the stuff in people’s head which makes them more productive.
      1. There’s a fair amount of evidence that increasing education leads to greater productivity and the greater wages that come with it (there better be, right? Otherwise, what are you doing here?).
      2. But as a recipe for development, it doesn’t work out that way.
   3. Building a school is easy; running it is hard.
      1. Like other forms of physical capital, schools have to be maintained and staffed. Everything from books to electricity is in short supply.
      2. Many governments use teaching and administration positions as political patronage. If you support the government in some key way, you’ll be rewarded with a regular paycheck but not expected to teach. You don’t even have to understand the subject you’re teaching.
   4. Incentives matter
      1. If you overcome these problems and gain a good education in the developing world, there is little guarantee you’ll be rewarded.
      2. In part of the issues above, the material rewards aren’t that great. People are rewarded for supporting the government, not starting useful businesses.
5. The Mystery of Capital
   1. There are other possible reasons for poverty—overpopulation or overwhelming debt—which economists have considered. But few explanations hold as much promise as what Hernando de Soto describes in his landmark book, *The Mystery of Capital*.
   2. De Soto argues physical capital in developing countries is dead. It’s an asset, not capital; it can’t be used to produce other things. Land is often unregistered, homes are built illegally, and businesses start outside the formal section.
      1. Without legally recognized collateral or an official address, people can’t get a business loan. Without a legal business, they have trouble expanding or selling it. They can’t use the court systems. They can’t advertise.
      2. Recall the key aspect of capitalism: private property which is strictly enforced and clearly defined. The developed world has a solid legal system for this reason.
   3. People don’t register their businesses or legally secure their land because it’s really, really hard.
      1. Armed with a research team, de Soto attempted to open a simple garment factory (one employee) in Lima, Peru. Working six hours a day, the team registered the business in 289 days. Similarly disastrous results were repeated with similar experiments in Egypt, the Philippines, and Haiti.
      2. So people prefer to work in the extralegal sector (the black market). And it’s hard to go back because that involves admitting to the authorities you’ve been breaking the law.
   4. The key goal, then, is legal reform. But it’s very hard as it involves:
      1. Creating competitors for politically-connected businesses;
      2. Changing the minds of the custodians of the current bureaucracy;
      3. Titling land and assets based on hundreds of different local customs;
      4. Untangling decades or centuries of informal history; and
      5. Convincing millions to change how they live their lives.

1. Based on the per capita money income in the past 12 months, from 2008 to 2012 ($28,051), divided by 365.25 days. From Census: <http://quickfacts.census.gov/qfd/states/00000.html> [↑](#footnote-ref-1)
2. We call capital “K” to avoid confusion with consumption (C) and because in German, capital is “kapital.” (Many economics working on the role of capital in the economy at the time this became a popular abbreviation were German-speaking, including Karl Marx, Eugen Böhm von Bawerk, and F.A. Hayek.) [↑](#footnote-ref-2)