

The Stages of Economic Growth Revisited

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ABSTRACT

Following Rostow (1960), we propose a theory for classifying countries according to their stages of growth and for analyzing the determinants of growth in and between the different stages. We conclude that, even if they have inefficient institutions and policies, poorer countries can achieve rapid growth by adopting the technologies and managerial practices of countries like the United States. Rostow (1960) hypothesized that taking off into economic growth was a difficult task for countries in the 19th Century, requiring major changes in institutions. In the 20th Century, however, as the United States and other advanced countries became richer because of improvements in technologies and managerial practices, it became easier for poor countries to take off into rapid growth by adopting some of these improvements. As they become richer, however, their growth rates will decline unless these countries have efficient institutions and policies. For many countries, this requires that they undertake serious institutional and policy reforms. Our analysis further suggests that world economic leadership is unlikely to be provided by less-developed countries like China.

* Preliminary versions of this work has been circulated as Costa et al. (2016a, 2016b). We are grateful to Edward Prescott for extensive discussions. We also benefited from comments from Jean O'Brien-Kehoe and Kei-Mu Yi. The data set referred to in the text and used to construct the figures is available at <http://www.econ.umn.edu/~tkehoe/>. The views expressed herein are those of the authors and not necessarily those of the Federal Reserve Bank of Minneapolis or the Federal Reserve System.

Introduction: A new theory of economic growth

Since the time of Adam Smith (1776), economists have asked: Why do some countries grow more rapidly than others? This question can be extended in many ways: Will the Chinese economy surpass the U.S. economy? Following the recent worldwide recession, what country, or group of countries, will emerge as the engine of world economic growth? We propose a new theory for addressing these questions.

In 1960, Walt W. Rostow proposed a theory of economic history in which countries pass through five stages of economic growth. For Rostow, the most significant growth transition was from stage I, a traditional economy, through stage II, preconditions to take-off, to stage III, a take-off into sustained growth of the sort first achieved by the United Kingdom during the Industrial Revolution.

We propose an updated theory of the stages of growth, based on recent developments in economic theory and data analysis. We view Rostow's most significant conclusion to be that the policies that promote economic growth in one stage are different from those that promote growth in other stages.¹

Since the 1960s, economic growth has spread throughout the world. We calculate that in 2010 there were only seven countries² that had never experienced 25 years or more of growth in real GDP per working-age person averaging at least 1.0 percent per year³ — the sort of growth first experienced by the United Kingdom during the Industrial Revolution — and they contained less than 2 percent of the world's population. In 1960, in contrast, more than 50 percent of the world's population lived in countries that had never experienced this sort of sustained growth.

Although taking off into growth has become easier, catching up with the United States has not. In 2010 only 19 percent of world population lived in countries that at some point in the 20th Century had reached 35 percent of the income per person of the United States, a slight decrease from almost 21 percent in 1960. We examine how a country moves from the Malthusian trap — where increases in population eat up any increase in income — into a take-off into growth like that experienced by the United Kingdom during the Industrial Revolution.

¹ The mechanics of our theory follow Kehoe and Ruhl (2010), who in turn follow Parente and Prescott (1994, 2002) and Kehoe and Prescott (2002, 2007).

² Afghanistan, the Central African Republic, Haiti, Madagascar, Niger, Senegal, and Somalia.

³ We refer to real GDP (gross domestic product) per working age person (15 to 64 years) as income per person. We take real GDP data from the Maddison Project and working-age population data from the World Bank's *World Development Indicators* and from National Statistics, Republic of China (Taiwan) for Taiwan for 1960–2010.

We continue to sketch out the theory, asking: What do developing countries need to do to move into the next two stages, catching up to and joining the economic leader? Should we expect the recent slowdown of growth in China to continue? In recent years, development economists have raised these sorts of questions, asking, for example, what policies a country like China needs to implement to escape what Gill and Kharas (2007) call the middle income trap, where a country reaches the World Bank definition of “middle income” but then stagnates.

We identify a country as *catching up* to the economic leader if it has a period of at least 15 years with more than 35 percent of the income per person of the economic leader. We have chosen the 35 percent cut-off because the data indicate that reaching this level requires massive immigration from rural areas to urban areas and a sharp reduction in agriculture as a fraction of total output. During the 20th Century and early 21st Century, when the United States has been the economic leader, catching up also requires long periods during which growth in income per person exceeds 2.0 percent per year. We identify a country as *joining* the economic leader if it has a period of at least 15 years with more than 65 percent of the income per person of the economic leader.

Lessons from the growth leaders

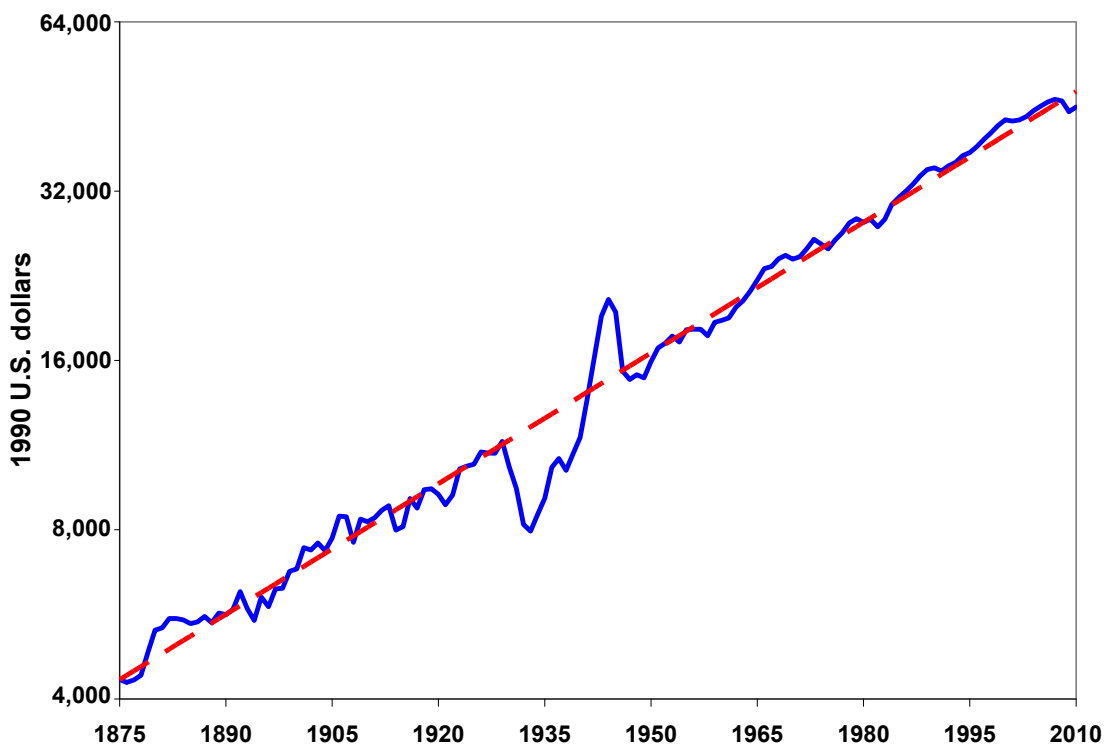
Economic growth in the United States has been remarkably constant since 1875. Figure 1 plots U.S. per capita income and compares it with a trend of 1.8 percent per year. With the exception of the Great Depression of the 1930s and the subsequent build-up during World War II, U.S. growth has been stable, with small business cycle fluctuations around the trend line. In our theory, this growth is the result of steady productivity growth resulting from continual adoption of improved technologies and managerial practices. And in contrast with the previously dominant view followed by Rostow that growth is driven by capital accumulation, we hold that productivity growth drives economic growth.⁴

Since the beginning of the 20th Century, the United States has been the richest major country in the world, and we refer to it as the economic leader. In the 19th Century, the United Kingdom had been the economic leader. In our theory, less developed countries are able to adopt the technologies and managerial practices of the economic leader and potentially grow at the same rate. The income level of a particular country compared with the economic leader

⁴ Following the work of Solow (1956) and Swan (1956).

depends on its institutions and policies. A poorer country can grow as fast as the economic leader even with inefficient institutions and policies.

Figure 1: Growth in Per Capita Income, 1875 to 2010, United States



The growth achieved by the United States towards the end of the 19th Century was rapid by historical standards up to that time. Clark (2007) argues that no country in the world had experienced sustained growth in income per person before the Industrial Revolution in the United Kingdom, starting around 1800. Before that, although there was growth in total income, it was accompanied by, or quickly followed by, comparable growth in population, as first modeled by Malthus (1798). Over the period 1820–1900, the United Kingdom achieved an unprecedented growth of 1.2 percent per year in income per person. Even so, during the 1870s, the United States started to grow faster, and, in 1901, the United States passed the United Kingdom and became the economic leader.

Key features of the Industrial Revolution in the United Kingdom and later growth in the United States included the migration of population from rural to urban areas, the movement of workers from agriculture into manufacturing, and increases in life expectancy followed by declines in fertility. Why the Industrial Revolution occurred first in the United Kingdom in the

19th Century and not in China in the 14th Century is an intriguing question addressed by economic historians like Elvin (1973) and Landes (2006). In terms of our theory, what is important is how quickly the Industrial Revolution spread, and how easy it was for countries that followed to achieve the sort of sustained economic growth rates that had made the United Kingdom an exceptional case in the early 19th Century.

Stages of economic growth

We classify the countries in our sample into four stages of economic growth [For details on country data and classification, see appendix.]

0. Malthusian trap
1. Taking off into growth
2. Catching up to the economic leader
3. Joining the economic leader.

Between 1823 and 1848, the United Kingdom achieved average annual growth of 1.0 percent in income per person. Using that as a benchmark, we classify countries that have never achieved average annual growth of 1.0 percent for 25 years as being in **Stage 0: Malthusian trap**, where economic growth is roughly matched by population growth.

Countries that have achieved experienced 1.0 percent average annual growth for 25 years are classified in **Stage 1: Taking off into growth**. We do not use Rostow's term "*sustained growth*" (emphasis added) because all too frequently the growth, although prolonged, is not sustained. Consequently, we classify a country as "taking off" after it *completes* 25 years of at least 1.0 percent average annual growth in per capita income.

Rostow emphasized a transitional stage between the traditional stage and the take-off stage during which countries developed the preconditions necessary for the take-off, including higher investment rates, improved technologies, and individual social mobility. For Rostow, taking off was a complex and difficult task that required extensive preparation. But in fact, our analysis suggests that as the international economic leader has become richer, it has become progressively easier for poorer countries to achieve economic take-off — that is, transitioning from the Malthusian trap to taking off is more common as the leading nation becomes more affluent.

It has, however, become difficult for countries to advance from Stage 1 to Stages 2 and 3 — that is, while taking off appears to have become easier, it is now more challenging to catch up to and join the economic leader. And our theory suggests that countries that are behind the economic leader can achieve higher rates of growth by reforming their institutions and policies,⁵ benefiting from the sort of catch-up growth that Mexico experienced over the periods 1890–1910 and 1950–1980.⁶

We classify countries as being in **Stage 2: Catching up to the economic leader** if their income per person is above 35 percent that of the economic leader for at least 15 consecutive years, something that was accomplished by Mexico at the end of the 19th Century and beginning of the 20th Century and later during the 1970s and 1980s.⁷

We classify countries as being in **Stage 3: Joining the economic leader** if their income per person is above 65 percent that of the economic leader for at least 15 consecutive years. Nations at this stage include not only the richer countries of Western Europe, Australia, Canada, and Japan, but also recent additions Hong Kong and Singapore.

Countries can progress through the stages of growth, but they can also fail to do so. We classify a country as failing after taking off if its average annual growth rate falls below 1.0 percent for 25 years, and we classify a country as failing at catching up if its income per person falls below 35 percent of the economic leader for more than 15 years. Similarly, we classify a country as failing at joining the economic leader if its income per person falls below 65 percent of the economic leader for more than 15 years.

Taking off into growth

The experience of the United Kingdom during the Industrial Revolution provides us with a clear criterion for classifying an economic take-off. We have chosen the cutoffs of 35 percent of the economic leader and 65 percent of the economic leader for the next two stages because these cut-offs sort countries into groups with identifiably different characteristics. Early growth in the United Kingdom and the United States was based on movements of population from rural

⁵ In this, we follow North (1991).

⁶ Kehoe and Meza (2011).

⁷ We smooth the data on income per person for all of our countries using a Hodrick-Prescott (1997) filter, a standard technique used to remove business cycles from economic time series. The Hodrick-Prescott filter still leaves the Great Depression of the 1930s and the World War II build-up in the U.S. data, however. Consequently, we ignore the data 1930–1945 in making comparisons across countries.

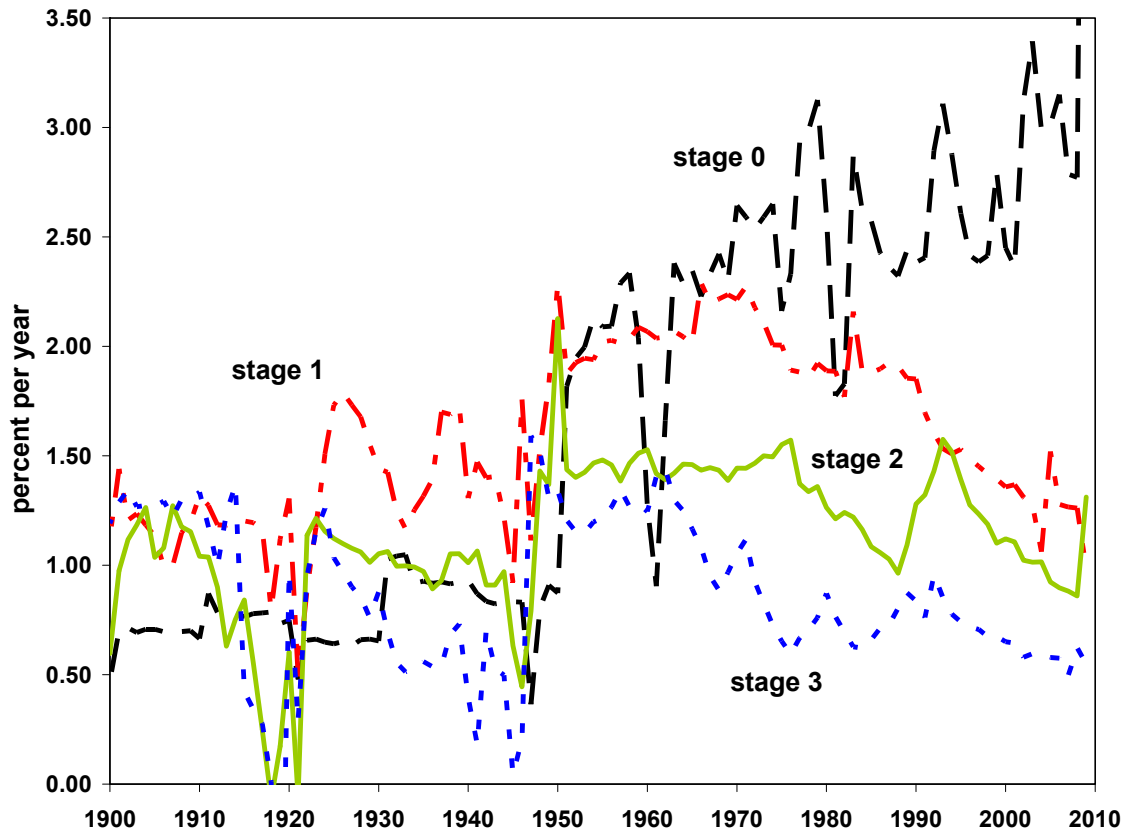
to urban areas and movements of workers from agriculture to manufacturing. Kehoe and Ruhl (2010) show that similar movements occurred later in Mexico and more recently in China. De Vries (2008) argues that the movement of workers out of traditional agriculture was essential for organizing these workers into economically efficient work teams.

As countries move from the Malthusian trap into taking off, they become somewhat more urban. The major increase in urbanization, however, occurs as countries move from taking off to catching up. Countries joining the economic leader do not have a significantly different degree of urbanization than do countries catching up. Data on agriculture as a share of output shows the same pattern. A country that has reached one stage of growth does not revert to the characteristics of the previous stage if it later fails at the higher stage. Mexico, for example, reached the catching up stage but did not experience a large reverse migration from urban areas back to rural areas after it failed to maintain its growth. Education follows a different path. Average levels of education also increase with the stages of growth, but the largest increase in education is in moving from the catching up stage to the joining stage, and countries that fail *do* experience some reversion to lower levels of education.

Urbanization and education rates increase over time in countries that remain in the stage, while dependence on agriculture decreases. Even “Malthusian trap” countries have become more urbanized, less dependent on agriculture, and more educated, and these worldwide trends help explain why it has become easier to take off into growth.

Deaton (2013) emphasizes the role of improvements in health and reductions in fertility in generating the take-off into growth. These changes occurred slowly in the 19th Century, but sped up in the 20th Century, especially during the second half. The improvements in health in poorer countries — which increased life expectancy significantly before fertility fell — have been responsible for the explosion of the world population in the 20th Century. As figure 2 shows, most of this explosion has occurred in countries in the Malthusian trap (stage 0) and the take-off into growth (stage 1). By the time that countries have reached the stages of catching up to (stage 2) and joining (stage 3) the economic leader, they have been reducing fertility and population growth. This pattern contrasts to that in the 19th Century and early 20th Century, when richer countries had faster population growth than poorer countries.

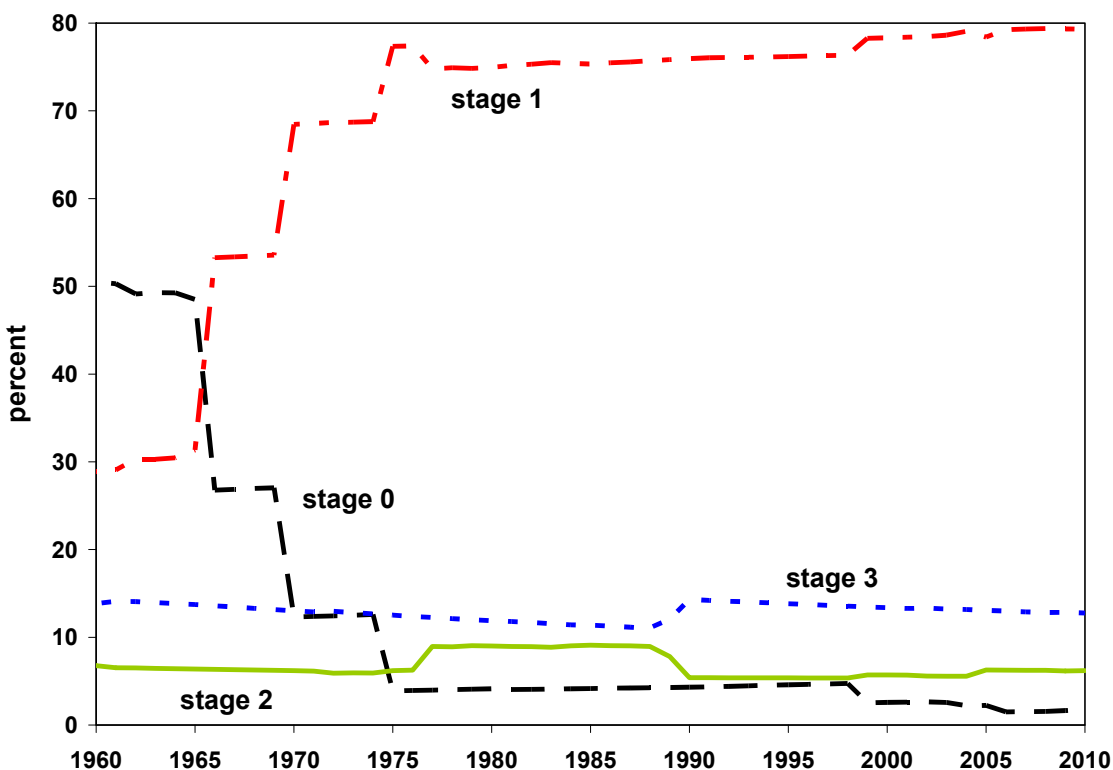
Figure 2: Population growth rates by stage of growth



As figure 3 shows, more than 50 percent of the world's population lived in countries in the Malthusian trap in 1960. By 2010, less than 2 percent of the world's population lived in the 7 countries still in the Malthusian trap (Afghanistan, Central African Republic, Haiti, Madagascar, Niger, Senegal, and Somalia). The major countries to take off into growth were China in 1966 and India in 1970.⁸

⁸ It is instructive to understand why we classify China as taking off into growth in 1966. Over the period 1941–1966, annual growth in income per person averaged more than 1.0 percent. There were years of negative growth during this period — 1941–1949 were years of World War II and the Chinese Civil War, and 1958–1961 were the disaster of the Great Leap Forward — but the other years had such rapid growth in income per person that the average was more than 1.0 per year.

Figure 3: Share of world population by stage of growth



Growth after the take-off

Although the data in figure 3 indicate that economic take-off has become far easier to achieve than Rostow thought, it has proven more difficult for countries to catch up to and join the economic leader, the United States. In 1960, only 7 percent of the world’s population lived in countries in the catching up stage, and this fell to 6 percent in 2010. Similarly, only 14 percent of the world’s population lived in countries in the joining the economic leader stage in 1960, falling to 13 percent in 2010. This drop in the fraction of the world’s population in richer countries is accounted for by the slower population growth in these countries. The number of countries catching up to and joining the economic leader increased by 13 individual countries and 1 country group (21 small Caribbean countries) from 1960 to 2010.

A country like China may at some point become the world economic leader. These countries are still a long way off. China, for example, had 24 percent of U.S. income per person in 2010. For the foreseeable future, the relevant question is whether China will be able to advance to the catch-up stage of growth. We address this sort of question in the sequel to this paper (Costa *et al.*, 2016).

The power of productivity and institutions

Growth in the United States has been the result of increases in productivity and that capital is accumulated to keep the ratio of capital to output roughly constant.⁹ Given this empirical evidence, we model the growth of the United States and other advanced countries — those in the stage of joining the economic leader — as a balanced growth path in which output and capital grow at the same, constant rate.¹⁰ Why the balanced growth path of the United States, the economic leader in the 20th Century, had a growth rate close to 2 percent per person per year, while that in the United Kingdom, the economic leader in the 19th Century, was closer to 1 percent is an important question. Our theory simply takes these trend growth rates as given, however, and asks how less developed countries react to it. Trend growth could still accelerate to 3 percent per year in the 21st Century, although it shows no sign of doing so.

What forces have driven the near-constant growth in productivity in the United States? William Lewis (2004), a management consultant, views productivity increases as improvements in “best practice,” the result of improvements both in technology and in managerial practices. Lewis’s view of improvements in best practice and their adoption by firms in less developed countries complements the theory of follow-the leader growth developed by Parente and Prescott (1994, 2002): While best practices in the United States are constantly improving, countries that are behind can grow at the same rate as the economic leader by adopting these best practices, perhaps with a lag. If a country eliminates barriers to adopting best practices, it goes through a period of rapid growth during which capital and labor adjust to the improved productivity.

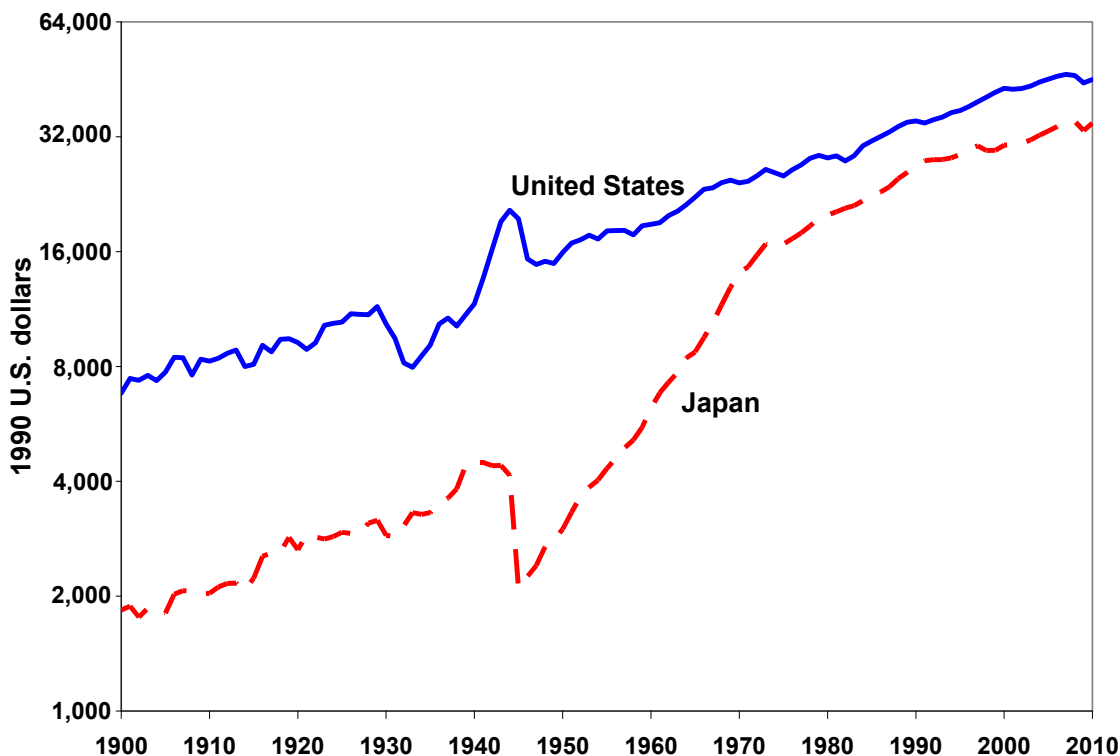
Japan provides an instructive example of a country moving from one balanced growth path to another. Figure 1 compares the economic growth in Japan 1900–2010 with that in the United States. After the Meiji Restoration in 1868 abolished feudal institutions and opened Japan to the rest of the world, Japan grew rapidly, reaching a balanced growth path with income per person about 27 percent of the U.S. level during 1900–1930. Following the devastation of World War II, Japan needed until the late 1950s to build up the capital necessary to recover to its previous balanced growth path. The American occupation of Japan 1945–1952 and its aftermath brought a new set of institutions, however, which allowed the Japanese economy to adopt best practices more rapidly and widely than before the war. The Japanese economy continued to

⁹ Solow (1956, 1957), Swan (1956), and Kaldor (1961).

¹⁰ In this, we follow Solow (1956, 1957) and Swan (1956).

grow rapidly until its income per person reached 80 percent of the U.S. level in 1991, and many predicted that it would pass the U.S. level. Following a decade of recession in the 1990s, however, Japan has settled down to a new balanced growth path in 2000 with about 77 percent of the U.S. income per person.

Figure 1: Real GDP per working-age person in Japan and the United States



We follow North (1991) in viewing institutional changes as moving countries from one stage of economic growth to another. We view the institutional changes of the Meiji Restoration as generating the rapid growth 1870–1900 that moved Japan from the Malthusian trap to the take-off into growth. Similarly, we view the institutional changes associated with the American occupation as generating the rapid growth 1945–1991 that moved Japan to catch up to and to join the economic leader.

We have chosen the 65 percent cut-off for joining the economic leader because it picks up countries like Japan that share some of the economic leadership with the United States. Lewis (2004) argues that Japan, led by Toyota, has been the leader in setting best practice in automobile production, and heavy manufacturing more generally, since the 1970s. He suggests

that the gap of more than 20 percent in income per person between Japan and the United States is due to Japan lagging significantly behind best practice in such other sectors as retailing, food processing, housing construction, and health care provision.

Our theory views the institutions that lead to these deviations from best practice as putting the brakes on Japanese economic growth in the 1990s and keeping Japan more than 20 percent below the U.S. level. Eichengreen, Park, and Shin (2011), following the hypothesis in Kehoe and Ruhl (2010), confirm that, following periods of rapid growth, countries tend to converge to growth paths of 2 percent per person per year, as does Japan in figure 1.

Barriers to growth

Most countries have not experienced the growth that Japan has had, moving from taking off to catching up to and to joining the economic leader, and we hypothesize that the lack of institutional and policy change is the primary barrier to growth for these nations. Just as institutional changes can lead to growth, the absence of such changes can lead to stagnation. Parente and Prescott (1994, 2002) and Lewis (2004) view inefficient institutions and policies as imposing barriers to the adoption of best practice. A vivid example of a barrier to growth is provided by North (1968), who argues that most of the six-fold increase in productivity in ocean shipping from 1600 to 1850 was due to the suppression of piracy, which allowed shippers to develop larger ships with smaller crews that could make voyages independently rather than in convoys. Between 1600 and 1850 there were improvements in technology such as the development of the chronometer for navigation, but North argues that none of the major improvements in best practice in shipping was due to technology. He cites as evidence that by 1600 the Dutch had developed a ship design, the flute, that had most of the crucial technological advantages of early 19th Century ships but had only limited use in Baltic bulk trade and English coal trade because of its vulnerability to pirate attacks and the prevalence of piracy on major ocean trade routes in the 17th and 18th Centuries.

Some barriers to growth are imposed by forces outside a country, like North's sea pirates or a colonial power that suppresses domestic institutions so that it can exploit a country's resources. Most often, however, the pirates who are holding back adoption of best practice are elites or special interest groups within a country. In some countries, these groups operate directly within the government. In others, they manipulate government institutions. Table 1

reports survey measures of perceptions of corruption constructed by Transparency International and the impact of government regulations on the ease of doing business for small and medium size firms constructed by the World Bank’s Doing Business project. Countries are ranked from the lowest perception of corruption to the highest and from the highest ease of doing business to the lowest. Asturias *et al.* (2015a) use cross-country, firm-level data to argue that the ease of entry for new firms is crucial for generating the sort of rapid growth that allows a country to move from one stage to another.

Table 1: Perceived Corruption and Ease of Doing Business in Countries organized by Growth Stages, 2010

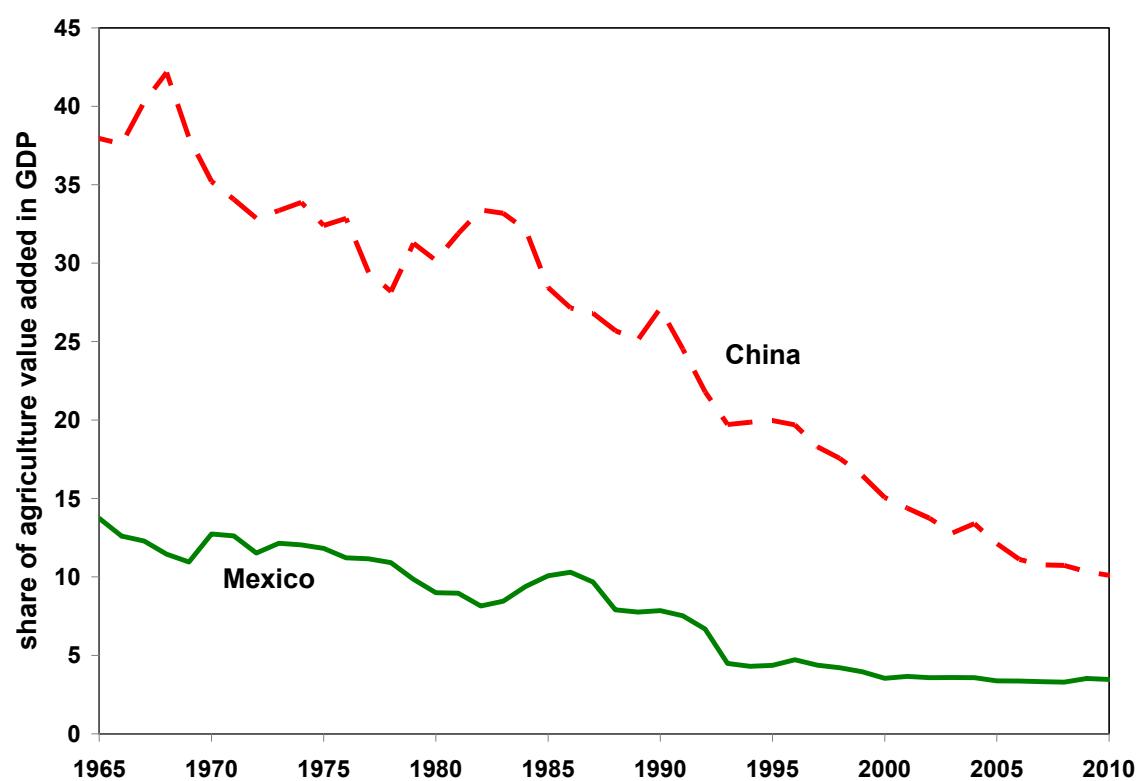
Growth Stage	Corruption perceptions	Ease of doing business
stage 3 (joining)	21.7	16.7
stage 3 failure	111.6	128.9
stage 2 (catching up)	49.2	53.3
stage 2 failure	100.3	68.5
stage 1 (taking off)	95.6	108.2
stage 1 failure	116.4	121.5
stage 0 (Malthusian trap)	143.8	156.7
Population-weighted, average ranks. Lower number means less perceived corruption and greater ease of doing business. The Transparency International ranking runs from 1 to 177. www.transparency.org/ The Doing Business ranking runs from 1 to 182. www.doingbusiness.org		

China versus Mexico

Over the past two decades, China has experienced very rapid economic growth. We argue that, unless it undergoes major institutional change, China has reached (or soon will) the limit of its rapid growth, as did Japan in 1991 and Mexico in 1981. China is still in the take-off

stage because its income per person is only 24 percent of that of the United States. China is still benefiting from massive migration of population from rural to urban areas and movement of workers from agriculture into industry. As seen in figure 2, China is still significantly behind Mexico in this process.¹¹ We should point out that Asturias *et al.* (2015b) argue, following Kehoe and Meza (2011), that China has had an advantage over Mexico because it opened to international trade and investment earlier in its industrialization process, building up an industrial structure better able to cope with international competition.

Figure 2: Share of agriculture in GDP



Kehoe and Ruhl (2010) argue that Mexico has had poor growth performance since the 1980s because of problems with its financial system, immobility in labor markets, and lack of rule of law. They point that these sorts of barriers to growth are also present in China, and are

¹¹ Determining where exactly China stands compared to Mexico in income per person depends on what data source we use. Comparing income levels across such different countries is an inherently difficult task. The Maddison Project has China only 11 percent behind Mexico in 2010, the latest year for which data are available, which would imply that China is currently slightly ahead. The World Bank's World Development Indicators have China 47 percent behind Mexico in 2010 and the Penn World Tables have China 44 percent behind, however, and both would imply that China is still significantly behind.

perhaps even worse there. Transparency International, for example, ranks China 78 in 2010 and Mexico 98, while Doing Business ranks China 89 and Mexico 51. Our theory suggests that the barriers that slowed growth in Mexico have not yet slowed China because China has not reached the catching up stage of growth. Perhaps these barriers are starting to bind on China. If not, we hypothesize that they will soon.

Who will overtake the United States?

Starting in the 1870s, the United States began to grow at a consistently higher rate than that of the United Kingdom and in 1901 overtook the United Kingdom to become the economic leader. Is some country currently overtaking the United States? As we have seen, Japan reached 80 percent of the U.S. level in 1991. That is a closest a major economy has come in recent decades. Hong Kong, Norway, and Singapore were approaching the U.S. level in 2010, and may soon pass it, but these are very small countries who do what they do very well but are never going to be the leaders in a significant number of economic sectors. It is conceivable that South Korea, which has had high growth in recent decades, will eventually pass the United States, but, as of 2010, South Korea had a level of income per person only 64 percent of the U.S. level and still had not entered the stage of joining the economic leader. Currently, there is no major country that is the obvious candidate for the next world economic leader.

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Appendix

In developing our theory, we face an easier task than did Rostow because we have far more data. In particular, we use the data of the Maddison Project, which continues the work of Angus Maddison (2003) in estimating real GDP for many countries over long periods of time. The 2010 database that we use has data for 223 countries, which contain more than 99.9 percent of the world's population.

Because of data limitations and the very small sizes of some countries, we group the data into 135 countries and 8 country groups that contain the remaining 88 countries. We group the 15 countries that made up the former Soviet Union into one group, for example, because of lack of data for individual countries before 1990. We also group together 21 very small countries in the Caribbean.

The U.S. data from the Maddison Project that we use differ from those from the U.S. Bureau of Economic Analysis used by Kehoe and Ruhl (2010). The different ways in which these data were constructed explain why the 1.8 percent per person per year trend growth that we find for the United States differs from the 2.0 percent per person per year trend found by Kehoe and Ruhl.