



Economic Policy Papers

EXECUTIVE SUMMARY

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. 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.

The Stages of Economic Growth Revisited*

Part 1: A General Framework and Taking Off into Growth

Daniela Costa

University of Minnesota

Timothy J. Kehoe

University of Minnesota

Federal Reserve Bank of Minneapolis

National Bureau of Economic Research

Gajendran Raveendranathan

University of Minnesota

Introduction: A new theory of economic growth

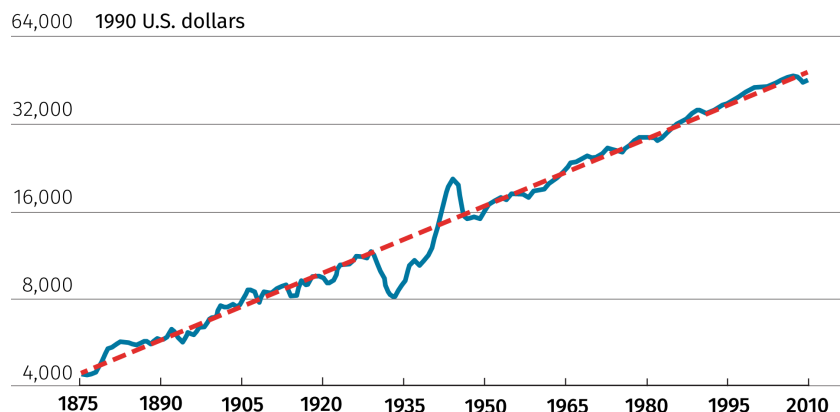
Since the time of Adam Smith (1776), economists have asked: Why do some countries grow more rapidly than others? This question can be extended in many ways: Will the Chinese economy surpass the U.S. economy? Following the recent worldwide recession, what country, or group of countries, will emerge as 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

*This paper reports on the results of a larger project that we are conducting jointly with Sewon Hur of the University of Pittsburgh and Kim J. Ruhl of the Stern School, NYU. The authors are grateful to Edward Prescott for extensive discussions. They 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.

Growth in per capita income, 1875 to 2010, United States

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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

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.² With the exception of the Great Depression of the 1930s and the subsequent buildup 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.³

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

The growth achieved by the United States toward 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 fol-

lowed by, comparable growth in population, as first modeled by Malthus (1798). Over the period 1820–1900, the United Kingdom achieved an unprecedented growth rate 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 the 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 percent in income per person. Using that as a benchmark, we classify countries that have never achieved average annual growth of 1 percent for 25 years as being in **Stage 0: Malthusian trap**, where economic growth is roughly matched by population growth.

Countries that have experienced 1 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 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, individual social mobility and other changes. For Rostow, take-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 Stage 2 and Stage 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,⁴ benefiting from the sort of catch-up growth that Mexico experienced over the periods 1890–1910 and 1950–1980.⁵

We classify countries as being in **Stage 2: Catching up to the economic leader** if their per capita income 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.⁶

We classify countries as being in **Stage 3: Joining the economic leader** if their per capita income is above 65 percent 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 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.

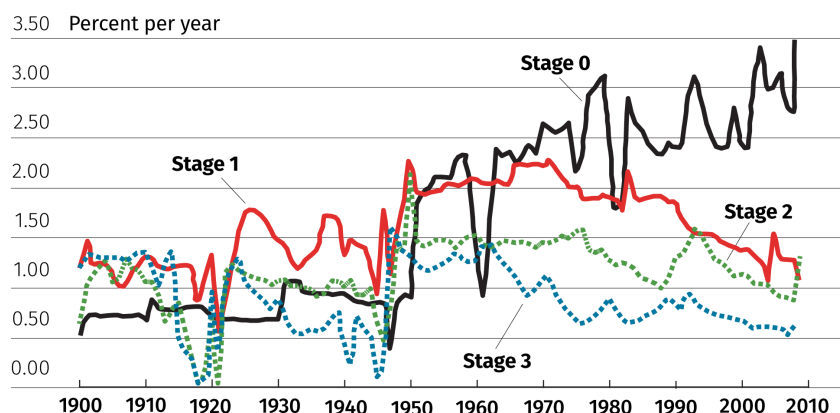
Taking off into growth

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 cutoffs 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 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 show 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.

Population growth rates by stage of growth

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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 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.

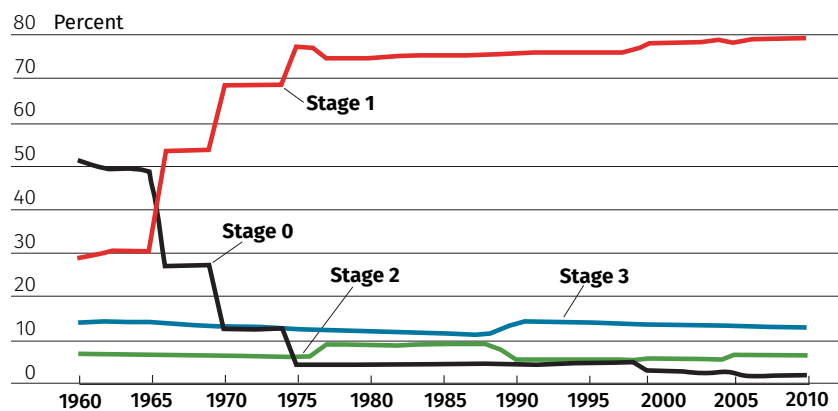
As Figure 3 shows, more than 50 percent of the world’s population lived in countries in the Malthusian trap in 1960 (Stage 0; black line). By 2010, less than 2 percent of the world’s population lived in the seven countries still in the Malthusian trap (Afghanistan, Central African Republic, Haiti, Madagascar, Niger, Senegal and Somalia). The major countries to take off into growth were China in 1966 and India in 1970.⁷

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

Share of world population by stage of growth

3



countries. The number of countries catching up to and joining the economic leader increased by 13 individual countries and one 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. 2015).

Endnotes

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

²By “per capita income,” we refer to real GDP (gross domestic product) per working-age person (15 to 64 years). We take real GDP data from the Maddison Project (2013) 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 use population data from the Maddison Project to infer changes in the working-age population before 1960.

³Following the work of Solow (1956) and Swan (1956).

⁴In this, we follow North (1991).

⁵Kehoe and Meza (2011).

⁶We 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 buildup in the U.S. data, however. Consequently, we ignore the 1930–1945 data in making comparisons across countries.

⁷It 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 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 percent per year.

References

- Clark, Gregory. 2007. *A Farewell to Alms: A Brief Economic History of the World*. Princeton University Press.
- Costa, Daniela, Timothy J. Kehoe and Gajendran Raveendranathan. 2015. “The Stages of Economic Growth Revisited, Part II: Catching Up to and Joining the Economic Leader.” Federal Reserve Bank of Minneapolis.
- Deaton, Angus. 2013. *The Great Escape: Health, Wealth, and the Origins of Inequality*. Princeton University Press.
- De Vries, Jan. 2008. *The Industrious Revolution: Consumer Behavior and the Household Economy, 1650 to the Present*. Cambridge University Press.
- Elvin, Mark. 1973. *The Pattern of the Chinese Past: A Social and Economic Interpretation*. Stanford University Press.
- Hodrick, Robert J., and Edward C. Prescott. 1997. “Postwar U.S. Business Cycles: An Empirical Investigation.” *Journal of Money, Credit, and Banking* 29: 1–16.
- Kehoe, Timothy J., and Felipe Meza. 2011. “Catch-Up Growth Followed by Stagnation: Mexico, 1950–2010.” *Latin American Journal of Economics* 48: 227–68.
- Kehoe, Timothy J., and Edward C. Prescott. 2002. “Great Depressions of the 20th Century.” *Review of Economic Dynamics* 5: 1–18.
- Kehoe, Timothy J., and Edward C. Prescott. 2007. *Great Depressions of the Twentieth Century*. Federal Reserve Bank of Minneapolis.
- Kehoe, Timothy J., and Kim J. Ruhl. 2010. “Why Have Economic Reforms in Mexico Not Generated Growth?” *Journal of Economic Literature* 48: 1005–27.
- Landes, David S. 2006. “Why Europe and the West? Why Not China?” *Journal of Economic Perspectives* 20: 3–22.

- Maddison, Angus. 2003. *The World Economy: Historical Statistics*. Development Centre Studies, OECD.
- Maddison Project. 2013. <http://www.ggd.net/maddison/maddison-project/home.htm>. 2010 and 2013 versions.
- Malthus, Thomas R. 1798. *An Essay on the Principle of Population*. J. Johnson in St. Paul's Church-Yard.
- North, Douglass C. 1991. "Institutions." *Journal of Economic Perspectives* 5: 97–112.
- Parente, Stephen L., and Edward C. Prescott. 1994. "Barriers to Technology Adoption and Development." *Journal of Political Economy* 102: 298–321.
- Parente, Stephen L., and Edward C. Prescott. 2002. *Barriers to Riches*. MIT Press.
- Rostow, Walt W. 1960. *The Stages of Economic Growth: A Non-Communist Manifesto*. Cambridge University Press.
- Solow, Robert M. 1956. "A Contribution to the Theory of Economic Growth." *Quarterly Journal of Economics* 70: 65–94.
- Smith, Adam. 1776. *An Inquiry into the Nature and Causes of the Wealth of Nations*. Book Renaissance.
- Swan, Thomas. 1956. "Economic Growth and Capital Accumulation." *Economic Record* 32: 334–61.

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 eight 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 percent per person per year trend found by Kehoe and Ruhl.

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