Economic transformation, population growth and the long-run world income distribution ☆

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ABSTRACT

We present and calibrate a model where trade with advanced economies spurs development, and trade opportunities depend on the relative population in advanced and developing countries. As developing countries become advanced, prospects improve for the remaining developing countries. If population growth differentials between developing and advanced economies are small, economic development accelerates over time. Otherwise, long-run global prosperity requires a sufficiently large initial population in advanced countries. More open countries develop faster, but more openness by all developing countries may only modestly increase their aggregate growth. China's development may hurt developing countries in the short-run, but improves their long-run prospects.

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1. Introduction

Integration with the world economy has arguably been the chief route from poverty to wealth. Japan exported cheap goods after World War II and later moved on to more technologically sophisticated products. As Japan grew, Korea, Taiwan Province of China, Hong Kong SAR and Singapore replaced Japan as low wage exporters, and when these economies moved on to more sophisticated products, Thailand and Malaysia filled their niche. More recently, China has become an important exporter of manufactured goods and India is increasingly moving into services exports. A number of explanations have been advanced for the link between non-traditional exports and growth, including learning and political economy effects of trade. This paper does not seek to model the reasons for this link, but instead, takes it as given and explores its implications for the long-run evolution of the world income distribution.

We present a model in which countries have an opportunity to develop when they integrate with the world economy by producing non-traditional exports for advanced countries. A developing country's export opportunities are greater the more potential buyers there are in advanced countries and the fewer potential competitors there are in developing countries. Thus, as developing countries succeed in becoming advanced economies, their success will improve the export opportunities for the remaining developing countries, which can lead to accelerating global growth. Once China, for example, becomes rich, a billion more people will live in a country that imports labor-intensive goods and a billion fewer in a country that exports them, opening up opportunities for other countries to fill this niche. Whether the world economy converges to a state of widespread prosperity depends on the extent of barriers to trade, the rate at which developing countries that are engaging in trade become advanced economies, migration rates, population growth rates in rich and poor countries, and potentially on initial conditions. A key factor influencing the long-run evaluation of the world economy is differences in population growth rates between countries. If the disparity in population growth rates between developing and advanced countries is not large relative to the economic transformation and migration rates, then the proportion of the world population living in advanced countries will increase indefinitely. If the disparity in population growth rates is sufficiently large, then the long-term evolution of the world economy will depend on whether or not the share of the population living in advanced countries (and resulting demand for developing country labor and migration) is above a critical level necessary for the development and migration process to dominate the opposing demographic trend. If it is above (below) that critical level,

the proportion of the world population living in advanced (developing) countries increases indefinitely.

A simple decomposition of trends in world population shows that in the 19th century, the proportion of the world population living in advanced economies grew despite a slow rate at which developing countries transformed into advanced economies because population growth in advanced countries exceeded that in poor countries. In the 20th century advances in cheap easy-to-use medical technology, such as vaccines and antibiotics, disproportionately reduced mortality in the developing world and this, combined with falling fertility in the advanced world, led to rapid declines in the share of the world population in advanced countries. Calibration based on the post-war period suggests disparities in population growth rates are large enough that the proportion of the world population living in poor countries will not decline rapidly. In fact, in our baseline calibration, the proportion of the world population in advanced countries is currently below the critical threshold for the world economy to converge to the favorable steady state. However, if population growth in the developing world continues to decline faster than in advanced countries (as projected by the United Nations), the system will converge to the favorable steady state, albeit extremely slowly. An increase in the rate at which poor countries develop disproportionately increases the speed of convergence, due to the model's non-linearities. Rapid growth in China and India would translate into a large increase in the proportion of the world population in advanced economies, moving that ratio well above its critical threshold. That would lead to an acceleration of development elsewhere and a rapid convergence to widespread prosperity (that is, a convergence that takes decades not centuries).

The model also suggests that improvements in policy that reduce the cost of trade can lead to rapid growth for a particular country, but that the response of world growth to a similar improvement by all developing countries will be much smaller. In our model, a developing country will only start exporting to advanced economies once all the other developing countries with lower costs have already done so. When a country improves its policy environment by reducing tariffs or other barriers to trade, it advances its place in the "queue" of countries waiting to integrate into the world economy. But given the limited capacity to absorb all the labor in the developing world, the speed at which development occurs is itself constrained by the size of advanced economies (and small improvements in the average trade cost will only translate into small gains in global growth). This queuing feature might help explain why growth failed to pick up in many developing countries despite policy improvements in the past decades (for example, much progress has been made in trade liberalization and macroeconomic stability). Under the model, even if some developing countries have policies that are so bad that they would never integrate into the global economy, the world may still converge to a widespread prosperity steady-state since labor from these "hopeless" countries could be absorbed into the global economy through migration, as long as there are not too many of these countries.

Our paper is related to previous studies that analyzed economic growth in the (very) long-run. Quah (1993) and Kremer et al. (2001) consider a transition matrix analysis of the world income distribution. Our model departs from the transition matrix approach in allowing transition probabilities to depend on the state of the world economy. This can generate more optimistic predictions of accelerating growth in the world economy, with developing countries potentially doing better in the future than countries with similar characteristics have done in the past.

The idea that learning externalities from advanced countries can facilitate the development of poorer countries dates back at least to Gerschenkron (1962). Tamura (1996) presents a model with endogenous choice between fertility and human capital investment, which addresses some of the same issues studied in this paper, showing that as rich countries grow they raise the return on human capital, causing

human capital investment, demographic transition, and growth in poor countries. Much of the novelty of our approach relies on focusing on trade as the conduit for transformation and the limitations on the extent to which the modern global economy can absorb all the labor in the developing world. Our analysis also sheds new light on a host of topical issues which likely depend on the relative population in advanced and developing countries, such as the role of migration, the impact of reforms, aid, and the broader implications of the emergence of China.

Perhaps the most closely related model to ours is that of Lucas (2000), in which economic growth begins in a stagnant economy with an exogenous probability, and is then proportional to the difference between a country's income and that of the leading country (which grows at a constant rate).[1] By allowing for an endogenous take-off process and differential population growth, our model can generate much richer dynamics, including multiple steady states. Depending on parameter values and initial conditions, there may be accelerating global growth or a declining fraction of the world population living in rich countries. In that latter scenario, a non-infinitesimal share of developing countries will never be integrated into the global economy and will remain stagnant forever, which would not occur in Lucas (2000), even if his setting was extended to allow for population growth differentials. Our endogenous take-off process also provides a framework for analyzing the impact of channels which depend on the relative size of the rich population in the world, as described above.

The remainder of the paper is organized as follows. Section 2 presents the model. Section 3 solves for the evolution of global economy. Section 4 introduces differences across countries. Section 5 extends the model to capture terms of trade changes as the global economy develops. Section 6 calibrates the model, and Section 7 concludes.

2. The model

Suppose there are two types of countries: advanced and developing. The world economy consists of a continuum of countries with measure one, and countries are similar to other countries of the same type. We later discuss the effects large countries can have on the evolution of the world economy (which is illustrated in Section 6). Section 4 introduces differences in the barriers to trade across developing countries.

2.1. Production

There are two production technologies: traditional and modern. Labor is the only input and is inelastically supplied. Advanced and developing countries are equally productive in the traditional technology, with each unit of labor producing one unit of the final consumption good. The modern technology includes two tasks: a simple and a complex one. The complex task produces intermediate input H, while the simple task produces intermediate input L. Trade in intermediate inputs potentially allows modern production to be split among countries. The population of advanced countries consists of high-skill workers, and only those countries can produce intermediate good H. The population of developing countries consists of low-skill workers. This polarization of skills is derived as the outcome of an optimal fertility and education investment decision in Section 2.2.

Both types of workers can produce the intermediate good L, which can be produced anywhere, but production in a developing country c

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[1] Lucas (2009) presents a model building on that insight where the stock of knowledge in a poor country is a function of its human capital and that of the leading economy, which allows for higher growth during its catching-up process. The model is calibrated using measures of openness, development, and employment share of agriculture to determine the group of countries where this catching-up process has started.