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# WHAT HAVE WE LEARNED FROM RECENT EMPIRICAL GROWTH RESEARCH?†

## Levels of Economic Activity Across Countries

By ROBERT E. HALL AND CHARLES I. JONES\*

In the title of his 1989 Richard T. Ely lecture to the American Economic Association, David Landes asked, “Why are we so rich and they so poor?” (Landes, 1990). It is an odd fact that the subsequent explosion of empirical work on economic growth has rarely returned to this question, choosing instead to focus on explaining differences in average growth rates across countries, computed over several decades. In this essay and in recent research (Hall and Jones, 1996), we examine economic levels instead of economic growth.

Levels of economic performance vary considerably across countries, and the differences are typically persistent over time. For example, the ratio of GDP per worker in the fifth-richest country to that in the fifth-poorest country in 1988 was 29. In 1960, this ratio was 26. The correlation between the log of GDP per worker in 1960 and 1988 is 0.91. Why are some countries so much richer and more productive than others? This is one of the fundamental questions in economics.

Our study of economic levels builds on a large body of work by economic historians, development economists, and theorists. Our contribution is to focus this often disparate work sharply on levels of output per worker and to exploit the substantial data-collection efforts of the contributors to the empirical growth literature. We conclude that differ-

ences in levels of economic success across countries are driven primarily by the institutions and government policies (or *infrastructure*) that frame the economic environment in which people produce and transact. Societies with secure physical and intellectual property rights that encourage production are successful. Societies in which the economic environment encourages the diversion of output instead of its production produce much less output per worker. Diversion encompasses a wide range of activities, including theft, corruption, litigation, and expropriation.

### I. Recent Empirical Growth Research

One of the original motivations for the empirical growth literature was the observation that average annual growth rates over several decades vary substantially across countries (see, e.g., Robert E. Lucas, 1988). Simple calculations reveal that even small differences in such growth rates can add up over time to enormous differences in levels of income. Recent growth research has been successful in explaining differences in growth rates across countries, but the explanation is somewhat of a surprise, and perhaps even a little disappointing. There is a great deal of empirical and theoretical work to suggest that the primary reason that countries grow at such different rates for decades at a time is *transition dynamics*. Put very crudely, a country with output substantially below the level of its balanced-growth path will grow rapidly; a country above its balanced-growth path will grow slowly. This explanation does not require any difference in the long-run growth rate of economies (see e.g., Robert Barro and Xavier Sala-i-Martin, 1992; N. Gregory Mankiw et al., 1992).

This by itself, however, does not mean that there are no differences across countries in

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the long-run growth rate, only that such differences are not required to understand cross-sectional growth rates. To take the argument further, consider the research-based theories of economic growth of Paul M. Romer (1990) and others. The world economy grows because of technological progress through the invention of new ideas. In examining individual countries, however, one cannot ignore technology transfer and diffusion. Singapore does not grow solely or even primarily because of the inventions of its citizens. Instead, Singapore is effective at taking advantage of technologies invented elsewhere. In this view, technologies are invented throughout the world and then gradually diffuse. Growth in all countries is driven by the underlying growth rate of world knowledge. The diffusion of technology may take a long time, but the fact that it happens eventually generates the result that all countries have the same long-run rate of growth.<sup>1</sup>

The sense in which this might be viewed as disappointing is that it seems to call into question the original spirit of the endogenous-growth literature. However, this is not necessarily the case. Instead of studying economic growth, one can study economic levels. All of the substantive issues of growth research remain, and some new ones emerge.

We believe that it is a fair conclusion that growth research has not provided workable explanations for the extreme diversity in output per worker across countries. If technology and capital can move across borders, the force of arbitrage will raise output per worker in poorer countries. An explanation of highly stable differences in output per worker must invoke highly persistent barriers to arbitrage. Our approach considers barriers related to infrastructure.

The trend in the empirical growth literature has been to slice up 30 years of cross-section data into a panel data set of decade or five-year growth rates. While this is a useful way to proceed if one is interested in transition dy-

namics, for our purposes it goes in exactly the wrong direction. We are interested in the long-run determinants of economic success. We hypothesize that these long-run determinants are factors that are likely to change slowly over time, like the institutional structure of the economy. In our econometric framework, we include variables such as the language spoken in a country (to help measure the type of infrastructure; one might think that countries that inherited the English language also inherited British institutions such as a strong judiciary) and the extent to which the economy is organized around a system of private ownership. The determinants we consider are likely to be roughly the same in 1960 and in 1988. To the extent that one conditions on initial income, or to the extent that one includes fixed effects in a panel regression, it may be very difficult or impossible to uncover the effects we search for. It is the fixed effect itself that we are trying to explain.

A definitive study of current levels of economic activity across countries would explain the level of activity at the moment that human occupation began and would then consider the growth that occurred in each subsequent year up to the present. The existing large body of research on growth over periods of different lengths and our recent work on levels in a cross section of countries give alternative and complementary approximations to the definitive study.

## II. Theory and Qualitative Evidence

What explains the large differences in economic levels across countries? Our hypothesis is that an important part of the explanation lies in the economic environment in which individuals produce, transact, invent, and accumulate skills. The infrastructure of an economy is the collection of laws, institutions, and government policies that make up the economic environment. A successful infrastructure encourages production. A perverse infrastructure discourages production in ways that are detrimental to economic performance. A corrupt bureaucracy, for example, acts as a tax on the productive activities of the economy. Investors must spend some of their time and resources bribing officials in order to ob-

<sup>1</sup> A number of papers have been written along these lines. See, for example, Stephen L. Parente and Edward C. Prescott (1994), Jonathan Eaton and Samuel S. Kortum (1995), and Barro and Sala-i-Martin (1995).

tain permits and licenses necessary for the conduct of business. As Andrei Shleifer and Robert W. Vishny (1993) argue, if the government is organized so that a number of bureaucrats have "hold-up" power over an investment project, the result may be to cut investment dramatically: the officials may be unable to coordinate, so that the sum total of bribes required to conduct business is greater than the private gains from setting up the business in the first place.

This kind of diversion of resources can have important dynamic consequences for the allocation of talent (see William J. Baumol, 1990; Kevin Murphy et al., 1991). Individuals who might otherwise become entrepreneurs will instead devote their energies to rent-seeking or other forms of diversion. The types of skills that an individual accumulates may be those that maximize an individual's chance of securing a position in the government bureaucracy instead of skills that would increase the productive capacity of the economy. Medieval China and its imperial examinations represents a classic example of this diversion of talent. Douglass North's (1990) famous example of pirates investing in technologies and skills to make piracy more effective is another.

Societies that have successfully developed infrastructures that favor production over diversion have typically done so through effective government. Such policies might include a strong judiciary and secure property rights or their equivalent. In an environment with an effective judicial system, relatively few resources are actually needed to enforce the laws, because of the deterrent effect of the credible threat of enforcement. At the same time, the power to make and enforce laws is the power to break them, and in a number of societies, the government itself is a primary source of diversion. This suggests the importance of the separation of powers and a system of checks and balances.

A number of authors have proposed similar theories in different contexts (see Hall and Jones [1996] for citations). Our research is complementary to these earlier studies. The contribution of Hall and Jones (1996) is to examine these issues empirically using the large collection of data assembled by the em-

pirical growth literature. We will review the findings of this research next.

### III. The Productivity of Nations

A glance at data on the wide variation in output per worker across countries raises an age-old question: why are some countries so much richer and more productive than others? Mankiw et al. (1992) provide one answer to this question, based on the production function. Their answer is that some countries invest a larger fraction of their output in physical and human capital than others. But this raises another question: why is it that some countries invest so much more than others? In Hall and Jones (1996) we consider the determinants of the accumulation of physical and human capital. Our conclusion is that differences in infrastructure are fundamental to accumulation. In countries in which the infrastructure favors diversion over production, investment in capital, skills, and new ideas is reduced by the threat of diversion. Moreover, some of the investment that does take place is devoted to increasing the effectiveness of diversion instead of the effectiveness of production.

We examine a reduced-form econometric model in which differences in infrastructure across economies explain differences in output per worker. Then, we use the cross-country version of Robert M. Solow's (1957) growth accounting to decompose the level of output per worker in an economy into levels of inputs and the productivity of these inputs, the multifactor productivity level. We examine subsidiary reduced-form equations that show the relationships of capital inputs and multifactor productivity to measures of infrastructure across countries.

To measure infrastructure, we use several different variables. First, we use an index of the extent to which government policies favor production instead of diversion. Second, we use a measure of the openness of the country to international trade. Interference with trade is a sensitive indicator of the degree to which the government itself engages in diversion. Third, we measure the extent to which the economy is organized around the principle of private ownership of the means of production. Fourth, we use a measure of the fraction of the

population in a country that speaks an international language such as English or Spanish, as mentioned earlier.

Finally, we include one physical measure of infrastructure: the distance of the country from the equator. A long tradition among demographers and geographers recognizes that countries with temperate climates tend to have more successful economies than those with tropical climates. However, this relationship has not been examined carefully by economists.

Notice that our independent variables measure characteristics of the economy that change extremely slowly, if at all, over time. Distance from the equator is fixed, for example. It would be impossible to measure the roles of these variables in a cross-country growth framework or in panel estimation with unrestricted country effects. On the one hand, we require a much more stringent assumption to identify our equation than would be required in a setup with uninterpreted country effects. On the other hand, we are able to reach conclusions about determinants of economic success that elude research in a growth or panel framework.

For a detailed discussion of our methods and findings, the reader is referred to Hall and Jones (1996). We summarize our findings with the following points:

1. Differences in infrastructure are associated with a large fraction of the variation in the log of GDP per worker across countries; the  $R^2$ 's from our equations are typically above 0.75.
2. Infrastructure affects GDP per worker strongly through each element of the production function. That is, a poor infrastructure reduces the capital stock per worker, reduces the accumulation of skills measured by educational attainment, and reduces the total factor productivity of these inputs.
3. All of our measures of infrastructure are important, with one exception. The type of economic organization (capitalist vs. statist) is not a strong predictor of economic performance, either in simple bivariate relations or in our complete specification. Part of the explanation is that a number of

poor countries in sub-Saharan Africa are classified as capitalist, while a number of statist economies like the former Soviet Union and the former East Germany have relatively high output per worker.

4. Distance from the equator is the single strongest predictor of long-term economic success in our specification. Being located at the equator like Zaire or Uganda is associated with a reduction in output per worker by a factor of 4.5 relative to the Scandinavian countries.

#### IV. Conclusion

Recent theoretical and empirical work on economic growth suggests the usefulness of studying differences in economic levels across countries. The United States, Honduras, and Malawi all grew at roughly the same rate from 1960 to 1988. The underlying differences in infrastructure and government policies that influence long-run economic performance show up in levels, not growth rates.

A focus on economic levels leads to interesting new directions for empirical work. Our use of variables such as distance from the equator and language is just one example. Many of the variables employed in the empirical growth literature must be ruled out for our purposes because they are endogenous to the level of income. For example, measures such as the size of the government inclusive of welfare spending and the level of development of the financial sector are clearly endogenous. To explain differences in levels of long-run economic success across countries, one is forced to focus on more basic determinants.

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