

Endogenous Growth, Market Failures and Economic Policy

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Für mein Zwergi

From the earliest times of which we have record – back, say to two thousand years before Christ – down to the beginning of the eighteenth century, there was no very great change in the standard of life of the average man living in the civilized centres of the earth . . .

This slow rate of progress, or lack of progress, was due to two reasons – to the remarkable absence of important technical improvements and to the failure of capital to accumulate.

(John Maynard Keynes, “Economic Possibilities for Our Grandchildren”, *Essays in Persuasion*, 1931, pp. 322ff.).

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MARTIN ZAGLER

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1 Introduction: The Empirics of Economic Growth

Macroeconomics is essentially about two things, growth and cycles. Whilst cycles have been given much attention in the past (see, for example, Keynesian Macroeconomics, following Keynes, 1936), and present, for instance the theory of real business cycles (Cooley, 1995), and New Keynesian Economics (for an overview, see Mankiw and Romer, 1991), to give just a few examples, there has not been much work in the field of economic growth between the publication of Robert Solow's "Contribution to the Theory of Economic Growth" (Solow, 1956) – and its application in the field of development economics – and the reappearance of growth theory in Macroeconomics in the work of Paul Romer (Romer, 1986).

Whilst it seems intuitive to discuss issues of the business cycle, as it dramatically influences current well-being, it might not seem as important to consider growth issues. Yet there are two arguments in favor of an immanent importance of theorizing about economic growth – one numerical, one theoretical.

First, consider an economy with a fairly reasonable long-run growth rate of 3 per cent per year. This would accumulate to 34.4 per cent in only ten years. If one could foster growth by only 0.1 percentage point per year, this would increase the ten-year compound growth rate by 1.3 percentage points. Now take the annual standard deviation of the business cycle, which is slightly above one percentage point per year in industrialized countries. Having fostered economic growth initially, a "normal" recession would still exhibit a GDP which is higher than at 3 per cent constant growth without fluctuations. Still, I would not go as far as Robert Barro and Xavier Sala-i-Martin (1995a), who concluded that:

if we can learn about government policy options that have even small effects on the long-run growth rate, then we can contribute much more to improvements in standards of living than has been provided by the entire history of macroeconomic analysis of counter-cyclical policy and fine-tuning. Economic growth ... is the part of macroeconomics that really matters

as other welfare indicators, in particular concerning distributional justice, like the unemployment rate, fluctuate much more with the business cycle as compared to the trend of the economy. It was for this reason Robert Solow announced in his Nobel Laureate address (1988), that any theory of growth without taking unemployment seriously lacks theoretical background for political conclusions.

But – and this is the second, and more important, argument – thinking about the long-run perspective of an economy is a necessary fundamental for any time-consistent theory of the cyclical behavior of the economy, as the long-run course of the economy is a natural candidate for the boundary or transversality condition of the short-run model.

In the following chapters, I make an attempt to actively contribute to this modern theory of economic growth, which – contrary to the results indicated by Robert Solow (1956) – states that long-run growth depends on economic variables, and – and this is the essential point – can therefore be influenced by the decisions people, consumers, firms, and market institutions make.

1.1 STYLIZED FACTS

Economic growth describes the long-term behavior of real output in economies, abstracting from short-term fluctuations, such as business cycles. In growth theory we are tempted to analyze reasons for persistent changes in these aggregate variables. Therefore, most of the statistical observations that I shall discuss will actually try to show why growth can happen.

An easy definition of growth is to look at annual rates of increase of Gross Domestic Product (GDP) *per capita*. Despite the problem that GDP will certainly not correspond to the aggregate well-being of the individuals within the economy, it should give an easy-to-measure approximation. In terms of utilitarian economics, a social welfare function would be more correct. But as we do not know shadow prices of income, we can only estimate these type of functions, and therefore will not do much better. At any rate, growth rates of the GDP *per capita* have steadily increased at fairly constant rates over long periods of time.

Starting to discuss empirical regularities of economic growth, one first has to describe the data used. As in most cases time series are not available for the long-run, one usually studies cross-country data,

implicitly assuming that different countries potentially reflect the evolution of a single nation. There are three important cross-country data sets, which will be applied in the following. The first, and qualitatively best, are data of the OECD countries, including twenty-four industrialized countries in Europe, North America, Japan, Australia, and New Zealand (OECD, 1993). As the sample size is not very large, one frequently refers to the Penn World Tables (Summers and Heston, 1991), which includes data of some 120 countries on a purchasing power parity (PPP) basis. Finally, an interesting sample comes from the individual states of the United States, with the advantage that many barriers to trade can be ruled out from these data (US Department of Commerce, 1993). Most of these series, and a few others can also be found in the Barro and Lee data (Barro and Sala-i-Martin, 1995a).

Since the mid-nineteenth century, when production data were first collected, one can observe continued growth in output. Figure 1.1 depicts the distribution of average annual rates of economic growth in the OECD, measured as changes in real GDP, in the period 1960–1990. Economic growth averaged a substantial 3.6 per cent per year. There has, however, been some difference in growth rates across countries.

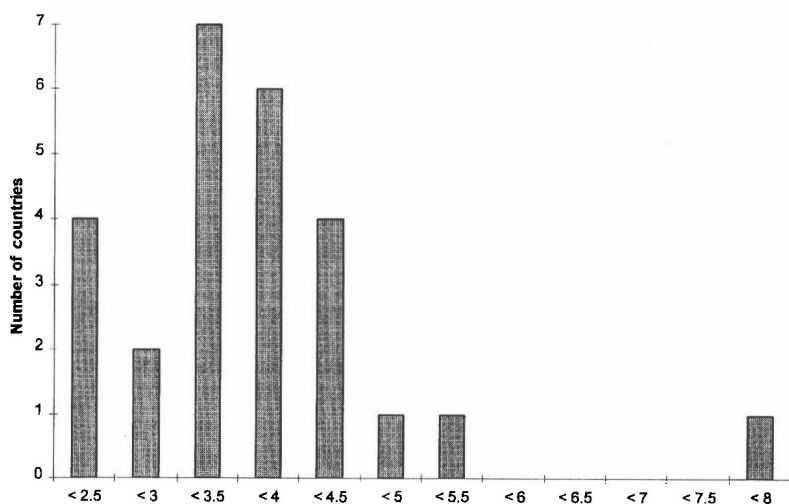


Figure 1.1 Histogram for annual average per capita growth rates of twenty-six OECD countries, 1960–1996

Source: OECD, *Main Economic Indicators* (1997).

Growth rates range from Switzerland's 2.24 per cent to South Korea's 7.8 per cent. In the OECD sample, we find besides Korea also Japan, Turkey, Mexico and Spain in the lead group, whilst New Zealand, Sweden, and Great Britain join Switzerland at the lower end. While the first group had low standards of living in 1960, the latter consists of richer economies. This has led to the hypothesis that poorer economies grow faster than rich ones.

This brings us to the question of correlation between the level of GDP and its growth rate. One line of argument suggests that growth rates have a tendency to converge internationally. This would imply that poor countries would exhibit higher rates of growth than rich nations. We do find some evidence when looking at Less Developed Countries (LDCs) in Africa, Asia, and Latin America. Maddison (1987) finds evidence for a sample period from 1870 to 1984 that France, Germany, the UK, the Netherlands, and Japan have steadily caught up with the US economy, which can be considered as the dominant economy and is therefore used as the reference country. Baumol (1986) gets similar results for OECD countries. Finally, Barro and Sala-i-Martin (1989) test for convergence within US states and find that the gap in GDP *per capita* between poor and rich states decreases more or less constantly by about 2 per cent per year. Recent empirical research has questioned this hypothesis. De Long (1987) enlarges Maddison's sample and concludes that there is no positive correlation between growth and welfare.

Figure 1.2 supports the idea of a negative correlation for the OECD sample, as already indicated. Including non-OECD nations in the analysis, any strong correlation between beginning-of-period levels of income and within-period growth is absent. Poor countries such as Ghana or Chad have exhibited a constant decline in real output, whereas the "four Tigers," Hong Kong, Korea, Singapore, and Taiwan, where people were not better off in 1960, experienced a phase of enormous growth.

This difference over such a long time is enormous, considering the fact that South Korea has raised its standard of living by a factor of seven, whilst Iraq has halved its well-being within thirty years. To sum up, there is a large heterogeneity in economic growth rates in the world economy, and this fact makes it interesting to ask what factors have influence on the economic growth rate.

Before that, one should note several other empirical regularities of economic growth. Some of them were originally discovered by Nicholas Kaldor in 1961, but continue to hold. Recent reformulation of his hypothesis can be found in Barro and Sala-i-Martin (1995a). The first

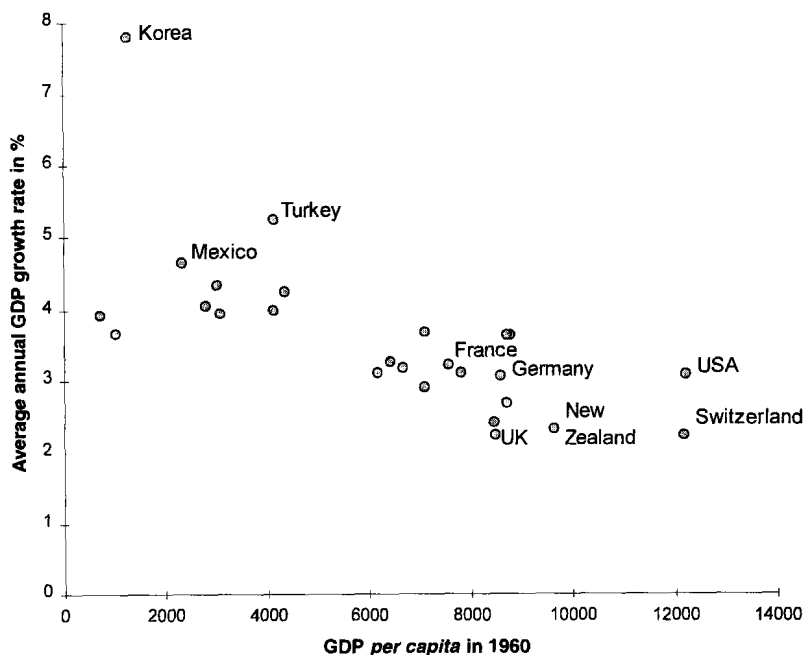


Figure 1.2 Average annual compound *per capita* growth rates for twenty-six OECD countries, 1960–1996

Source: OECD, *Main Economic Indicators* (1997).

fact is that *per capita* GDP grows over time, and its growth rate does not tend to diminish. This fact has already been discussed, and is supported by empirical evidence. Romer (1986) reports for intervals of forty years that in the United States, annual *per capita* GDP increased from 0.58 per cent in the period 1800–1840 to approximately 2.47 per cent since 1960. Barro and Sala-i-Martin show that for a sample of sixteen industrialized countries, GDP increased annually by 1.2 per cent in the period 1870–1890 to an annual average of 3.7 per cent between 1950 and 1970, but growth rates started to decline to 2.2 per cent in the 1980s and 1990s. Although this does not seem to be consistent with the Kaldorian stylized fact, one has to note that for issues of economic growth, twenty years is definitely not the long run, and that due to the wartime experience, growth rates might have been overproportionally high in the 1950s and 1960s (Barro and Sala-i-Martin, 1995a, pp. 5ff.).

Kaldor's second and third facts state that physical capital *per worker* grows over time, whilst the ratio of physical capital to output is nearly

constant. Nowadays, one should include the fact that human capital – education and knowledge in a wider sense – increases as well. Despite problems of measurability, this fact has to be considered. It implies, among other things, that investment plays a major role in economic growth, an aspect which is certainly underrepresented in most models of the short run (Solow, 1970, pp. 3ff.).

On the other hand, one observes that the rate of return to capital – that is, the real interest rate – remains fairly constant over time. This implies that as the capital stock increases, its profitability does not decline. This does not, however, imply that the marginal product of capital must necessarily remain constant, as one cannot hold other factors, such as the labor force, productivity, or human capital constant in these empirical analyses (Solow, 1970, pp. 3ff.).

Kaldor's fifth fact states that the shares of capital and labor in national income remain nearly constant. This has several implications. On the one hand, remembering that the ratio of physical capital to GDP remains fairly constant, and the return to the factor capital stays constant, this fact is consistent with the preceding argument. On the other hand, the share of labor depends on the size of the population, which is most likely determined outside the economic model. The only other variable that can hold the balance between the wage bill and national income constant is hence the real wage. When GDP steadily increases, as already mentioned, this implies that wages must increase as well. Furthermore, as the share of capital in national income has to be constant, by definition of the other stylized facts, if there are productivity gains in the economy, these must be due to improvements in the labor force, as the capital stock does not get any return to productivity gains, whilst the labor force is rewarded with increasing wages.

Finally Kaldor argues that the growth rate of output per worker differs substantially across countries, as already shown in Figure 1.1. In particular the interpretation of this last aspect has been controversial, and will be treated separately in section 1.2 (Grossman and Helpman, 1990d, pp. 2ff.).

Paul Romer (1994) indicated five novel facts which are important for modern theories of economic growth. In particular, whilst Kaldor's facts can be explained by both neoclassical growth theories and endogenous growth theories, the new facts clearly favor the latter theory. First, Romer argues that there are many firms in a market economy. This fact is evident, but it implies that there cannot be a production structure which would heavily favor a monopolization of a business sector or the