

# **AGGREGATE GROWTH, 1950-2005**

**Nicholas Crafts**

(University of Warwick and CEPR)

and

**Gianni Toniolo**

(Duke University and CEPR)

## 1. Introduction

The Industrial Revolution saw the beginning of the era of "modern economic growth" (Kuznets, 1966) whose distinctive characteristic is substantial improvements in living standards resulting from rapid technological progress. This has been reflected not only in increases in real GDP per person but also in leisure time and life expectancy. Since World War II, western Europe has experienced an unprecedented period of growth but its performance relative to Asia and the United States has seemed less impressive in recent decades than in the early postwar period. Eastern Europe did much less well as communism was unable to sustain similar improvements over the long run and the initial years of transition to market economies proved difficult but has seen rapid growth in recent years. Against this background, variations in the performance of individual countries also catch the eye, for example, the Celtic Tiger phase of growth in Ireland and the long period of relative economic decline in the UK. The objective of this chapter is to explore what economists and policymakers can learn about modern economic growth from European successes and failures in the recent past.

Our analysis is informed by several key conceptual approaches. The first of these focuses on the micro foundations of growth in terms of incentives to invest and to innovate and draws on endogenous growth theory. The key ideas are captured in Figure 1 which is adapted from Carlin and Soskice (2006). Here the downward-sloping (Solow) line represents the well-known inverse steady-state relationship between technological progress and the capital-intensity of the economy for a given savings rate in the neoclassical growth model. The upward-sloping (Schumpeter) line reflects the endogeneity of technological progress based on the assumption that with a higher capital (and output) to labour ratio a larger market makes innovation potentially more profitable. The equilibrium rate of technological progress is established by the intersection of these two lines and, in turn, this determines the rate of economic growth.

Figure 1 implies that the rate of innovation increases when either the Solow and/or the Schumpeter line shifts upward. In the former case, this will be the result of an increased rate of investment which thus has growth rate effects, unlike the neoclassical model in which technological progress is exogenous. In turn, investment will respond to changes in the economic environment which affect its expected profitability. In the latter case, this will be the result of an increase in innovative effort for any given market size which will reflect such changes as greater technological opportunity, lower R & D costs, increased appropriability of returns, and intensified competitive pressure on managers. The implication of Figure 1 is that the growth rate will be affected by institutions and policies.

The second set of ideas on which we draw is that of catch-up growth in the tradition of Abramovitz (1986). This literature highlights that growth may be very rapid in phases where countries start from a low initial level but are able to catch-up the leaders by reducing gaps in capital intensity and technology. This implies that scope for catch-up must be taken into account in evaluating growth performance. Abramovitz stressed that catch-up is by no means automatic but depends on "social capability" and "technological congruence". The former relates to the incentive structures which influence the effective assimilation of new technology and the latter to the cost effectiveness of technologies that might be transferred from more advanced countries. In terms of Figure 1, Abramovitz can be thought of as seeing catch-up opportunities as potentially shifting upwards the Schumpeter line but by how much

depending on social capability and technological congruence. A phase of successful catch-up growth will tend to be one in which investment is highly profitable and will also see outward shifts of the Solow line.

The third perspective from which we take insights is that of the new economic geography pioneered by Krugman and Venables (1995). The key ideas here are those of the importance of agglomeration productivity benefits based on external economies of scale and of market access in location decisions. These can imply that there are strong tendencies to spatial concentration of economic activity as market integration proceeds and trade costs fall. In models of this type, economic development may bring a phase of divergence of income levels and peripheral regions may be disadvantaged. However, at lower levels of trade costs, new agglomerations further from the centre may become favoured locations.

The context of growth in the postwar period has been economic integration within Europe and globalization in the wider world economy driven both by technological change and trade-liberalization policies which have reduced, but by no means eliminated, trade costs. The basic insights of the new economic geography are that this may change optimal location of various activities over time but that it is likely that a strong relationship between population density and productivity will continue and that trade and investment flows are deterred by distance as in the gravity model formulation. This may mean that catch-up and convergence across European regions is incomplete but also that European regions have to adjust as industries migrate.

The postwar history of economic growth in both western and eastern Europe has seen different episodes. In western Europe, the period 1950 to 1973 is conventionally known as the "Golden Age of economic growth", followed by a period of slowdown and then, from the mid-1990s, the era of the "New Economy". This gives rise to classic questions which can usefully be addressed in the light of the theoretical approaches outlined above. These include the following: 'why did Europe experience the golden age and why did it come to an end?'; 'what accounts for relative success and failure across countries in different periods?'; 'why has Europe failed to complete its catch-up of the United States?'; 'what is different about growth in the ICT era?'

In eastern Europe, we can distinguish a communist "Silver Age" of growth ending in the early 1970s, followed by slowdown culminating in collapse at the end of the 1980s, and the subsequent transition to catch-up growth in a market economy. Here too classic questions are apparent: 'why did the communist era lead in Abramovitzian terminology to falling behind rather than forging ahead?'; the linked, but distinct, question 'why did the communist era end so abruptly?'; 'how does catch up in the transition economies compare with earlier experience elsewhere?'

## **2. European Growth in Long-Run Perspective**

This section seeks to establish the basic facts of European economic growth taking a long-run perspective and using the standard periodization employed by Maddison (2003). We both review aggregate European performance and also offer a preliminary view of catch-up and convergence across countries.

Table 1 reports the combined growth performance of 16 western European countries and provides comparison with the United States. Modern economic growth was clearly in evidence in much of the region after the Napoleonic Wars. Long run growth has been formidable – in 2005 real GDP per person in Western Europe was about 10 times the 1870 level. The growth rate has been quite variable – the Golden Age of 1950 to 1973 stands out as an era of extraordinarily rapid growth which in part represents recovery from a period when growth had been undermined by the World Wars and the Great Depression. The post-Golden Age slowdown period has seen growth which by pre-1950 standards looks quite good.

Table 1 also shows that from 1820 to 1950 real GDP per person in the United States pulled a long way ahead of western Europe which was at 96 per cent of the American level in 1820 but had fallen to 48 per cent by 1950. The Golden Age saw a catch up such that by 1973 Western Europe had reduced the gap markedly and was at 68 per cent of the United States level. Since 1973, however, growth rates have been virtually the same and the European catch-up in real GDP per person has stalled while still far from complete.

Table 2 reports income levels and growth rates of each of the 16 countries. Most countries share in the overall European ups and downs between periods but there are some notable exceptions. For example, the first industrial nation, UK, saw growth slow down in the late nineteenth century, Norway, Sweden and Switzerland escaped the worst effects of war and had relatively strong growth in the 1913 to 1950 period, while Ireland spectacularly bucked the trend to slowdown in the late-twentieth century. The long run has seen some notable changes in the rank order of countries, most obviously, the relative decline of the UK.

The ratio of real GDP per person in the top compared with the bottom country rose up until 1950 but has fallen since so that in 2005 it was about 2 while 11 countries were clustered within 9 per cent of the median. Unlike the earlier periods, since 1950 there has been a clear tendency to  $\beta$ -convergence such that, on average, countries with low initial income levels have grown more quickly. Generally speaking, however, over the long run countries in Southern European countries have persistently had relatively low levels of real GDP per person. On the other hand, peripherality now appears to be less of a handicap at least in some cases, as the rise of Ireland and Norway confirms.<sup>1</sup>

Table 3 presents data comparable to Table 1 for the aggregate of eastern European countries for which Maddison (2003) and GGDC (2007) present long-run estimates and also for Russia/USSR. Over the long period since 1870 real GDP per person has risen by less than in the west, about 7 times compared with 10 times. Levels of real GDP per person have always been well below those in Western Europe and over time the gap has widened, especially since 1973. Obviously, this was partly attributable to the collapse in output at the end of the communist period and the delay before catch-up growth started in the transition economies but slow growth was also very much the case in the 1970s and 1980s. In the Golden Age, however, communism delivered growth rates only a little below those in Western Europe,

---

<sup>1</sup> Measured in terms of real GDP per person Ireland in 2005 was \$27295, i.e., would have been just ahead of Norway. However, since Ireland is now home to many multinationals whose transfer pricing policies are devised to allow their profits to be taxed under Ireland's generous corporate tax regime, Irish GDP is artificially inflated probably by something close to the GNP- GDP gap and GNP is a more appropriate measure for recent performance (Cassidy, 2004).

although this is not so impressive once the much greater scope for catch-up is taken into account.

The USSR was clearly always a long way below the United States in terms of real GDP per person – about 30 per cent in 1950 and 36 per cent in 1973 – and, despite a promising start, in the Golden Age only reduced the gap very slowly. The growth rate of 3.35% per year for this period reported in Table 3 compares quite unfavourably with the achievements of western European countries like Italy or Spain who started out with similarly low income levels. A similar point emerges in Table 4 where Czechoslovakia is seen to have grown at 3.08% per year almost 2 percentage points per year lower than Austria.

Table 4 shows that the top eastern European countries have never had income levels higher than those at the bottom of the western European league table. At the end of the 'Silver Age' in 1973, all countries except Czechoslovakia were below Ireland then with the lowest level of real GDP per person in the west. In 2005, east Germany was just below Portugal now the lowest western European country.

Table 5 provides estimates of cross-section equations of the form:

$$GYP = \alpha + \beta (Y/P)_0$$

where GYP is the rate of growth of real GDP per person and  $(Y/P)_0$  is the level of real GDP per person at the start of the period measured as a percentage of that in the leading country. Since no other variables are included this is an unconditional–convergence regression in which the null hypothesis of no  $\beta$ –convergence is rejected by a significant negative coefficient on  $(Y/P)_0$ .  $\beta$ –convergence is evident in the 1950 to 1973 period and less strongly after 1973 but not in earlier periods; the estimates imply a rate of convergence of a little over 2 per cent per year in the Golden Age but only 1.5 per cent per year thereafter.

When eastern European observations are added to the cross section the estimated coefficient on initial income is virtually the same but for the post-1950 periods an eastern European dummy variable is significantly negative. The regression confirms the point made earlier – communist countries under-performed in the Golden Age and, allowing for initial income levels, their growth was about 1.3 percentage points lower than their western European counterparts.

Table 6 reports the coefficient of variation of levels of real GDP per person. A reduction in this statistic corresponds with the concept of  $\sigma$ –convergence for which  $\beta$ –convergence is a necessary but not sufficient condition.  $\sigma$ –convergence is apparent in western Europe since 1950 and dispersion among these countries was at a historic low in 2005. If a pan–European perspective is adopted, there was weak  $\sigma$ –convergence during the Golden Age but not since.

In Table 7, the regression analysis of unconditional convergence is repeated using data on regional GDP per person in western Europe. Not surprisingly, the basic results are very similar to those obtained in Table 5. Again, unconditional  $\beta$ –convergence is observed in both periods but at a slower rate after 1973. When country dummy variables are added to the regression, it is interesting to note that estimated coefficients suggest quite large differences between growth outcomes in the Golden Age, though not post-1973. Normalizing for scope

for catch-up, West Germany, Spain and Italy seem to have out-performed and the United Kingdom to have under-performed.

Although there has been catch-up and convergence at the regional level since 1950, the gap between the highest and lowest real GDP per person is still considerably larger than at the regional than at the national level. Table 8 reports calculations of the Theil inequality index for the six countries comprising the sample in Table 7. This shows that, while there was a marked fall in overall inequality of regional incomes between 1950 and 1973 and a further reduction subsequently, this has been entirely driven by narrowing gaps between rather than within countries.

Against this background, Table 9 offers some preliminary analysis of agglomeration effects. These regressions confirm that real GDP per person at the regional level has been positively related to population density and adversely affected by peripherality throughout the postwar period. Over the long run, as European integration has progressed, it is noticeable that the disadvantage of being distant from the centre of Europe has decreased considerably while the density elasticity of GDP per person in 2005 was only half its 1950 magnitude. Returning to the results in Table 7, in both periods there is no evidence that peripherality had adverse effects on growth but density has mildly positive effects.

Growth of real GDP per person is fundamental to growth in living standards but is seen by many as too narrow a concept which fails to reflect important aspects of well-being which have changed considerably over the long run. It has frequently been suggested that changes in leisure and in longevity should be taken into account. Tables 10 and 11 report that nowadays Europeans do indeed spend many fewer hours in market work and live a lot longer than their great–great–grandparents. Annual hours worked have roughly halved since 1870 (and this has only partly been offset by greater labour force participation) while life expectancy has roughly doubled in the same period. The improvement in longevity has been largely independent of increases in income; at any income level, life expectancy is now much greater than in the late nineteenth century (Kenny, 2005). While the reduction in mortality risks has been quite general, Table 10 reports some interesting differences in recent trends in hours worked, most notably between the United States and France.

Looking to a broader measure of living standards than is provided by the national accounts raises a whole host of index-number problems. We use a version of the method proposed by Usher (1980) which is set out in full in Crafts (1997) to augment GDP by imputing a value to changes in mortality and work hours. Since there have been generally favourable trends in these variables, Usher's method leads to the conclusion that augmented GDP has grown faster than conventional GDP.<sup>2</sup>

The estimates in Table 12 should be regarded as illustrative rather than definitive but the following implications are probably reasonably robust. First, the additions to growth for

---

<sup>2</sup> Obviously, there are a number of other aspects of well-being that might be incorporated in a broad concept of economic growth. The discussion in Crafts (2002) suggests that it is likely that the conclusion that GDP growth underestimates broad growth in the modern period would still be valid if they were taken into account but it should be noted that we are concerned with the history not the sustainability of living standards. Such a conclusion would probably not hold for the industrial-revolution era.

changes in market work and life expectancy are non-trivial.<sup>3</sup> Second, on the whole the imputations for reduced mortality are greater than those for more leisure. Third, the total additions in each period are fairly similar so the Golden Age is still visible, as is the subsequent slowdown. Fourth, in the Golden Age a notable difference between USSR and the typical western European country is that the imputation for additional leisure is small.

Estimates of life expectancy (but generally not hours of work) are available for eastern European countries. These follow a broadly similar pattern to that of western Europe until the recent past and Table 13 indicates that longevity imputations to growth would be similar through 1973. However, the period of transition has seen the eastern Europeans generally fall behind in mortality improvements and the disastrous Russian experience is the most striking feature of Table 13.

### 3. Growth Accounting Estimates

Growth accounting can be used to benchmark the sources of growth by imposing a standard production-function formula. This allows comparisons both between countries and over time and is a useful diagnostic for the evaluation of growth performance. The traditional methodology is based on a Cobb-Douglas production function

$$Y = AK^{\alpha}L^{\beta}$$

and the Solow residual measure of total factor productivity (TFP) growth is computed as

$$\Delta A/A = \Delta Y/Y - s_K \Delta K/K - s_L \Delta L/L$$

where  $s_K$  and  $s_L$  are the factor income shares of capital and labour, respectively, which are taken to be 0.35 and 0.65 in the benchmarked studies reported below.<sup>4</sup> The contribution of labour force growth can be refined by taking labour quality into account rather than simply measuring the crude quantity of labour. So it is quite standard to take account of the education of the labour force by converting years of schooling per worker into an augmented labour input.

The basic growth accounting equation can be converted into an expression that accounts for the rate of growth of labour productivity as follows:

$$\Delta(Y/L)/(Y/L) = s_K \Delta(K/L)/(K/L) + \Delta A/A$$

i.e., in terms of contributions from capital-deepening and TFP growth.

It should be noted that TFP does not equate to technological progress even though the latter is a major component of the former. Two important reasons for this are that improvements in the efficiency with which inputs are used and economies of scale show up in the Solow residual. Slightly less obvious is that the underlying rate of technological progress may not

---

<sup>3</sup> It is worth noting that our approach to valuing reductions in mortality risks is very conservative compared with that in Nordhaus (2002).

<sup>4</sup> The acceptability of these values as an estimate for the output elasticities is holds up well even if this precise specification of the production function is questionable, see Aiyer and Dalgaard (2005).

feed through into productivity improvements because the economy does not always operate at optimal capacity because of adjustment costs and fixed factors of production.

In episodes of catch-up growth, strong labour productivity growth is based on a combination of substantial capital-deepening and rapid TFP growth from a starting point where capital per worker and, especially, the level of TFP are both relatively low.<sup>5</sup> The former reflects a history of a shortfall of savings and investment and the latter is partly a consequence of technology gaps but also partly of inefficient use of factors of production.

Table 14 reports growth accounting estimates of the sources of economic growth in western European countries in three periods, the latter part of the Golden Age, the subsequent period of slowdown, and the recent past when ICT became important. The Golden Age era of rapid catch-up was indeed a period when both capital-deepening and TFP growth contributed greatly to labour productivity growth. In fact, in the majority of countries, TFP growth made the larger contribution. This was not based to any significant extent on domestic R & D but rather on a combination of technology transfer, structural change, economies of scale and fuller utilization of factors of production as postwar reconstruction was completed (Temin, 2002).<sup>6</sup>

Similar estimates are not generally available for eastern European countries but it is possible to construct crude estimates for the USSR. As Table 14 reports, the striking feature of catch-up growth in the communist world is that, if standard growth-accounting assumptions are adopted, it relied much more on 'extensive growth'. While the capital deepening contribution to growth in the Golden Age was similar or a bit lower, TFP growth was decidedly inferior such that its contribution was very weak compared with countries like Ireland or Italy with similar catch-up potential.<sup>7</sup> A comparison between Tables 14 and 15 shows that catch-up growth in Golden-Age western Europe owed a good deal more to TFP growth and less to capital-deepening than was the case in the east Asian Tigers from the 1960s through the 1980s.

Table 14 reveals that the slowdown in labour productivity growth in western Europe after the Golden Age reflected declines in both capital deepening and TFP growth in every country but that the latter was generally more important. The unweighted average decrease between 1960-70 and 1970-90 was 1.00 percentage points per year for the capital-deepening contribution but 1.75 percentage points per year for TFP growth which was largely the result of the evaporation of the transitory components mentioned above. In the Soviet Union, TFP growth turned slightly negative but the decline in labour productivity growth owed almost as much to a reduction in the contribution from capital-deepening.

---

<sup>5</sup> The well-known paper of Hall and Jones (1999) documents that low levels of labour productivity owe more to low TFP than to low capital per worker and that low TFP is in turn strongly correlated with low institutional quality.

<sup>6</sup> Econometric confirmation that TFP growth does not measure technological progress in this period is provided by Rossi and Toniolo (1996) for Italy where economies of scale were a very important component of TFP growth and for German and UK manufacturing where adjustment costs impeded full realization of the productivity potential of new technology (Crafts and Mills, 2005).

<sup>7</sup> It has been suggested that this may be an artefact of the methodology and that the USSR is better described in terms of a production function with a very low elasticity of substitution between capital and labour and thus severely diminishing returns to capital (Weitzman, 1970). Allen (2003) provides a convincing rebuttal of this claim noting that the technological possibilities were similar in West and East and that there is clear evidence of massive waste of capital in the Soviet system which implies that standard benchmarking is appropriate.

In the most recent period, 1990-2003, Table 14 shows a considerable diversity in performance among western European countries. Nine of these sixteen countries were no longer catching up the United States in terms of labour productivity and in eleven of them TFP growth was below that of the United States. While both capital-deepening and TFP growth recovered from the lows seen in 1970-1990 in the United States, they fell further in the majority of western European countries though with some notable exceptions with regard to TFP growth including the Scandinavian countries, Greece, Ireland and the UK. More detailed growth accounting confirms that these outcomes are quite closely related to differential success in exploiting the opportunities of the ICT era (Timmer and van Ark, 2005), a theme which will be explored in section 6.

Finally, Table 16 reports growth accounting estimates for the transition economies of eastern Europe starting from the mid-1990s. Labour productivity growth in the countries which have now joined the EU is still quite modest relative to the rates achieved by western European countries in the Golden Age except in the Baltic countries. These outcomes seem to result more from TFP growth than capital-deepening contributions, although it should be noted that the data used to construct this estimates are more than usually imperfect. TFP growth in CIS countries has been relatively strong. In this region, strong TFP growth probably reflects a bounce back from an earlier output collapse similar to postwar reconstruction but on a much larger scale with, in some cases including Russia, a strong impetus from a high price of oil (Iradian, 2007).

#### **4. The Golden Age**

From the late 1940s to the mid-1970s, growth in Europe was exceptional but performance was not uniformly good. This raises two questions which this section addresses, namely:

- 1) What explains the Golden Age?
- 2) What accounts for relative success and failure during the Golden Age?

In fact, examining the latter question gives further insight into the former as the variance in growth outcomes is quite informative.

Prior to 1950, western Europe had endured two world wars and the interwar depression and so many countries were well below the income level that a continuation of pre-1914 trend growth would have predicted. Reconstruction and the correction of policy errors such as the disastrous protectionism of the interwar period had the potential to deliver a phase of rapid growth. International economic relations would be different under the auspices of the Bretton Woods Agreement and the Marshall Plan than under the League of Nations and the Treaty of Versailles.

It is widely recognized that the Bretton Woods era of international monetary system which coincided with the Golden Age was a period when macroeconomic fluctuations were quite relatively gentle and it has been argued that this provided a highly favourable context for rapid postwar growth (Boltho, 1982). Theory is ambiguous about this claim, however, and economists have struggled to identify robust effects of output volatility on growth (Norrbin and Yigit, 2005). It is, of course, true that not having a 'lost decade' resulting from a world economic crisis was a big plus.

Rapid catch-up growth was, however based on more than this. The Golden Age can be seen as a period when western European growth was augmented by enhanced 'social capability' and 'technological congruence' (Abramovitz and David, 1996). In terms of Figure 1, in an era when American technology became more appropriate in a European context, better institutions and policies promoted favourable shifts in both the Solow and Schumpeter lines.

The relative importance of these factors varied over time, as is revealed by the cross-country growth regressions in Temin (2002). In the 1950s, countries with relatively large scope for postwar reconstruction (e. g., West Germany) grew relatively quickly, in both the 1950s and early 1960s countries with large agricultural sectors (e.g., Italy) performed relatively well but after 1965 orthodox reduction of capital to labour and technology gaps took centre stage.

The results from long run time-series analysis of the 'Janosy Hypothesis' obtained by Mills and Crafts (2000) confirm and extend these conclusions. Janosy (1969) maintained that the phase of super growth after World War II was based simply on a reversion to the pre-1914 trend growth path. This was shown to be incorrect in that for all western European countries real GDP per person is above the pre-1914 trend line by the end of the Golden Age. However, in the most war-affected economies of Austria, France, Netherlands and West Germany, there is clear evidence of a slow-down in growth from the late 1950s.

The role of the Marshall Plan, which provided \$13 billion of grant aid from the United States to western Europe in the period 1948 to 1951, has been the subject of significant research. It is now generally agreed that the direct effects were of little importance in the launching of the Golden Age. The investment rate was raised by perhaps 1 per cent of GDP but basic growth economics suggests that would have only a modest impact on growth and there is no reason to think that the alleviation of supply bottlenecks mattered much either (Eichengreen and Uzan, 1992).<sup>8</sup>

If there were substantial effects of the Marshall Plan, they came through indirect channels. De Long and Eichengreen (1993) suggest that it was a highly successful structural adjustment program (much more so than those designed by the World Bank in the 1980s and 1990s). These indirect effects worked through conditionality that changed the environment in which economic policy was made both by strengthening commitments to the market economy and trade liberalization and also by facilitating social contracts that underpinned high investment.<sup>9</sup>

Trade liberalization can be expected to raise income levels by more than just the traditional welfare triangles effect. In addition, there may be positive impacts from greater investment, more technology transfer, intensified competition and the realization of both internal and external economies of scale. Whether or not these have permanent effects on the growth rate, there is strong evidence that they have raised the level of income. Badinger (2005) finds that the process of European integration from the 1950s meant that European incomes were 26

---

<sup>8</sup> Using standard neoclassical assumptions, with an initial capital to output ratio of around 2 and an output elasticity of 0.35 the growth effect of an increase in the investment rate of 1% of GDP would have been less than 0.2 percentage points per year. Calvo-Gonzalez (2001) demonstrates that exclusion from the Marshall Plan did not throttle Spanish growth.

<sup>9</sup> De Long and Eichengreen conclude that "The advantages of the co-operative equilibrium were suddenly clear" (1993, p. ); see the discussion of the 'Eichengreen Hypothesis' in Appendix 1.

per cent higher in 2000. His index of integration shows that the strongest impact was felt between the late 1950s and the early 1970s when about 55 per cent of the initial trade barriers were eliminated through the establishment of the European Community and EFTA and the Kennedy Round of the GATT. The implication was an increase of the European growth rate of around 1 per cent per year during this period.

External trade liberalization and the increased integration of the European market were factors that speeded up technology transfer and helped Europe to reduce the technology gap with the United States. There was more to it than this, however. Nelson and Wright (1992) also stressed the greater cost-effectiveness of American technology in Europe, the increasing codification of technological knowledge and increases in European technological competence based on increased investments in human capital and R & D.<sup>10</sup>

In turn, it would be incorrect to see rapid TFP growth in Golden Age Europe as simply a reflection of technology transfer. Improvements in resource allocation played an important part, most notably in the context of a contraction of agricultural employment. Orthodox shift-share analysis does not capture this adequately because it assumes that productivity growth rates in each sector would be unaffected by the absence of structural change whereas, taking the more plausible approach of Kindleberger (1967), rapid productivity advance in agriculture was predicated on the transfer of surplus labour out of small-scale family farms. Table 17 quantifies the contribution of structural change to labour productivity growth using the method proposed by Broadberry (1998) which implies that this had a major impact in Italy and Spain and a quite sizeable impact in France and West Germany.

The most striking hypothesis to explain enhanced social capability in postwar western Europe is that of Eichengreen (1996) who argued that high investment rates which allowed successful exploitation of catch-up opportunities were facilitated by successful social contracts which sustained wage moderation by workers in return for high investment by firms. These 'corporatist' arrangements provided institutions to monitor capitalists' compliance and centralized wage bargaining which protected high-investment firms and prevented free-riding by sub-sets of workers. In addition, the state provided 'bonds' that would be jeopardized if labour defected on the agreements in the form of an expanded welfare state. The central foundation of a high investment/wage moderation equilibrium is that both sides are willing to wait for jam tomorrow.

It is certainly true that corporatist industrial relations were quite widespread in the Golden Age; Crouch (1993) puts Austria, Belgium, Netherlands, Switzerland, West Germany and the Scandinavian economies in this category. Two of the most obvious 'failures' of the Golden Age, Ireland and UK, did not succeed in establishing these institutions, having strong but decentralized collective bargaining. Yet, centralized wage bargaining does not appear to have been correlated with faster growth, *ceteris paribus* (Crafts, 1992). However, as the appendix shows, this is, at best, a crude test of the Eichengreen hypothesis on which the jury is still out.

A glance at Table 2 shows a strong inverse correlation between the level of real GDP per person in a country in 1950 and its growth rate during the Golden Age, as would be expected given the evidence of unconditional convergence in this period. However, Table 2 also points to countries which appear to have done rather better or worse than their initial income

---

<sup>10</sup> Verspagen (1996) provides some quantitative evidence of the importance of improvements in European technological competence in promoting catch-up.

might predict and these do indeed include West Germany in the former and Ireland and UK in the latter category. The residuals from the regression of Table 5 are + 0.68 for West Germany and -1.70 and -0.68 for Ireland and UK, respectively.<sup>11</sup> Thus, the diagnosis is that UK could not have grown as fast as Italy or Spain which had greater scope for catch-up but should have been able to match Denmark or Sweden while Ireland's growth might have been similar to that of Italy rather than Switzerland.

Going beyond the Eichengreen Hypothesis, does the literature on these countries suggest further reasons for their apparent success or failure? In particular, is it possible to understand this in terms of the microfoundations of growth? Ireland is a particularly interesting case because the poor growth performance of the Golden Age was followed from the late 1980s by the famous Celtic Tiger phase of very rapid catch-up growth. Analysis of the reasons for this acceleration also either explicitly or implicitly analysis of the reasons for Golden Age failure.

It seems clear that the issues relate primarily to Irish economic policy rather than peripherality which Table 7 suggests was not an adverse factor. The most obvious initial error, which was corrected in the 1960s and 1970s, was to delay trade liberalization and to pursue instead policies of import substitution (O'Grada and O'Rourke, 1996). More than this, from the late 1960s, Ireland adopted a series of policies that facilitated technology transfer through attracting FDI which could use Ireland as a platform from which to export, and thus to make a favourable shift in the Schumpeter Line of Figure 1. These included a very generous corporate tax regime and a big (belated) upgrade in the educational standards of the Irish labour force. When macroeconomic stabilization was achieved in the late 1980s in the context of a social contract the ingredients of the Celtic Tiger were in place (Barry, 2002).

With regard to West Germany and the UK, there were important differences in institutions and policies during the Golden Age. First, it is clear that West Germany was much more successful in human and physical capital accumulation. In 1973, capital per hour worked in West Germany was 35 per cent above the UK level and in 1978/9 only 34.5% of West German workers were low skill compared with 72.8% in the UK (O'Mahony, 1999). This strong record of accumulation was based on corporatist institutions that incentivized vocational training and an 'insider' financial system that fostered relationship-specific long-term investments (Carlin, 1996). Second, there was a major difference between the two countries in terms of industrial relations. Whereas West Germany established a system of industrial unions, multiple unionism was quite prevalent in the UK. Multiple unionism makes the 'hold-up problem' for investments in fixed capital much more serious and encourages free-riding by unions; Bean and Crafts (1996) show that multiple unionism exerted a significant penalty in terms of productivity growth for the UK. Third, competition was relatively weak in the UK compared with West Germany partly because the UK was slow to liberalize external trade and partly because competition policy was a low priority and badly-designed. Price-cost margins were much higher and supernormal profits more persistent in the UK than in West Germany (Crafts and Mills, 2005; Geroski and Jacquemin, 1988). This mattered because UK firms suffered more from the agency problems that arise

---

<sup>11</sup> For West Germany and UK these are fairly similar to the coefficients on the country dummy variables in Table 7; strictly speaking, these coefficients estimate the difference from Netherlands growth but since that is a country for which the residual in the unconditional convergence regression is virtually zero they are comparable. In turn, these coefficients change little if other variables such as the proportion of employment in agriculture are added to the regional growth regression.

from separation of ownership and control for which competition is the antidote.<sup>12</sup> The UK evidence is that weak competition in the absence of a dominant external shareholder was associated with markedly inferior productivity performance (Nickell et al. 1997).<sup>13</sup> In terms of the growth economics of Figure 1, West Germany was better placed than the UK.

The picture of Golden Age growth in western Europe that has emerged is follows. First, the era was one of strong  $\beta$ - and  $\sigma$ -convergence. Second, fast growth was partly based on opportunities to recover from earlier adverse shocks and policy errors but it is clear that European growth involved more than just this; both capital to labour and TFP gaps with the United States were considerably reduced. Third, as modern growth economics stresses and as comparisons across European countries confirm, incentive structures mattered for growth performance.

The performance of eastern European economies during the Golden Age was less impressive, even though growth was rapid by historical standards. The diagnostics developed earlier reflect this. The regression of Table 5 suggested that there was a growth shortfall of about 1.3 percentage points and the growth accounting of Table 14 points to weak TFP growth as a key reason.

Closer examination of growth in the USSR helps explain this outcome and also highlights important themes in the western European experience. Following World War II, the Soviet economy grew much as the Janossy hypothesis would predict, albeit with a modest trend growth in labour productivity. Worrying signs of a serious retardation in productivity growth on top of a Janossy-type slowdown did not appear until the 1970s (Harrison, 1998). The Soviet economy succeeded in 'extensive growth', in that the investment/GDP ratio roughly doubled between 1950 and the early 1970s to just under 30 per cent and the capital stock grew at about 8.5 per cent per year in this period (Ofer, 1987). Diminishing returns to capital accumulation (a rapidly rising marginal capital to output ratio), exacerbated by slow TFP growth, implied that the rate of capital stock growth delivered by a given investment rate was falling over time.

Relatively low TFP growth was not the result of inadequate volumes of R & D which by the 1970s was very high by world standards at around 3 per cent of GDP. Rather the problem lay in the incentive structures that informed innovation at the firm level. This was a classic case of a failure in terms of 'social capability'. The planning system rewarded managers who achieved production targets in the short term rather than those who found ways to reduce costs or improve the quality of output over the long term. The balance of risk and reward was inimical to organizational and technological change and the 'kicking foot' of competition was absent (Berliner, 1976). The Schumpeter line of Figure 1 was subject to a major adverse shift compared with Western economies.

## 5) The Post-Golden Age Slowdown

---

<sup>12</sup> West Germany relied much less on public joint stock companies where these issues are likely to matter most. German companies almost always had a shareholder with 25% of the company whereas in UK only a small percentage did (Carlin, 1996, p. 488). It should be noted that it is ownership concentration not bank shareholdings per se that deliver good performance (Edwards and Nibler, 2000).

<sup>13</sup> In the one instance where UK competition policy was made considerably tougher, the 1956 Restrictive Practices Act which addressed the widespread cartelization that prevailed at the time, there was a marked improvement in productivity in the sectors which were collusive prior to the legislation (Symeonidis, 2007).

After the early 1970s growth slowed down quite markedly right across Europe. The end of the Golden Age had a number of unavoidable aspects including the exhaustion of transitory components of fast growth such as post-war reconstruction, diminishing returns to investment as the postwar boom went on, and reduction in the scope for catch-up as the gap with the leader narrowed and, in addition, growth of real GDP per person in the United States weakened. In the East, the problems of slowdown became so acute as to trigger a regime-changing collapse.

On closer inspection, however, the story is clearly more complex and the context in which growth took place was changing. By 1973, de-industrialization had begun in much of western Europe and in the ensuing decades it became general (cf. Table 18); increasingly, the key to successful growth performance would reside in services rather than the manufacturing sector. This tendency was intensified by the rapidly-increasing integration of world markets (globalization) and the switch of world industrial production and exports from Europe to Asia (cf. Table 19). And, while there was less scope for catch-up, slowdown was exacerbated by a sharp fall in the rate of catch-up, as reflected in the smaller coefficients on the initial income term in the regressions reported in Tables 5 and 7. Although, the lower income countries of western Europe continued to grow more quickly, for western Europe as a whole, since the early 1970s, catch-up has stalled with real GDP per person at only about 2/3 of the American level (Table 1). It is also noticeable that the pattern of relative success and failure changed after the Golden Age, for example, growth performance in Ireland has improved dramatically while that of Germany has deteriorated.

With regard to labour productivity, although here too there was a marked drop in the size of the catch-up term in growth regressions (Crafts, 2007), western European countries continued to narrow the gap with the United States until the mid-1990s, as Table 20 reports. However, the growth accounting estimates of Table 14 show that this was despite very big reductions in the contribution of capital-deepening (the median fell to 1.0 from 2.0 per cent per year in 1970-90 compared with 1960-70) and, especially, in TFP growth (the median fell from 2.5 to 0.9 per cent per year).

This description prompts the following questions:

- 1) What accounts for the differing trends in GDP per person and labour productivity vis-a-vis the United States?
- 2) Why did the European growth slowdown go beyond what was unavoidable?
- 3) Why was the slowdown so much more serious for eastern Europe?

The short answer to the first of these questions is that, since the Golden Age, on average, Europeans work less than Americans (cf. Table 10), in particular, because they have more unemployment and longer holidays. The implications for economic welfare depend on the extent to which shorter work years for the employed are attributed to distortions from tax (Prescott, 2004) or from collective bargaining (Alesina et al., 2005) rather than different preferences (Blanchard, 2004). The experience across Europe is quite complicated, the literature has not yet reached a consensus on this issue and a satisfactory explanation has not yet been achieved.; the elasticity of labour supply to tax changes seems too small to account for more than a modest part of the experience and the cultural argument seems less than fully

convincing given that the differential is recent, while strong collective bargaining produced work-sharing responses in some countries but not others (Faggio and Nickell, 2007).

In considering labour productivity growth, it is helpful to divide the post-Golden Age period in the mid-1990s at the point where ICT had a major impact. Table 21 shows that from 1973 to 1995, western European countries generally continued to catch-up the United States in terms of labour productivity and all except Switzerland had faster growth. Indeed, the raw data show that by 1995 six countries had apparently overtaken the United States and had a higher level of labour productivity. In fact, underlying performance was probably not quite that good as European responses to the difficult macroeconomic environment of the 1970s and 1980s entailed reductions of labour inputs promoted both by collective bargaining and by government policies which disproportionately affected the employment of low productivity (especially young and elderly) workers. The estimates in column (2) of Table 20 report the results of an econometric procedure to normalize for the productivity impact of different labour market structures. On the basis of these normalized estimates it seems probable that only Norway (which had become a major oil producer) actually overtook the United States and that underlying European labour productivity growth was a fair bit lower than the raw data suggest. Even so, virtually all countries continued to catch up the United States through the mid-1990s, albeit more slowly than before.

What may have accounted for this undue weakening of productivity growth ? One very obvious point is that the fragility of the Eichengreen wage moderation/high investment equilibrium was revealed and it did not generally survive the turbulence of the 1970s, a time when union militancy and union power rose dramatically, as did labour's share of value added, and the rewards for patience fell in conditions of greater capital mobility, floating exchange rates and greater employment protection. At the same time, the corporatist model of economic growth was becoming less appropriate in economies which now needed to become more innovative and less imitative in achieving productivity growth, as Eichengreen (2006) himself has recently emphasized.

Especially given the difficulties of the 1970s, in many countries the postwar settlements entailed a substantial rise in social welfare payments financed to a considerable extent by 'distortionary' taxation.<sup>14</sup> The estimates in Kneller et al. (1999) indicate that an increase of 1 percentage point in the ratio of distortionary taxation to GDP reduces the growth rate by 0.1 percentage points so the tax increases between 1965 and 1995 would on average entail a fall in the growth rate of about 1 percentage point.

Equally, the typical western European country also acquired a legacy of strong regulation (cf. Tables 22 and 23) which inhibited growth performance but was politically difficult to reform. The evidence is that strict product market regulation raised mark-ups and lowered entry rates, thus reducing competitive pressure on managers with adverse impacts on both investment and innovation (Griffith and Harrison, 2004; Griffith et al., 2006), and reduced TFP growth relative to the United States in this period by around 0.75 percentage points on average based on the estimates in Nicoletti and Scarpetta (2005).<sup>15</sup> Similarly, high levels of employment regulation (if enforced) slow down the process of creative destruction and the labour force

---

<sup>14</sup> 'Distortionary' is the term used by Kneller et al. (1999). This is basically direct taxation which in many new growth models has adverse effects on growth whereas indirect taxes do not.

<sup>15</sup> The concept of product market regulation employed by these authors and which the OECD PMR indicators seek to capture is the extent to which the regulatory environment is conducive to competition.

adjustment that it entails. The results in Caballero et al. (2004) could account for a difference of 0.5 percentage points per year between France and the United States in labour productivity growth in the 1980s and 1990s

Two countries which were 'growth failures' in the Golden Age and which were in crisis in the 1970s and early 1980s, namely, Ireland and the UK, stand out as having made important reforms which improved their relative performance. The former represents an interesting permutation on the Eichengreen Hypothesis because it developed a new kind of social contract in which wage restraint was exchanged for tax cuts which were conducive to employment growth and to massive inflows of FDI already encouraged by Ireland's low corporate tax rates and strong connections with the United States (Barry, 2002).

The UK was a country which had failed to establish a favourable Eichengreen equilibrium. Yet it held back on policy reform in areas such as fiscal policy, privatization and collective bargaining in vain attempts to do so. The Thatcher years after 1979 when a radical prime minister, aided by the absence of restraints in the British political system to the exercise of executive power, finally gave up on corporatism and ended the implicit trade union veto were a period of de-regulation and much increased competitive pressure on management, and of reform in industrial relations, thus addressing some of the weaknesses that had undermined the UK in the Golden Age (Crafts, 2002b).

The Soviet economy suffered from problems which in a sense were similar but were much more severe. By the 1970s, the arithmetic of Soviet growth was becoming considerably less friendly as diminishing returns reduced the capital-deepening associated with the constant investment rate of a little under 30 per cent of GDP. The data constructed for the analysis in Allen (2003) show that the capital-stock growth rate fell from 7.4 per cent per year in the 1960s to 3.4 per cent per year in the 1980s and the scope for raising the investment rate was constrained by defence expenditure (16 per cent of GDP). The situation was exacerbated by a decline in TFP growth which turned negative at this point (cf. Table 14). This was driven by "waste of capital on a grand scale" (Allen, 2003, p. 191) as old factories were re-equipped and expansion of natural resource industries in Siberia was pursued.

The incentive structures used by the Soviet leadership to motivate managers and workers were a complex mixture of rewards, punishments and monitoring. Each of these became increasingly expensive over time with the implication that the viability of the system was threatened. Product innovation drove up monitoring costs which also inhibited moves from mass to flexible production. A more educated population meant both that incarceration was more costly in terms of loss of human capital and that rewards needed to be higher. A TFP growth failure undermined the returns to extra effort. The interesting feature of this system is that it could be tipped from a high coercion, high effort equilibrium to a low coercion, shirk and steal equilibrium if rewards and punishments were no longer credible and this was perceived by the workers.<sup>16</sup> Harrison (2002) argues that this accounts for the sudden collapse at the end of the 1980s.

## **6) The Era of the 'New Economy' and Transition**

It is well-known that the United States has enjoyed a labour productivity growth revival since the mid-1990s and that for the first time in the postwar period this has outpaced average

---

<sup>16</sup> This is set out more formally in Appendix 2.

western European performance. About the same time, it became clear that the Solow Productivity Paradox that you could see the computer everywhere but in the productivity statistics no longer applied. A standard American perspective on recent European growth is that it has been handicapped by too much taxation, too much regulation and too little competition (Baily and Kirkegaard, 2004).

This summary needs some qualification. Table 20 reports considerable diversity in western European productivity growth in the period 1995-2005 when seven countries exhibited stronger productivity growth than in 1973-95 and five (Finland, Greece, Ireland Norway and Sweden), had faster productivity growth than the United States. On the other hand, Italy and Spain experienced major declines in productivity growth.

Two questions deserve attention:

- 1) Is the 'American diagnosis' of weak European productivity growth correct ?
- 2) How far does ICT explain productivity growth differentials ?

Tables 21 to 23 show that the United States has relatively low 'distortionary' taxation, product market and employment protection regulation, and price-cost margins in services while the evidence reviewed in the previous section confirms that this would be conducive to stronger productivity growth. However, if these aspects of the European social market model were damaging, they had largely been put in place by the 1980s. Moreover, they did not preclude catch-up in the pre-1995 period.

Recent research has found that the adverse effects of regulation on productivity performance are strongest in the face of new technological opportunities and have impacted strongly on the diffusion of ICT. Cross-country regression evidence shows that employment protection deters investment in ICT equipment (Gust and Marquez, 2004) because reorganizing working practices and upgrading the labour force, which are central to realizing the productivity potential of ICT, are made more expensive. Restrictive product market regulation has deterred investment in ICT capital directly (Conway et al., 2006) and the indirect effect of regulation through raising costs has been relatively pronounced in sectors that use ICT intensively. There has been a strong correlation between product market regulation and the contribution of ICT-using services (notably in distribution) to overall productivity growth (Nicoletti and Scarpetta, 2005). Thus, the story is not that regulation has become more stringent but rather that existing regulation has become more costly in the context of a new technological era based on ICT.

The contribution that ICT made to labour productivity growth can be estimated using growth accounting techniques. In principle, this approach would identify contributions from ICT capital-deepening, TFP growth in ICT production and (unremunerated) TFP spillovers from the use of ICT capital. In practice, this last aspect has proved somewhat elusive. Growth accounting estimates are reported in Table 24. They confirm that ICT contributed more to productivity growth in the United States than in the EU both before and after 1995 and that it played a significant role in the acceleration of American productivity growth after the mid-1990s.

Within Europe, in the late 1990s three countries, namely, Finland, Ireland and Sweden, had a greater contribution to productivity growth from TFP in ICT production than the United

States. In each case, gross output in ICT production was much larger relative to GDP – 22.5 per cent in Ireland compared with 3 per cent in the United States (Timmer and van Ark, 2005) – and each of these countries had higher labour productivity growth than the United States in 1995-2004. That said, it is also clear that, especially in the big continental European economies, there was a substantial weakening of non-ICT related sources of productivity growth in the EU after 1995.

Another take on the role of ICT in recent growth can be obtained by considering the part that particular sectors have played. Here the big story is the contribution made by market services that are intensive in the use of ICT, in general, and the distributive trades, which account for close to 20 per cent of employment in the typical OECD country, in particular. This may reflect the impact of TFP spillovers and it certainly involves so-called 'soft savings' achieved through the extra information that ICT provides that permits better organization of inventories, logistics etc. Table 24 also reports estimates of the contribution to overall productivity growth made by ICT-using market services in 1996 to 2001. The big advantage that accrued to the United States obviously looms large relative to the gap in productivity growth with European countries.

The UK has experienced a relatively strong contribution to productivity growth from the regulation-sensitive ICT-using services sector and ICT capital deepening has been above the EU average. As a lightly-regulated economy, the UK has been better positioned than the other big European economies to prosper in the ICT era. This has been reflected in TFP growth and relatively strong contributions to productivity growth from both ICT-using services and ICT capital deepening. In a sense, this can be seen as an unexpected bonus from the failure to establish a successful corporatist model in an earlier generation.<sup>17</sup>

Irish growth during the 'Celtic Tiger' phase has been sustained both by strong employment growth and strong productivity growth.<sup>18</sup> Fast growth represented a belated catch-up as policy errors from the Golden Age such as protectionism and neglect of human capital formation were corrected and macroeconomic stabilization was achieved but was augmented by a very elastic supply of labour in a regional economy starting with high unemployment where labour market reform dramatically reduced the NAIRU (Crafts, 2005).

Table 24 shows very clearly that the key aspect of recent Irish productivity performance is the huge contribution of ICT production (almost entirely for export). If this is taken out of labour productivity growth, then the other components have not been exceptional. Clearly, the large ICT production sector in Ireland is a result of supply-side policies that have attracted FDI and have developed a successful cluster. These include interventions that have improved the infrastructure and labour supply available to the multinationals. However, the success of the low tax, light regulation approach would have been much less spectacular if the composition of manufacturing output had happened to be less favourable. This suggests that Ireland is something of a special case rather than an experience that can now easily be replicated across the European economies as a whole. Specialization in ICT exports is not possible for everyone and low corporate taxes are most effective in attracting a large share of FDI if other countries do not follow suit.

---

<sup>17</sup> Though it should also be noted that recent legislation has substantially strengthened competition policy.

<sup>18</sup> Labour inputs grew at 2.1 per cent per year from the start of the Celtic Tiger in 1987 to 2004 during which period real GDP per person grew 1.4 per cent per year faster than real GDP per hour worked (GGDC, 2007).

The end of the communist regime ushered in a process of transition for central and eastern European economies which now had an opportunity to go down the path of rapid catch-up growth but needed to be transformed into effective market economies. In some ways, the situation might be thought to have similarities to the beginning of the Golden Age in western Europe but obviously there were also big differences in terms of social capability, access to foreign capital, and initial economic structure. The immediate experience of transition was traumatic as GDP fell dramatically in most countries. Since the mid-1990s, there has been rapid economic growth in many countries but also considerable variance - for example over 1992-2004 real GDP per person rose by 64% in Poland but shrank by 26% in neighbouring Ukraine (Beck and Laeven, 2006).

This prompts two questions:

- 1) How does catch-up growth in the eastern Europe since 1995 compare with the experience of Golden-Age western Europe ?
- 2) What accounts for early growth success and failure in the Transition Economies

Three big differences between the East in the 1990s and the West in the 1950s deserve to be highlighted. First, the legacy of communism was an allocation of resources which reflected the extensive model of Soviet growth and was highly distorted in many ways. One important corollary of this was the absence of a large reserve of low productivity agricultural labour - none of the countries listed in Table 25 had a share of the labour force in agriculture in 1990 as high as France (or Italy or Spain etc.) in 1950. Another implication was that the starting point was one of "over-industrialization", and a very weak development of the service sector.

Second, this new episode of catch-up growth is taking place in the context of a much more-globalized world economy. This implies that the domestic savings constraint is no longer binding and that foreign capital and technology can be drawn upon more readily. Lucas (2000) argued that it was realistic to think that new countries joining the catch-up growth club could expect to achieve much faster growth than their predecessors – his calibrated model suggests a bonus of 2.5 percentage points per year nowadays compared with 50 years ago.

Third, the institutions necessary for a successful market economy had to be developed ab initio. This was not a matter of fine-tuning the rules of the game for the capital market or wage bargaining but much more fundamental, for example, establishing secure property rights and the rule of law to underpin investment and innovation in some cases in economies which had been under communist control for over 70 years. As Table 26 reports, progress was quite rapid in central Europe and the Baltics but not in Russia. However, even in 2006 the Rule of Law indicator still shows a big gap between the best of western Europe and the best transition economy.

Beck and Laeven (2006) showed that weakness in institutional reform has been highly correlated with the number of years under communism and the importance of rents from natural resource exports. Indeed, some countries in this region appear to be vulnerable to the 'natural resource curse'.<sup>19</sup> In addition, the prospect of joining the EU acted as an effective

---

<sup>19</sup> The 'natural resource curse' refers to the poor growth performance of countries rich in minerals. Sala-i-Martin and Subramanian (2003) report estimates that suggest the channel through which this works is bad institutions.

form of conditionality for the 2004 Accession Countries who needed to make reforms to qualify.<sup>20</sup>

Table 27 juxtaposes labour productivity growth rates in the West in the Golden Age and in the East in the early years of catch-up and places them in the context of the initial labour productivity gap. The fast-growing Baltic countries have growth rates which, if sustained, will compare favourably with anything seen in the Golden Age, and which are based, as Table 14 and 16 reveal, on very strong TFP growth. Elsewhere, however, labour productivity growth has been less than impressive and even somewhat disappointing in Bulgaria and the Czech Republic. Certainly, these growth rates are lower than would be expected on the basis of early growth regressions that ignore the importance of institutional quality.<sup>21</sup> In fact, relative growth performance is well-explained by the extent of liberalization and of (the exogenous component of) institutional reform, both of which have been shown to have strong positive effects on growth (Beck and Laeven, 2006; Fidrmuc, 2003).

## Conclusions

The objective of this chapter is to explore what economists and policymakers can learn from recent European experience of economic growth. The framework that we have used to do this is based on the key concepts of growth based on endogenous innovation and catch-up. This concluding section seeks to pull together some important overview points from the details that have emerged in the course of our exposition.

First, it is clear that rapid, sustained catch-up growth in Europe and been based on substantial contributions from both capital-deepening and TFP growth. The latter obviously did benefit from technology transfer but rapid TFP growth, as measured by conventional growth accounting, also reflected improvements in the allocation of resources and economies of scale. The Achilles Heel of the Soviet economy was its inability to achieve strong TFP growth.

Second, evaluations of growth performance must take into account differential scope for catch-up. This matters for comparisons between both countries and periods. A notable case in point is comparison of Golden Age growth rates in eastern and western Europe. The raw data say that there was little difference, 3.81 percent per year compared with 4.06 per cent per year, but normalizing for initial real GDP per person average east European growth was inferior by 1.3 percentage points.

Third, and most important, microeconomic foundations matter for growth so institutions and policy make a real difference. This is confirmed throughout the chapter, notably, in terms of understanding why growth was so strong in the Golden Age and then slowed down so much thereafter, in explaining why Ireland's Golden-Age failure was transformed into the Celtic Tiger, and making sense of the emerging pattern of success and failure among the Transition Economies. The demise of the Soviet Union exemplifies the importance of incentive structures rather than an unfavourable elasticity of substitution between capital and labour.

---

<sup>20</sup> Clearly, this has not worked very well for Bulgaria and Romania.

<sup>21</sup> Initial optimism about growth in these transition economies was based on projections which emphasized high levels of education and big initial productivity gaps, cf Fischer et al. (1998); these would suggest average productivity growth rates of around 5.5 per cent per year.

Fourth, elaborating on this fundamental point about the role of incentive structures, several further insights deserve to be highlighted. These include the following:

- a) Contrary to conventional wisdom, European experience suggests that conditionality can sometimes be successfully deployed to improve long-term growth prospects through the promotion of institutional and policy reform. This is a plausible interpretation both of the main impact of the Marshall Plan and also of the EU Accession Process 50 years later.
- b) The evidence suggests that strengthening competition is conducive to faster productivity growth, notably in the context of adjusting rapidly to new technological opportunities and in mitigating agency problems within firms. The old (Schumpeterian) claim that market power is good for technological progress does not represent a good basis for anti-trust policy, as UK experience especially underlines.
- c) The relative failure of European countries generally to exploit the opportunities of ICT is, at least partly, a result of having more regulation than the United States. The point to note, however, is that this did not reflect more stringent regulation but rather that the costs of existing regulation rose in the context of the new technology.

Finally, history matters. Western European countries developed institutions and policies that, generally speaking, served them well during the Golden Age. The downside of these arrangements was that they commanded political support that made them difficult to reform when this became necessary in the subsequent period. Status quo bias made a flexible policy response problematic.<sup>22</sup>

---

<sup>22</sup> The notion of "status quo bias" in the context of policy reform is due to Fernandez and Rodrik (1991) and refers to blocking coalitions of rational voters who lose or fear they might lose from proposed policy changes.

## Appendix 1

Cameron and Wallace (2002) provide a game-theoretic version of Eichengreen's argument that a co-operative equilibrium that entailed high investment in return for wage moderation underwrote high investment in Golden-Age Europe.

The idea is to model a situation where it is profitable for a firm to invest if the union selects a low wage claim but not if the union makes an aggressive pay claim. In addition, if the union knows for sure that the firm would invest rather than pay profits out as dividends a lower pay claim would be optimal. The wage moderation/high investment equilibrium is Pareto-dominant. This requires the two conditions

$$\text{(Firm)} \quad \delta_F \pi(w_0, L_0) > I > \delta_F \pi(w_H, L(w_H))$$

$$\text{(Union)} \quad (1 + \delta_U)w_0 L_0 > w_H L_0 + \delta_U w_H L(w_H)$$

where  $I$  is the investment,  $\delta_F$  and  $\delta_U$  are, respectively, the firm and union discount factors where a higher value implies greater patience,  $\pi$  is the profit function, and  $w_0, L_0$  and  $w_H, L_H$  are the wage bills associated with the profit-maximizing employment level chosen by the firm at low and high wages, respectively. The two conditions imply that discounted profits and the discounted sum of total wages are higher with investment and wage moderation.

If, as is likely, the payoffs are subject to some uncertainty, then the equilibrium that is chosen will be based on risk-dominance. This implies that the wage restraint/ high investment equilibrium is chosen if and only if

$$[\delta_F \pi(w_0, L_0) - I][(1 + \delta_U)w_0 L_0 - w_H L_H - \delta_U w_H L(w_H)] >$$

$$[I - \delta_F \pi(w_H, L(w_H))](w_H - w_0)L_0$$

In the case where  $f(L) = AL^\alpha$  this condition can be re-stated as

$$(\delta_F/\delta_U)[(1 + \delta_U)w_0 - w_H]L_0 > I(\alpha/(1 - \alpha))$$

$$\text{where } L_0 = (\alpha A/w_0)^{1/(1-\alpha)}.$$

This formulation implies that defection from the wage restraint/high investment equilibrium is more likely if  $\delta_F$ ,  $\delta_U$ , or  $A$  decrease or  $w_H$  increases. Thus, the good outcome is less likely when firms and/or workers become more impatient, in the case of adverse technology shocks or when unions' bargaining power goes up.

The Eichengreen hypothesis that centralized wage bargaining is conducive to the high investment/wage moderation equilibrium might be interpreted as a prediction that  $\delta_U$  and  $\delta_F$  will be high. However, other aspects of the Golden Age economic environment are clearly relevant and these might include restricted capital mobility as positive for  $\delta_U$  the fixed exchange rate regime as a constraint on  $w_H$ , and nice technology surprises as positive for  $A$ .

Key implications of this formulation are that the good equilibrium is quite fragile and that formulating a decisive test of the Eichengreen hypothesis is not straightforward. However,

this set-up does help to explain why the Marshall Plan may have been good news and the end of the restricted capital-mobility, fixed-exchange rate Bretton Woods system may have been bad news for the prospects of sustaining the co-operative equilibrium.

## Appendix 2

Harrison (2002) considers a game between the Dictator (D) and the Producer (P) to investigate when it will pay both parties to maintain a high coercion, high effort with monitoring equilibrium.

1) The payoffs in such a state with high effort is observed and rewarded are

$$D: z + f - m - r$$

$$P: y - e + r$$

2) compared with the following where low effort is detected and punished

$$D: z - m - q$$

$$P: y - p$$

3) and compared with these payoffs if monitoring is abandoned and the producer shirks and steals

$$D: z - s$$

$$P: y + s$$

where  $z$  is the dictator's rent when effort is low,  $f$  is the additional rent if effort is high,  $q$  is the cost of punishment to the dictator,  $m$  is monitoring cost,  $r$  is the reward cost,  $y$  is producer income,  $e$  is the cost of effort to the producer,  $p$  is the cost of punishment to the producer, and  $s$  is stolen rents.

The dictator will prefer 1) to 3) when  $(z + f - m - r) > (z - s)$  or equivalently when  $(f + s - m) > r$ .

The producer will prefer 1) to 2) when  $(y - e + r) > (y - p)$  or equivalently when  $r > (e - p)$ .

Combining these two conditions indicates that the high coercion, high effort equilibrium is sustainable if

$$(f + s - m) > r > (e - p)$$

In addition, the Producer has to believe that the Dictator will not default, i.e., that the future value of the Dictator's rents is sufficient to make a promise not to default credible.

If the sum of  $m + q$  or the sum of  $m + r$  become high enough, the Dictator would rationally give up monitoring and settle for the shirk and steal equilibrium. If the  $r$  that the Dictator can afford becomes too low, the Dictator is challenged to enforce a penalty to deter shirk and steal.

Increasing costs of monitoring ( $m$ ), rewards ( $r$ ) and punishments ( $q$ ) all tend to undermine the high coercion, high effort equilibrium which may then be abandoned with a collapse of output.

## References

- Abramovitz, M. (1986), "Catching Up, Forging Ahead and Falling Behind", *Journal of Economic History*, 36, 385-406.
- Abramovitz, M. and David, P. A. (1996), "Convergence and Delayed Catch-Up: Productivity Leadership and the Waning of American Exceptionalism", in R. Landau, T. Taylor and G. Wright (eds.), *The Mosaic of Economic Growth*. Stanford: Stanford University Press, 21-62.
- Aiyar, S. and Dalgaard, C-J. (2005), "Total Factor Productivity Revisited: a Dual Approach to Development Accounting", *IMF Staff Papers*, 52, 82-102.
- Alesina, A. F., Glaeser, E. L. and Sacerdote, B. (2005), "Work and Leisure in the US and Europe: Why So Different?", CEPR Discussion Paper No. 5140.
- Allen, R. C. (2003), *Farm to Factory*. Princeton: Princeton University Press.
- Badinger, H. (2005), "Growth Effects of Economic Integration: Evidence from the EU Member States", *Review of World Economics*, 141, 50-78.
- Baily, M. and Kirkegaard, J. F. (2004), *Transforming the European Economy*. Washington: Institute for International Economics.
- Bairoch, P. (1968), *The Working Population and Its Structure*. Brussels: Institut de Sociologie.
- Bairoch, P. (1982), "International Industrialization Levels from 1750 to 1980", *Journal of European Economic History*, 11, 269-331.
- Barry, F. (2002), "The Celtic Tiger Era: Delayed Convergence or Regional Boom?", *ESRI Quarterly Economic Commentary*, 84-91.
- Bean, C. and Crafts, N. (1996), "British Economic Growth since 1945: Relative Economic Decline ... and Renaissance?", in N. Crafts and G. Toniolo (eds.), *Economic Growth in Europe Since 1945*. Cambridge: Cambridge University Press, 131-172.
- Beck, T. and Laeven, L. (2006), "Institution Building and Growth in Transition Economies", *Journal of Economic Growth*, 11, 157-186.
- Berliner, J. S. (1976), *The Innovation Decision in Soviet Industry*. Cambridge, Mass.: MIT Press.
- Blanchard, O. (2004), "The Economic Future of Europe", *Journal of Economic Perspectives*, 18(4), 3-26.
- Boltho, A. (1982), "Introduction", in A. Boltho (ed.), *The European Economy: Growth and Crisis*. Oxford: Oxford University Press.

- Bosworth, B. P. and Collins, S. M. (2003), "The Empirics of Growth: an Update", *Brookings Papers on Economic Activity*, 2, 113-206.
- Bourles, R. and Cette, G. (2006), "Les Evolutions de la Productivite 'Structurelle' du Travail dans les Principaux Pays Industriels", *Bulletin de la Banque de France*, 150, 23-30.
- Broadberry, S.N. (1998), "How Did the United States and Germany Overtake Britain? A Sectoral Analysis of Comparative Productivity Levels, 1870-1990", *Journal of Economic History*, 58, 375-407
- Caballero, R., Cowan, K., Engel, E. and Micco, A. (2004), "Effective Labor Regulation and Microeconomic Flexibility", NBER Working Paper No. 10744.
- Calvo-Gonzalez, O. (2001), "Bienvenido, Mister Marshall! La Ayuda Economica Americana y la Espanola en La Decada de 1950", *Revista de Historia Economica*, 19, 253-275.
- Carlin, W. and Soskice, D. (2006), *Macroeconomics: Imperfections, Institutions and Policies*.  
Oxford: Oxford University Press.
- Cameron, G. and Wallace, C. (2002), "Macroeconomic Performance in the Bretton Woods Era and After", *Oxford Review of Economic Policy*, 18, 479-494.
- Carlin, W. (1996), "West German Growth and Institutions, 1945-90", in N. Crafts and G. Toniolo (eds.), *Economic Growth in Europe Since 1945*. Cambridge: Cambridge University Press, 455-497.
- Cassidy, M. (2004), "Productivity in Ireland: Issues and Trends", *Central Bank of Ireland Quarterly Bulletin*, Spring, 83-105.
- Ciccone, A. (2002), "Agglomeration Effects in Europe", *European Economic Review*, 46, 213-227.
- Conway, P. and Nicoletti, G. (2006), "Product Market Regulation in the Non-Manufacturing Sectors of OECD Countries: Measurement and Highlights", OECD Economics Department Working Paper No. 530.
- Conway, P., Janod, V. and Nicoletti, G. (2005), "Product Market Regulation in OECD Countries: 1998-2003". OECD Economics Department Working Paper No. 419.
- Conway, P., de Rosa, D., Nicoletti, G., and Steiner, F. (2006), "Regulation, Competition and Productivity Convergence", OECD Economics Department Working Paper No. 509.
- Crafts, N. F. R. (1992), "Institutions and Economic Growth: Recent British Experience in an International Context", *West European Politics*, 15, 16-38.
- Crafts, N. F. R. (1997), "The Human Development Index and Changes in Standards of Living: Some Historical Comparisons", *European Review of Economic History*, 1, 299-322.

- Crafts, N. (2002a), "Is Economic Growth Good for Us?", *World Economics*, 4(3), 35-49.
- Crafts, N. (2002b), *Britain's Relative Economic Performance, 1870-1999*. London: IEA.
- Crafts, N. (2005), "Interpreting Ireland's Economic Growth", background paper for UNIDO, *Industrial Development Report*.
- Crafts, N. (2007), "Recent European Economic Growth: Why Can't It Be Like the Golden Age?", *National Institute Economic Review*, 199, 69-81.
- Crafts, N. and Mills, T. C. (2005), "TFP Growth in British and German Manufacturing, 1950-1996", *Economic Journal*, 115, 649-670.
- Crouch, C. (1993), *Industrial Relations and European State Traditions*. Oxford: Clarendon Press.
- De Long, J. B. and Eichengreen, B. (1993), "The Marshall Plan: History's Most Successful Structural Adjustment Program", in R. Dornbusch, W. Nolling and R. Layard (eds.), *Postwar Economic Reconstruction and Lessons for the East Today*. Cambridge, Mass.: MIT Press, 189-230.
- De Melo, M., Denizer, C., Gelb, A. and Tenev, S. (2001), "Circumstance and Choice: the Role of Initial Conditions and Policies in Transition Economies", *World Bank Economic Review*, 15, 1-31.
- Edwards, J. and Nibler, M. (2000), "Corporate Governance in Germany: the Role of Banks and Ownership Concentration", *Economic Policy*, 31, 239-267.
- Eichengreen, B. (1996), "Institutions and Economic Growth: Europe after World War II", in N. Crafts and G. Toniolo (eds.), *Economic Growth in Europe Since 1945*. Cambridge: Cambridge University Press, 38-72.
- Eichengreen, B. (2006), *The European Economy Since 1945*. Princeton: Princeton University Press.
- Eichengreen, B. and Uzan, M. (1992), "The Marshall Plan: Economic Effects and Implications for Eastern Europe and the Former USSR", *Economic Policy*, 14, 13-76.
- Faggio, G. and Nickell, S. (2007), "Patterns of Work Across the OECD", *Economic Journal*, 117, F416-F440.
- Fernandez, R. and Rodrik, D. (1991), "Resistance to Reform: Status-Quo Bias in the Presence of Individual-Specific Uncertainty", *American Economic Review*, 81, 1146-1155.
- Fischer, S., Sahay, R. and Vegh, C. A. (1998), "How Far is Eastern Europe from Bussels ?", IMF Working paper No. 98/53.
- Geroski, P. and Jacquemin, A. (1988), "The Persistence of Profits: a European Comparison",

- Economic Journal*, 98, 375-389.
- Griffith, R. and Harrison, R. (2004), "The Link between Product market Regulation and Macroeconomic Performance", European Commission Economic Papers No. 209.
- Griffith, R, Harrison, R. and Simpson, H. (2006), "Product Market Reform and Innovation in the EU", IFS Working paper No. 06/17.
- Groningen Growth and Development Centre (2007), *Total Economy Database*.
- Gust, C. and Marquez, J. (2004), "International Comparisons of Productivity Growth: the Role of Information Technology and Regulatory Practices", *Labour Economics*, 11, 33-58.
- Hall, R. E. and Jones, C. I. (1999), "Why Do Some Countries Produce So Much More Output per Worker than Others ?", *Quarterly Journal of Economics*, 114, 83-116.
- Harrison, M. (1998), "Trends in Soviet Labour Productivity, 1928-85: War, Postwar Recovery, and Slowdown", *European Review of Economic History*, 2, 171-200.
- Harrison, M. (2002), "Coercion, Compliance, and the Collapse of the Soviet Command Economy", *Economic History Review*, 55, 397-433.
- Hoj, J., Jimenez, M., Maher, M., Nicoletti, G. and Wise, M. (2007), "Product Market Competition in OECD Countries: Taking Stock and Moving Forward", OECD Economics Department Working Paper No. 575.
- Huberman, M. (2004), "Working Hours of the World Unite?: New International Evidence of Worktime, 1870-1913", *Journal of Economic History*, 64, 964-1001.
- Iradian, G. (2007), "Rapid Growth in Transition Economies: Growth Accounting Approach", IMF Working Paper No. 07/164.
- Janossy, F. (1969), *The End of the Economic Miracle*. White Plains, NY.: IASP:
- Kaufmann, D., Kraay, A. and Mastruzzi, M. (2007), "Governance Matters VI: Aggregate and Individual Governance Indicators, 1996-2006", World Bank Policy Research Working Paper No. 4280.
- Kenny, C. (2005), "Why Are We Worried About Income? Nearly Everything Else that Matters is Converging", *World Development*, 33, 1-19.
- Kindleberger, C. P. (1967), *Europe's Postwar Growth: the Role of Labor Supply*. Princeton: Princeton University Press.
- Kneller, R., Bleaney, M. and Gemmell, N. (1999), "Fiscal Policy and Growth: Evidence from OECD Countries", *Journal of Public Economics*, 74, 171-190.
- Krugman, P. R. and Venables, A. J. (1995), "Globalization and the Inequality of Nations", *Quarterly Journal of Economics*, 110, 857-880.

- Kuznets, S. S. (1966), *Modern Economic Growth: Rate, Structure and Spread*. New Haven: Yale University Press.
- Lindert, P. H. (2004), *Growing Public*. Cambridge: Cambridge University Press.
- Lucas, R. E. (2000), "Some Macroeconomics for the 21st Century", *Journal of Economic Perspectives*, 14(1), 159-178.
- Maddison, A. (2003), *The World Economy: Historical Statistics*. Paris: OECD.
- Martinez-Galarraga, J. (2007), "New Estimates of Regional GDP in Spain, 1860-1930", paper presented to Workshop on Historical Economic Geography of Europe, 1900-2000, Madrid.
- Mills, T. C. and Crafts, N. F. R. (2000), "After the Golden Age: a Long-Run Perspective on Growth Rates that Speeded Up, Slowed Down and Still Differ", *The Manchester School*, 68, 68-91.
- Molle, W. (1980), *Regional Disparity and Economic Development in the European Community*. Farnborough: Saxon House.
- Nelson, R. R. and Wright, G. (1992), "The Rise and Fall of American Technological Leadership: the Postwar Era in Historical Perspective", *Journal of Economic Literature*, 30, 1931-1964.
- Nickell, S. (2005), "What Has Happened to Unemployment in the OECD since the 1980s?", unpublished presentation to Work and Pensions Economics Group, HM Treasury.
- Nickell, S., Nicolitsas, D. and Dryden, N. (1997), "What Makes Firms Perform Well?", *European Economic Review*, 41, 783-796.
- Nicoletti, G. and Scarpetta, S. (2005), "Regulation and Economic Performance: Product Market Reforms and Productivity in the OECD", OECD Economics Department Working Paper No. 460.
- Nordhaus, W. D. (1972), "The Recent Productivity Slowdown", *Brookings Papers on Economic Activity*, 3, 493-531.
- Nordhaus, W. D. (2002), "The Health of Nations: the Contribution of Improved Health to Living Standards", NBER Working Paper No. 8818.
- Norrbin, S. and Yigit, P. (2005), "The Robustness of the Link between Volatility and Growth of Output", *Review of World Economics*, 144, 343-356.
- OECD (2001), *Historical Statistics*. Paris.
- OECD (2005), *OECD in Figures*. Paris.

- OECD (2006), *Revenue Statistics, 1965-2005*. Paris.
- OECD (2007), *Social Expenditure Database*. Paris.
- Ofer, G. (1987), "Soviet Economic Growth: 1928-1985", *Journal of Economic Literature*, 25, 1767-1833.
- O'Grada, C. and O'Rourke, K. H. (1996), "Irish Economic Growth, 1945-88", in N. Crafts and G. Toniolo (eds.), *Economic Growth in Europe Since 1945*. Cambridge: Cambridge University Press, 388-426.
- O'Mahony, M. (1999), *Britain's Productivity Performance, 1950-1996*. London: NIESR.
- Prescott, E. C. (2004), "Why Do Americans Work So Much More than Europeans?", *Federal Reserve Bank of Minneapolis Quarterly Review*, 28(1), 2-13.
- Raiser, M., Schaffer, M. and Schuchhardt, J. (2004), "Benchmarking Structural Change in Transition", *Structural Change and Economic Dynamics*, 15, 47-81.
- Ritschl, A. (1996), "An Exercise in Futility: East German Economic Growth and Decline, 1945-1989", in N. Crafts and G. Toniolo (eds.), *Economic Growth in Europe Since 1945*. Cambridge: Cambridge University Press, 498-540.
- Rossi, N. and Toniolo, G. (1996), "Italy", in N. Crafts and G. Toniolo (eds.), *Economic Growth in Europe since 1945*. Cambridge: Cambridge University Press, 427-454.
- Sala-i-Martin, X. and Subramanian, A. (2003), "Assessing the Natural Resource Curse: an Illustration from Nigeria", NBER Working Paper No. 9804.
- Statistisches Bundesamt Deutschland (2007), *Aktuelle Kreisergebnisse für Deutschland*.
- Symeonidis, G. (2007), "The Effect of Competition on Wages and Productivity", *Review of Economics and Statistics*, forthcoming.
- Temin, P. (2002), "The Golden Age of European Growth Reconsidered", *European Review of Economic History*, 6, 3-22.
- Timmer, M. and van Ark, B. (2005), "Does Information and Communication Technology Drive EU-US Productivity Growth Differentials ?", *Oxford Economic Papers*, 57, 693-716.
- UNCTAD (1983), *Handbook of International Trade and Development Statistics*. New York.
- UNIDO (2005), *International Yearbook of Industrial Statistics*. Vienna
- United Nations (1957), *Demographic Yearbook*. New York.

- United Nations (1965), *The Growth of World Industry, 1938-1961*. New York.
- United Nations (1988), *World Population Prospects*. New York.
- Usher, D. (1980), *The Measurement of Economic Growth*. Oxford: Blackwell.
- van Ark, B. (1996), "Sectoral Growth Accounting and Structural Change in Postwar Europe", in B. van Ark and N. Crafts (eds.), *Quantitative Aspects of Postwar European Economic Growth*. Cambridge: Cambridge University Press, 84-164
- Verspagen, B. (1996), "Technology Indicators and Economic Growth in the European Area: Some Empirical Evidence", in B. van Ark and N. Crafts (eds.), *Quantitative Aspects of Postwar European Economic Growth*. Cambridge: Cambridge University Press, 215-243.
- Weitzman, M. L. (1970), "Soviet Postwar Economic Growth and Capital-Labor Substitution", *American Economic Review*, 60, 676-692.
- World Health Organization (2007), *World Health Statistics*.
- World Trade Organization (2006), *International Trade Statistics*. Geneva.
- Yates, P. L. (1959), *Forty Years of Foreign Trade*. London: Allen and Unwin.

**Table 1. Levels and Growth Rates of Real GDP/Person: Western Europe and United States (\$1990GK and % per year)**

	<i>Western Europe</i>	<i>United States</i>		<i>Western Europe</i>	<i>United States</i>
1820	1205	1257	1820-1870	0.98	1.34
1870	1962	2445	1870-1913	1.33	1.82
1913	3461	5301	1913-1950	0.78	1.61
1950	4582	9561	1950-1973	4.06	2.45
1973	11431	16689	1973-2005	1.86	1.91
2005	20589	30519			

*Sources:* GGDC (2007) and Maddison (2003) updated from website.

**Table 2. Levels and Rates of Growth of Real GDP/Person in Western European Countries (\$1990GK and % per year)**

	<i>1820</i>	<i>1820-70</i>
Netherlands	1838	0.81
UK	1706	1.26
Belgium	1319	1.44
Denmark	1274	0.91
Austria	1218	0.85
Sweden	1198	0.66
France	1135	1.01
Italy	1117	0.59
Switzerland	1090	1.32
Germany	1077	1.08
Spain	1008	0.36
Portugal	923	0.11
Ireland	877	1.42
Norway	801	1.07
Finland	781	0.76
Greece	641	0.65
	<i>1870</i>	<i>1870-1913</i>
UK	3190	1.01
Netherlands	2757	0.90
Belgium	2692	1.05
Switzerland	2102	1.66
Denmark	2003	1.57
France	1876	1.45
Austria	1863	1.45
Germany	1839	1.61
Ireland	1775	1.01
Sweden	1662	1.46
Italy	1499	1.26
Norway	1360	1.39
Spain	1207	1.25
Finland	1140	1.44
Portugal	975	0.58
Greece	880	1.39
	<i>1913</i>	<i>1913-1950</i>
UK	4921	0.93
Switzerland	4266	2.06
Belgium	4220	0.70
Netherlands	4049	1.07
Denmark	3912	1.56
Germany	3648	0.17
France	3485	1.12
Austria	3465	0.18
Sweden	3096	2.12
Ireland	2736	0.64
Italy	2564	0.85

Norway	2447	2.18
Finland	2111	1.91
Spain	2056	0.17
Greece	1592	0.51
Portugal	1250	1.39
	<b>1950</b>	<b>1950-1973</b>
Switzerland	9064	3.08
Denmark	6943	3.08
UK	6939	2.42
Sweden	6739	3.06
Netherlands	5971	3.45
Belgium	5462	3.54
Norway	5430	3.24
France	5271	4.04
West Germany	4281	5.02
Finland	4253	4.25
Austria	3706	4.94
Italy	3502	4.95
Ireland	3453	3.03
Spain	2189	5.60
Portugal	2086	5.45
Greece	1915	6.21
	<b>1973</b>	<b>1973-2005</b>
Switzerland	18204	0.74
Denmark	13945	1.73
Sweden	13494	1.68
West Germany	13153	1.41
France	13114	1.67
Netherlands	13081	1.72
Belgium	12170	1.87
UK	12025	1.96
Norway	11324	2.78
Austria	11235	2.13
Finland	11085	2.18
Italy	10634	1.88
Spain	7661	2.74
Greece	7655	2.10
Portugal	7063	2.15
Ireland	6867	3.84
	<b>2005</b>	
Norway	27219	
Denmark	24116	
Ireland	23019	
Switzerland	22972	
Sweden	22912	
Netherlands	22531	
UK	22417	
France	22240	
Finland	22121	

Austria	22036
Belgium	21953
West Germany	20576
Italy	19252
Spain	18166
Greece	14868
Portugal	13954

*Note:* Ireland is GNP in 2005

*Sources:* GGDC and Maddison (2003) updated from website and West Germany from Statistisches Bundesamt Deutschland (2007)

**Table 3. Levels and Rates of Growth of Real GDP/Person in Eastern Europe and Russia/USSR (\$1990GK and % per year)**

	<i>Eastern Europe</i>	<i>Russia/ USSR</i>		<i>Eastern Europe</i>	<i>Russia/ USSR</i>
1820	683	688	1820-1870	0.63	0.63
1870	937	943	1870-1913	1.39	1.06
1913	1695	1488	1913-1950	0.60	1.76
1950	2111	2841	1950-1973	3.81	3.35
1973	4988	6059	1973-2005	1.14	0.14
2005	7174	6336			

*Source:* GGDC (2007) and Maddison (2003)

**Table 4. Levels and Rates of Growth of Real GDP/Person in Eastern European Countries (\$1990GK and % per year)**

	<b>1870</b>	<b>1870-1913</b>
Czechoslovakia	1164	1.38
Hungary	1092	1.54
Poland	946	1.43
Romania	931	1.47
Bulgaria	840	1.41
Yugoslavia	599	1.33
Albania	446	1.40
	<b>1913</b>	<b>1913-1950</b>
Hungary	2098	0.46
Czechoslovakia	2096	1.40
Romania	1741	-1.05
Poland	1739	0.94
Bulgaria	1534	0.20
Yugoslavia	1057	1.04
Albania	811	0.58
	<b>1950</b>	<b>1950-1973</b>
Czechoslovakia	3501	3.08
Hungary	2480	3.60
Poland	2447	3.45
East Germany	2102	4.47
Bulgaria	1651	5.19
Yugoslavia	1551	4.59
Romania	1182	4.79
Albania	1001	3.62
	<b>1973</b>	<b>1973-2005</b>
Czechoslovakia	7041	1.32
East Germany	5753	1.56
Hungary	5596	1.45
Poland	5340	1.46
Bulgaria	5284	0.96
Yugoslavia	4361	0.79
Romania	3477	0.44
Albania	2273	1.34
	<b>2005</b>	
East Germany	13800	
Czechoslovakia	10704	
Hungary	8857	
Poland	8476	
Bulgaria	7147	
Yugoslavia	5582	
Romania	3992	
Albania	3476	

*Sources:* GGDC (2007), Maddison (2003) and Statistisches Bundesamt Deutschland (2007).

**Table 5. Unconditional Convergence Regressions: Eastern and Western Europe**

	<i>1820-1870</i>	<i>1870-1913</i>	<i>1913-1950</i>	<i>1950-1973</i>	<i>1973-2005</i>
<b><i>Western Europe</i></b>					
Constant	0.580 (1.614)	1.394 (6.100)	1.100 (1.877)	6.340 (14.519)	4.091 (9.450)
Initial GDP/P % Leader	0.005 (0.905)	-0.002 (-0.530)	-0.00004 (-0.004)	-0.045 (-5.572)	-0.030 (-4.898)
R <sup>2</sup>	-0.012	-0.050	-0.071	0.667	0.605
<b><i>Western and Eastern Europe</i></b>					
Constant		1.359 (7.078)	1.128 (1.888)	6.468 (15.309)	3.858 (8.397)
Initial GDP/P % Leader		-0.001 (-0.439)	-0.0005 (-0.054)	-0.047 (-6.442)	-0.027 (-4.096)
Eastern Dummy		0.055 (0.370)	-0.446 (-1.019)	-1.334 (-3.932)	-2.084 (-6.374)
R <sup>2</sup>		-0.049	-0.015	0.643	0.637

*Note:* leader is defined as UK in 1820 and 1870 then USA.

*Source:* own calculations based on data in Tables 2 and 4.

**Table 6. Coefficient of Variation of Real GDP/Person.**

	<i>Western Europe</i>	<i>Eastern and Western Europe</i>
1820	0.27	
1870	0.35	0.46
1913	0.33	0.43
1950	0.41	0.55
1973	0.25	0.43
2005	0.15	0.43

*Source:* derived from Tables 2 and 4.

**Table 7. Unconditional Convergence Regressions: Western European Regions**

	<i>1950-73</i>	<i>1950-73</i>	<i>1950-73</i>	<i>1973-2005</i>	<i>1973-2005</i>	<i>1973-2005</i>
Constant	6.660 (39.755)	5.292 (17.567)	5.633 (13.926)	3.218 (19.608)	2.340 (9.731)	2.419
Initial GDP/P %Leader	-0.051 (-14.487)	-0.029 (-7.521)	-0.035 (-6.294)	-0.019 (-7.870)	-0.008 (-3.396)	-0.011 (-3.396)
Spain		0.920 (3.537)	0.826 (2.975)		0.793 (4.243)	0.660 (3.350)
West Germany		1.046 (4.346)	0.917 (3.683)		-0.229 (-1.247)	-0.265 (-1.514)
UK		-0.833 (-3.539)	-0.798 (-3.198)		0.195 (1.088)	0.082 (0.469)
France		0.169 (0.766)	0.167 (0.765)		-0.044 (-0.263)	-0.028 (-0.176)
Italy		0.716 (3.017)	0.645 (2.661)		0.085 (0.492)	0.023 (0.131)
Density			0.0002 (1.895)			0.0002 (2.930)
Distance to Luxembourg			-0.0001 (-0.462)			0.0001 (0.807)
R <sup>2</sup>	0.713	0.870	0.873	0.420	0.662	0.696

*Sources:* own calculations based on GDP per person relative to national average for France, Italy, Netherlands, Spain, UK and West Germany for set of same 85 regions obtained from Molle (1980), Martinez-Galarraga (2007) and Eurostat, *Regional Statistics*, various issues. These relativities were then applied to national estimates for real GDP per person reported in Table 2. Density (= population/land area) calculated from same sources. Distances to Luxembourg from [www.mapcrow.info](http://www.mapcrow.info) plus intercept of 100 km.

**Table 8. Regional GDP/Person: Theil Index of Inequality**

	<i>Between Countries</i>	<i>Within Countries</i>	<i>Total</i>
1950	0.055	0.036	0.091
1973	0.013	0.034	0.047
2005	0.002	0.038	0.040

*Note:* the between countries Theil Index for the 16 western European countries in Table 2 is 0.069 in 1950, 0.016 in 1973 and 0.007 in 2005.

*Sources:* as for Table 7.

**Table 9. Geography and Real GDP/Person Regressions**

	<i>1950</i>	<i>1973</i>	<i>2005</i>
Constant	10.032 (19.196)	10.646 (24.422)	10.678 (23.835)
Log Density	0.206 (4.318)	0.122 (3.178)	0.103 (2.633)
Log Distance to Luxembourg	-0.407 (-5.816)	-0.306 (-5.231)	-0.208 (-3.477)
R <sup>2</sup>	0.802	0.652	0.327

*Note:* dependent variable is the log of real GDP/Person, country dummies included but not reported and density instrumented using land area as in Ciccone (2002).

*Sources:* own calculations based on data from sources for Table 7.

**Table 10. Annual Hours Worked/Worker and Total Hours Worked/Population:  
Western European Countries, United States and USSR**

	<i>1870</i>	<i>1913</i>	<i>1950</i>	<i>1973</i>	<i>2005</i>
<i>Annual Hours/Worker</i>					
Austria			2100	1889	1519
Belgium	3483	2841	2404	1851	1611
Denmark	3434	2731	2145	1747	1575
Finland			2035	1914	1714
France	3168	2933	2233	2019	1529
(W) Germany	3284	2723	2372	1870	1437
Greece			2322	2111	1912
Ireland	3108	2690	2437	2103	1636
Italy	3000	2953	1928	1788	1592
Netherlands	3274	2942	2299	1823	1413
Norway			2039	1703	1360
Portugal			2344	2024	1709
Spain	2968	2601	2052	2124	1774
Sweden	3436	2745	2016	1642	1588
Switzerland	3195	2704	2092	1810	1534
UK	2755	2656	2112	1919	1624
United States	3096	2900	2016	1898	1791
USSR			1947	1791	
<i>Total Hours/Population</i>					
Austria			1037.9	839.2	709.7
Belgium	1463.4	1251.2	936.9	718.0	654.5
Denmark	1491.5	1169.1	1033.4	878.1	800.5
Finland			1055.1	955.2	786.4
France	1467.0	1370.4	1053.9	833.4	631.0
(W) Germany	1354.8	1269.6	982.5	819.5	685.6
Greece			787.9	754.4	785.2
Ireland			1000.8	728.4	785.8
Italy	1481.3	1398.8	686.2	658.1	665.3
Netherlands	1251.6	1112.2	885.1	726.3	706.9
Norway			892.1	721.1	684.3
Portugal			970.7	766.7	811.5
Spain	1129.1	977.2	868.5	809.3	834.2
Sweden	1586.7	1270.7	988.8	786.8	763.5
Switzerland	1541.0	1332.4	1044.0	964.4	856.7
UK	1154.4	1156.9	943.6	856.2	756.7
United States	1137.6	1153.4	804.6	784.2	882.7
USSR			873.1	847.9	

*Sources:* Huberman (2004) and GGDC (2007).

**Table 11. Life Expectancy at Birth.**

	<i>1870</i>	<i>1913</i>	<i>1950</i>	<i>1973</i>	<i>2005</i>
Austria	31.7	42.2	65.7	70.5	79.6
Belgium	40.0	49.6	67.5	71.4	78.6
Denmark	45.5	57.7	71.0	73.6	78.0
Finland	36.5	46.2	66.3	70.7	79.1
France	42.0	50.4	66.5	72.4	80.4
(W) Germany	36.2	49.0	67.5	70.6	79.5
Greece			65.9	72.3	79.5
Ireland		53.8	66.9	71.3	79.2
Italy	28.0	47.2	66.0	72.1	80.9
Netherlands	38.9	56.1	72.1	74.0	79.2
Norway	49.3	57.2	72.7	74.4	80.0
Portugal			59.3	68.0	78.2
Spain	33.7	41.8	63.9	72.9	80.3
Sweden	45.8	57.0	71.8	74.7	80.9
Switzerland	41.0	52.2	69.2	73.8	81.4
UK	41.3	53.4	69.2	72.0	78.9
Albania			55.2	67.7	70.9
Bulgaria		42.3	64.1	71.2	72.6
Czechoslovakia		42.4	65.9	70.0	75.4
East Germany			67.0	71.2	78.6
Hungary		39.5	63.9	69.9	72.9
Poland			61.3	70.4	75.0
Romania			61.1	69.0	71.9
Yugoslavia			58.1	68.4	73.8
United States	44.0	51.6	69.0	71.3	77.9
Russia/USSR		36.7	64.1	68.6	65.2

*Sources:* Crafts (1997), United Nations (1957) (1988), World Health Organization (2007)

**Table 12. Growth Rates of Augmented GDP/Person: Western European Countries, United States and USSR (% per year)**

	<i>GDP/Person</i>	<i>Leisure</i>	<i>Longevity</i>	<i>Augmented GDP/P</i>
<b><i>1870-1913</i></b>				
Belgium	1.05	0.27	0.43	1.75
Denmark	1.57	0.41	0.55	2.53
France	1.45	0.12	0.38	1.95
Germany	1.61	0.11	0.58	2.30
Italy	1.26	0.10	0.86	2.22
Netherlands	0.90	0.20	0.77	1.87
Spain	1.25	0.25	0.36	1.86
Sweden	1.46	0.39	0.50	2.35
Switzerland	1.66	0.25	0.50	2.41
UK	1.01	0.00	0.54	1.55
United States	1.82	-0.02	0.34	2.14
<b><i>1913-1950</i></b>				
Belgium	0.70	0.58	0.81	2.09
Denmark	1.56	0.25	0.60	2.41
France	1.12	0.53	0.72	2.37
Germany	0.44	0.51	0.83	1.78
Italy	0.85	1.17	0.85	2.87
Netherlands	1.07	0.44	0.72	2.23
Spain	0.17	0.23	0.99	1.39
Sweden	2.12	0.41	0.67	3.20
Switzerland	2.06	0.49	0.76	3.31
UK	0.93	0.41	0.71	2.05
United States	1.61	0.73	0.78	3.12
<b><i>1950-1973</i></b>				
Austria	4.94	0.71	0.43	6.08
Belgium	3.54	0.87	0.35	4.76
Denmark	3.08	0.52	0.23	3.83
Finland	4.25	0.32	0.40	4.97
France	4.04	0.76	0.53	5.33
West Germany	5.02	0.59	0.28	5.89
Greece	6.21	0.14	0.58	6.93
Ireland	3.03	1.05	0.40	4.48
Italy	4.95	0.13	0.55	5.63
Netherlands	3.45	0.66	0.17	4.28
Norway	3.24	0.68	0.15	4.07
Portugal	5.45	0.78	0.78	7.01
Spain	5.60	0.24	0.81	6.65
Sweden	3.06	0.74	0.26	4.06
Switzerland	3.08	0.25	0.41	3.74
UK	2.42	0.31	0.25	2.98
United States	2.45	0.08	0.21	2.74
Western Europe	4.12	0.46	0.43	5.01
USSR	3.35	0.09	0.40	3.84
<b><i>1973-2005</i></b>				

Austria	2.13	0.38	0.68	3.19
Belgium	1.87	0.20	0.54	2.61
Denmark	1.73	0.21	0.33	2.27
Finland	2.18	0.45	0.63	3.26
France	1.67	0.64	0.60	2.91
West Germany	1.41	0.42	0.67	2.50
Greece	2.10	-0.09	0.54	2.55
Ireland	3.84	-0.16	0.59	4.27
Italy	1.88	-0.02	0.66	2.52
Netherlands	1.72	0.06	0.39	2.17
Norway	2.78	0.12	0.42	3.34
Portugal	2.15	-0.12	0.77	2.80
Spain	2.74	-0.07	0.56	3.23
Sweden	1.68	0.06	0.46	2.20
Switzerland	0.74	0.26	0.57	1.57
UK	1.96	0.29	0.52	2.77
United States	1.91	-0.26	0.50	2.15
Western Europe	1.88	0.24	0.59	2.71

*Source:* own calculations based on Tables 2, 10 and 11, see text

**Table 13. Mortality Imputations to Growth: Eastern European Countries.**

	<i>1913-1950</i>	<i>1950-1973</i>	<i>1973-2005</i>
Albania		1.12	0.24
Bulgaria	0.98	0.64	0.10
Czechoslovakia	1.06	0.37	0.41
East Germany		0.38	0.56
Hungary	1.10	0.54	0.22
Poland		0.82	0.34
Romania		0.71	0.22
Russia/USSR	1.23	0.40	-0.26

*Source:* own calculations based on Table 11, see text.

**Table 14. Contributions to Labour Productivity Growth: Western Europe, USA, East Germany and USSR (% per year)**

	<i>Capital- Deepening</i>	<i>Human-Capital Deepening</i>	<i>TFP</i>	<i>Labour Productivity Growth</i>
<b><i>1960-1970</i></b>				
Austria	2.39	0.18	2.90	5.47
Belgium	1.36	0.42	2.33	4.11
Denmark	2.15	0.13	1.25	3.53
Finland	1.66	0.37	2.64	4.67
France	2.02	0.29	2.62	4.93
West Germany	2.10	0.23	2.03	4.36
Greece	3.63	0.26	4.45	8.34
Ireland	1.78	0.22	2.21	4.21
Italy	2.39	0.36	3.50	6.25
Netherlands	1.43	0.74	0.89	3.06
Norway	1.18	0.48	1.80	3.46
Portugal	2.05	0.35	3.99	6.39
Spain	2.45	0.38	3.73	6.56
Sweden	1.34	0.19	2.40	3.93
Switzerland	1.40	0.40	1.37	3.17
UK	1.45	0.17	1.24	2.86
USA	0.03	0.43	1.54	2.00
USSR	1.84	n/a	0.90	2.74
East Germany	1.10	n/a	1.71	2.81
<b><i>1970-1990</i></b>				
Austria	1.32	0.22	1.00	2.54
Belgium	0.96	0.18	1.38	2.52
Denmark	0.82	0.24	0.02	1.08
Finland	0.98	0.62	0.90	2.50
France	1.28	0.36	0.84	2.48
(W) Germany	0.79	0.40	0.69	1.88
Greece	1.24	0.50	0.06	1.80
Ireland	1.47	0.38	1.18	3.03
Italy	0.98	0.32	1.22	2.52
Netherlands	0.72	0.25	0.65	1.62
Norway	0.90	0.70	0.84	2.44
Portugal	0.90	0.44	1.01	2.35
Spain	1.54	0.37	1.13	3.04
Sweden	0.67	0.36	0.27	1.30
Switzerland	0.72	0.30	-0.38	0.64
UK	0.83	0.32	0.74	1.89
USA	0.24	0.41	0.43	1.08
East Germany	1.05	n/a	0.75	1.80
USSR	1.14	n/a	-0.06	1.08

**1990-2003**

Austria	0.86	0.27	0.37	1.50
Belgium	0.76	0.25	0.26	1.27
Denmark	0.72	0.19	0.95	1.86
Finland	0.49	0.31	1.49	2.29
France	0.58	0.27	0.13	0.98
Germany	0.76	0.17	0.60	1.53
Greece	0.61	0.35	1.25	2.21
Ireland	0.49	0.26	2.24	2.99
Italy	0.60	0.38	0.14	1.12
Netherlands	0.26	0.28	0.07	0.61
Norway	0.31	0.21	1.81	2.33
Portugal	1.13	0.47	-0.31	1.29
Spain	0.63	0.37	-0.37	0.63
Sweden	0.73	0.44	1.16	2.33
Switzerland	0.60	0.08	-0.23	0.45
UK	0.91	0.41	0.74	2.06
USA	0.90	0.10	0.82	1.82

*Notes:* all estimates based on  $\Delta(Y/L)/(Y/L) = \alpha\Delta(K/L)/(K/L) + \beta\Delta(HK/L)/(HK/L) +$  TFP growth assuming  $\alpha = 0.35$ ; for USSR human capital deepening subsumed in TFP.

*Sources:* estimates from Bosworth and Collins (2003) updated from website except USSR which is derived from data underlying Allen (2003, Figure 10.2) and, for employment, Harrison (1998) kindly supplied by the authors, and east Germany which is derived from Ritschl (1996) adjusted for revisions to labour productivity growth as reported in GGDC (2007). Irish estimates adjusted to GNP basis.

**Table 15. Contributions to Labour Productivity Growth: East Asian Tigers (% per year)**

	<i>Capital- Deepening</i>	<i>Human-Capital Deepening</i>	<i>TFP</i>	<i>Labour Productivity Growth</i>
<b><i>1960-1990</i></b>				
Singapore	3.34	0.31	1.32	4.97
South Korea	2.84	0.80	1.42	5.06
Taiwan	3.17	0.60	2.30	6.07
<b><i>1990-2003</i></b>				
Singapore	1.76	0.82	0.93	3.51
South Korea	2.40	0.46	0.95	3.81
Taiwan	2.67	0.34	1.75	4.76

*Source:* derived as in Table 14 from Bosworth and Collins (2003) updated on website.

**Table 16. Contributions to Labour Productivity Growth: Eastern Europe (% per year)**

	<i>Capital Deepening</i>	<i>Human-Capital Deepening</i>	<i>TFP</i>	<i>Labour Productivity Growth</i>
<b>1996-2006</b>				
Czech Republic	2.1	n/a	1.1	3.2
Estonia	3.1	n/a	4.3	7.4
Hungary	1.8	n/a	1.7	3.5
Latvia	2.7	n/a	3.9	6.6
Lithuania	2.1	n/a	4.1	6.2
Poland	1.9	n/a	2.5	4.4
Slovakia	2.3	n/a	1.5	3.8
Slovenia	2.0	n/a	1.8	3.8
CIS	2.0	n/a	3.7	5.7
Russia	1.3	n/a	2.7	4.0

*Source:* derived from data in Iradian (2007) imposing same benchmarking assumptions as in Table 14 with human capital subsumed in TFP.

**Table 17. Contribution of Structural Change to Labour Productivity Growth, 1950-1973 (% per year)**

	<i>Orthodox Measure</i>	<i>Broadberry Measure</i>
Denmark	0.24	1.10
UK	-0.12	0.31
Sweden	0.00	0.60
Netherlands	-0.31	0.29
France	0.00	0.52
West Germany	0.18	0.77
Italy	0.83	1.77
Spain	0.80	1.77

*Note:* the orthodox approach considers the contribution of structural change equals  $\Delta A_0/A_0 - \sum \Delta A_i/A_i * A_i/A_0 * S_i$  where A is labour productivity, S is share of employment, and subscripts o and i stand for the whole economy and sector i, respectively (Nordhaus, 1972). Broadberry (1998) modified this so that labour productivity growth in the case of declining sectors was measured using the overall rate of labour force growth not the sectoral rate. *Source:* derived from data in van Ark (1996) using a three sector (agriculture, industry, services) de-composition where agriculture is deemed to be the declining sector.

**Table 18. Sectoral Employment Shares**

	<i>Agriculture</i>	<i>Industry</i>	<i>Services</i>
<b>1950</b>			
Austria	32.3	37.1	30.6
Belgium	12.2	48.9	38.9
Denmark	25.1	33.3	41.6
Finland	46.0	27.7	26.3
France	31.5	31.8	36.7
Germany	23.2	42.9	33.9
Greece	48.2	19.3	32.5
Ireland	39.6	24.4	36.0
Italy	42.2	32.1	25.7
Netherlands	17.8	38.4	43.8
Norway	25.9	36.9	37.4
Portugal	48.4	25.1	26.5
Spain	48.8	25.1	26.1
Sweden	20.3	40.9	38.8
Switzerland	16.5	46.6	36.9
UK	5.3	48.8	45.9
<b>1974</b>			
Austria	13.0	44.8	42.2
Belgium	3.8	41.0	55.2
Denmark	9.6	32.3	58.1
Finland	16.3	36.1	47.6
France	10.6	39.4	50.0
Germany	7.0	46.7	46.3
Greece	36.0	27.8	36.2
Ireland	22.8	32.6	44.6
Italy	17.5	39.3	43.2
Netherlands	5.7	35.9	58.4
Norway	10.6	34.3	55.1
Portugal	34.9	33.8	31.3
Spain	23.2	37.2	39.6
Sweden	6.7	37.0	56.3
Switzerland	7.5	44.3	48.2
UK	2.8	42.0	55.2
<b>2004</b>			
Austria	5.0	27.8	67.2
Belgium	2.0	24.9	73.1
Denmark	3.1	23.7	73.2
Finland	4.9	25.7	69.4
France	3.5	23.0	73.5
Germany	2.4	31.0	66.6
Greece	12.6	22.5	64.9
Ireland	6.4	27.7	65.9
Italy	4.5	31.0	64.5
Netherlands	3.0	20.3	76.7
Norway	3.5	20.9	75.6

Portugal	12.1	31.4	56.5
Spain	5.5	30.5	64.0
Sweden	2.1	22.6	75.3
Switzerland	3.7	23.7	72.6
UK	1.3	22.3	76.4

*Note:* mining included in industry

*Sources:* Bairoch (1968), OECD (2001) (2005)

**Table 19. Shares of World Manufactured Production and Exports (%)**

	<i>1880</i>	<i>1913</i>	<i>1953</i>	<i>1973</i>	<i>2004</i>
<i>Production</i>					
Western Europe	53.7	48.4	26.1	32.9	27.2
North America	15.1	32.9	46.9	35.1	25.4
Japan	2.4	2.7	2.9	8.8	17.8
South & SE Asia	2.8	1.4	2.5	5.2	10.3
China	12.5	3.6	2.3	3.9	7.2
Rest of World	13.5	11.0	19.3	22.5	12.1
<i>Exports</i>					
Western Europe	89.1	77.2	54.2	56.6	46.2
North America	4.4	11.1	26.1	16.1	12.8
Japan		2.4	3.9	10.0	7.5
South & SE Asia	1.5	3.8	2.8	4.6	17.4
China			0.6	0.7	9.6
Rest of World	5.0	5.5	12.4	12.0	6.5

*Sources:* Bairoch (1982), UNCTAD (1983), UNIDO (2005), United Nations (1965), WTO (2006) and Yates (1959).

**Table 20. Levels and Rates of Growth of Real GDP/Hour Worked****a) Levels (1990GK\$)**

<b>1973</b>	<b>(1)</b>	<b>(2)</b>	<b>1995</b>	<b>(1)</b>	<b>(2)</b>	<b>2005</b>	<b>(1)</b>	<b>(2)</b>
Switzerland	18.88		Norway	31.67	28.78	Norway	39.78	36.68
Netherlands	18.01	17.69	W.Germany	30.08		France	35.24	31.44
Sweden	17.15	16.94	Belgium	29.21		Belgium	33.54	
Belgium	16.95		France	29.13	26.10	Netherlands	31.87	28.17
Italy	16.16	14.76	Italy	27.61	23.44	Austria	31.05	
W. Germany	16.05		Netherlands	27.47	23.28	Denmark	30.13	
Denmark	15.88		Denmark	27.01		Sweden	30.01	28.39
France	15.73	15.99	Austria	24.76		UK	29.62	28.56
Norway	15.70	14.96	Germany	24.50	21.31	Ireland	29.29	27.32
UK	14.05	14.05	UK	24.06	22.78	Italy	28.94	24.89
Austria	13.39		Sweden	23.47	21.89	Germany	28.86	24.88
Finland	11.61	12.40	Switzerland	23.33		Finland	28.13	26.79
Greece	10.15		Spain	22.24	18.44	Switzerland	26.82	
Spain	9.47	9.96	Finland	22.20	20.23	Spain	21.78	19.74
Ireland	9.45	10.41	Ireland	19.60	17.38	Greece	18.94	
Portugal	9.21		Greece	14.70		Portugal	17.20	
			Portugal	14.31				
USA	21.28		USA	27.77		USA	35.20	

**b) Rates of Growth (% per year)**

<b>1973-95</b>	<b>(1)</b>	<b>(2)</b>	<b>1995-2005</b>	<b>(1)</b>	<b>(2)</b>
Switzerland	0.97		Norway	2.31	2.46
Netherlands	1.94	1.26	Belgium	1.40	
Sweden	1.44	1.17	France	1.93	1.89
Belgium	2.51		Italy	0.48	0.62
Italy	2.47	2.13	Netherlands	1.50	1.93
W. Germany	2.90		Denmark	1.10	
Denmark	2.44		Austria	2.29	
France	2.84	2.25	Germany	1.66	1.57
Norway	3.24	3.02	UK	2.10	2.29
UK	2.48	2.22	Sweden	2.49	2.63
Austria	2.83		Switzerland	1.41	
Finland	2.95	2.25	Spain	-0.21	0.70
Greece	1.91		Finland	2.40	2.85
Spain	3.94	2.84	Ireland	4.10	4.62
Ireland	3.37	2.36	Greece	2.57	
Portugal	2.02		Portugal	1.87	
USA	1.22		USA	2.40	

*Note:* figures for Ireland are for GNP/HW. (1) refers to observed values and (2) refers to 'structural values'.

*Sources:* derived from Bourles and Cette (2006) and Groningen Growth and Development Centre (2007).

**Table 21. Distortionary Tax Revenues and Social Transfers (%GDP)****a) Distortionary Tax Revenues**

	<b>1965</b>	<b>1980</b>	<b>1995</b>	<b>2004</b>
Austria	21.2	26.7	29.6	30.6
Belgium	19.5	30.0	32.4	33.7
Denmark	17.8	27.0	33.1	32.8
Finland	17.3	23.2	31.8	30.2
France	21.3	30.0	31.2	32.3
Germany	21.2	27.3	26.8	24.6
Greece	10.0	13.9	18.6	22.0
Ireland	11.8	18.0	19.6	22.2
Italy	15.4	21.8	29.2	30.3
Netherlands	22.4	31.3	31.3	25.5
Norway	17.4	27.5	25.2	30.9
Portugal	8.8	12.6	19.2	21.2
Spain	8.7	17.9	22.9	25.0
Sweden	24.1	35.7	34.8	37.4
Switzerland	11.5	19.5	21.7	22.3
UK	20.3	24.9	22.7	24.5
USA	19.1	21.7	22.9	20.8

**b) Social Transfers**

	<b>1960</b>	<b>1980</b>	<b>1995</b>	<b>2003</b>
Austria	15.9	22.6	26.6	26.1
Belgium	13.1	23.5	26.4	26.5
Denmark	12.3	25.2	28.9	27.6
Finland	8.8	18.4	27.4	22.5
France	13.4	20.8	28.3	28.7
Germany	18.1	23.0	26.6	27.3
Greece	10.4	11.5	19.3	21.3
Ireland	8.7	17.4	18.4	18.8
Italy	13.1	18.0	19.8	24.2
Netherlands	11.7	24.1	22.8	20.7
Norway	7.8	16.9	23.5	25.1
Portugal		10.8	18.1	23.5
Spain		15.5	21.5	20.3
Sweden	10.8	28.6	32.5	31.3
Switzerland	4.9	13.9	17.5	20.5
UK	10.2	16.6	20.4	20.6
USA	7.3	13.3	15.4	16.2

Sources: Lindert (2004) OECD (2006) (2007). Ireland as % of GNP.

**Table 22. Product Market Regulation (0-10) and Price-Cost Margins**

	<i>PCM</i> <i>Manufactures</i>	<i>PCM</i> <i>Services</i>	<i>PMR</i> <i>1980</i>	<i>PMR</i> <i>1998</i>	<i>PMR</i> <i>2003</i>
Austria	1.15	1.28	8.50	3.00	2.33
Belgium	1.10	1.20	9.17	3.50	2.33
Denmark	1.11	1.25	9.17	2.50	1.83
Finland	1.18	1.27	9.00	3.50	2.17
France	1.12	1.26	10.00	4.17	2.83
Germany	1.13	1.25	8.67	3.17	2.33
Greece			9.50	4.67	3.00
Ireland			9.50	2.50	1.83
Italy	1.15	1.38	9.67	4.67	3.17
Netherlands	1.13	1.24	9.33	3.00	2.33
Norway	1.13	1.26	9.17	3.00	2.50
Portugal			9.83	3.50	2.67
Spain	1.14		8.33	3.83	2.67
Sweden	1.11	1.17	7.50	3.00	2.00
Switzerland			7.00	3.67	2.83
UK	1.11	1.16	8.00	1.83	1.50
USA	1.12	1.19	4.50	2.17	1.67

*Sources:* PMR indicator for 1980 from Conway and Nicoletti (2006) and for 1998 and 2003 from Conway et al. (2005); the 1980 numbers are not strictly comparable with those for the later years. Price-cost margins from Hoj et al. (2007).

**Table 23. Employment Protection (0-10)**

	<i>1960-4</i>	<i>1973-9</i>	<i>1988-95</i>	<i>2003</i>
Austria	3.25	4.20	6.50	4.85
Belgium	3.60	7.75	6.75	5.00
Denmark	4.50	5.50	4.50	3.50
Finland	6.00	6.00	5.65	5.00
France	1.85	6.05	7.05	7.00
Germany	2.25	8.25	7.60	5.60
Greece			8.00	7.00
Ireland	0.10	2.25	2.60	2.80
Italy	9.60	10.00	9.45	4.85
Netherlands	6.95	6.95	6.40	5.50
Norway	7.75	7.75	7.30	6.50
Portugal	0.00	7.95	9.65	8.00
Spain	10.00	9.95	8.70	7.50
Sweden	0.00	7.30	7.65	5.50
Switzerland	2.75	2.75	2.75	2.75
UK	0.80	1.65	1.75	1.75
USA	0.50	0.50	0.50	0.50

*Source:* Nickell (2005)

**Table 24. Contributions to Labour Productivity Growth (percentage points per year)****a) ICT**

	<i>ICT Capital Deepening</i>		<i>TFP in ICT Production</i>	
	<i>1990-95</i>	<i>1995-2001</i>	<i>1990-95</i>	<i>1995-2001</i>
Austria	0.21	0.37	0.08	0.20
Belgium	n/a	0.66	n/a	0.12
Denmark	0.25	0.64	0.05	0.10
Finland	0.23	0.66	0.16	0.69
France	0.21	0.33	0.17	0.31
Germany	0.33	0.37	0.14	0.24
Greece	n/a	0.49	n/a	0.01
Ireland	0.21	0.66	1.17	3.62
Italy	0.29	0.39	0.13	0.21
Netherlands	0.30	0.47	0.07	0.11
Portugal	0.28	0.47	0.02	0.31
Spain	0.20	0.17	0.09	0.15
Sweden	0.25	0.77	0.14	0.57
UK	0.36	0.61	0.21	0.38
EU	0.28	0.42	0.14	0.27
USA	0.40	0.72	0.25	0.44

**b) Non-ICT**

	<i>Non-ICT Capital Deepening</i>		<i>Non-ICT TFP</i>	
	<i>1990-95</i>	<i>1995-2001</i>	<i>1990-95</i>	<i>1995-2001</i>
Austria	1.03	1.03	0.36	1.12
Belgium	n/a	0.55	n/a	1.02
Denmark	0.70	0.92	1.56	0.19
Finland	0.84	-0.33	1.07	1.98
France	1.11	0.53	-0.11	0.55
Germany	1.18	0.50	1.22	0.63
Greece	n/a	1.09	n/a	1.66
Ireland	0.43	1.22	1.79	-0.01
Italy	1.09	0.59	1.49	-0.07
Netherlands	0.30	-0.01	0.36	0.26
Portugal	1.88	1.24	1.34	0.19
Spain	1.11	0.09	0.89	-0.77
Sweden	0.6	0.47	0.86	0.10
UK	0.88	0.59	1.20	0.09
EU	1.05	0.48	0.98	0.19
USA	0.19	0.32	0.36	0.37

**c) Contribution of ICT-Using Services, 1996-2001 (percentage points per year)**

Austria	0.5
Belgium	0.4
Denmark	0.4
Finland	0.3
France	-0.1
Germany	0.2
Ireland	0.7
Italy	0.1
Netherlands	0.3
Norway	0.4
Spain	0.1
Sweden	0.6
UK	0.8
USA	1.3

*Sources:* Nicoletti and Scarpetta (2005), van Ark et al. (2003), Timmer and van Ark (2005)

**Table 25. Economic Structure in Transition Economies in 1990**

	<i>% Agricultural Employment</i>	<i>% Industrial Employment</i>	<i>% Services Employment</i>	<i>Industry %GDP</i>	<i>% GDP Over- Industrialized</i>
Bulgaria	18.5	49.3	32.2	59	23
Czech Rep.	12.9	44.0	43.1	58	21
Estonia	21.0	36.8	42.2	44	10
Hungary	15.6	36.4	48.0	36	-1
Latvia	16.4	40.6	43.0	45	10
Lithuania	18.9	41.2	39.9	45	10
Poland	23.4	36.4	40.2	52	13
Romania	31.1	41.5	27.4	59	22
Russia	13.2	42.3	44.5	48	7
Slovakia	10.0	44.5	45.5	59	23
Slovenia	9.7	49.2	41.1	44	6

*Sources:* Raiser et al. (2004) and De Melo et al. (2001)

**Table 26. Rule of Law (-2.5 to 2.5)**

	<i>1996</i>	<i>2006</i>
Bulgaria	-0.11	-0.17
Czech Republic	0.84	0.73
Estonia	0.50	0.91
Hungary	0.85	0.73
Latvia	0.13	0.52
Lithuania	0.29	0.45
Poland	0.66	0.25
Romania	-0.16	-0.16
Russia	-0.74	-0.91
Slovakia	0.21	0.43
Slovenia	0.86	0.79
Austria	1.86	1.87
Belgium	1.55	1.45
Denmark	1.91	2.03
Finland	1.92	1.95
France	1.45	1.31
Germany	1.80	1.77
Greece	0.90	0.64
Ireland	1.72	1.62
Italy	0.97	0.37
Netherlands	1.81	1.75
Norway	2.00	2.02
Portugal	1.13	0.97
Spain	1.33	1.10
Sweden	1.84	1.86
Switzerland	2.07	1.96
UK	1.83	1.73

*Note:* the rule of law indicator measures the extent to which agents have confidence in and abide by the rules of society. It is based on an aggregation of components which include the effectiveness and predictability of the judiciary and the enforceability of contracts.

*Source:* Kaufmann et al. (2007)

**Table 27. Labour Productivity: Growth and Initial Level**

	<i>Labour Productivity Growth 1995-2005 (% per year)</i>	<i>GDP/Worker 1995 Level \$1990GK, (%US)</i>
Bulgaria	2.89	13294 (25.8)
Czech Republic	2.75	16974 (33.0)
East Germany	4.87	20525 (39.9)
Estonia	7.72	19478 (37.9)
Hungary	3.35	16422 (31.9)
Latvia	6.18	14676 (28.5)
Lithuania	6.36	12707 (24.7)
Poland	4.71	14539 (28.3)
Romania	3.47	7587 (14.7)
Russia	3.76	10761 (20.9)
Slovakia	4.24	17754 (34.5)
Slovenia	3.86	23028 (44.8)
	<i>Labour Productivity Growth 1950-1973 (% per year)</i>	<i>GDP/Worker 1950 Level £1990GK, (%US)</i>
Austria	5.42	7498 (31.3)
Belgium	3.56	14018 (58.5)
Denmark	2.89	14410 (60.1)
Finland	4.42	8203 (34.2)
France	4.64	11166 (46.6)
(W) Germany	4.73	19338 (43.2)
Greece	5.99	5644 (23.6)
Ireland	3.79	8407 (35.1)
Italy	4.78	9840 (41.1)
Netherlands	3.31	15508 (64.7)
Norway	3.39	12407 (51.8)
Portugal	5.83	5037 (21.0)
Spain	6.08	5171 (21.6)
Sweden	3.17	13744 (57.4)
Switzerland	2.79	18161 (75.8)
UK	2.43	15529 (64.8)

*Source:* GGDC (2007)

**Figure 1: Endogenous Growth**

