

GROWTH AND STRUCTURAL CHANGE IN SPAIN, 1850-2000: A EUROPEAN PERSPECTIVE ⁺*

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RESUMEN

En este ensayo se examina el progreso económico a largo plazo de la España contemporánea y se sitúa en perspectiva europea. En siglo y medio, la renta per capita aumentó quince veces. Tres grandes fases pueden distinguirse: 1850-1950, 1951-1974 y 1975-2000. El peor comportamiento relativo de España en el largo plazo se debió fundamentalmente al lento crecimiento durante etapas concretas del siglo anterior a 1950. En la segunda mitad del siglo XX, y en particular, durante 1959-1974, España acortó distancias. El cambio estructural contribuyó significativamente a la aceleración del crecimiento, en tanto la falta de exposición a la competencia internacional constituyó un elemento recurrente de atraso.

Palabras clave: crecimiento largo plazo, cambio estructural, convergencia, España, Europa

⁺ Written to honour Gabriel Tortella in his seventieth birthday.

^{*} Received on 5th March 2007. I am grateful to Stephen Broadberry, Alan Dye, Riitta Hjerpe, Angus Maddison, and Isabel Sanz-Villarroya for their comments. An earlier version of the paper was presented at the Vice-Presidential Session on «Convergence and Non-convergence since the Second World War», International Economic History Association Congress (Helsinki August, 2006). The usual disclaimer applies.

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ABSTRACT

Long run economic progress in modern Spain is assessed in this paper and its performance placed in European perspective. Over one and a half centuries, income per person rose 15 times. Three main phases can be established: 1850-1950, 1951-1974 and 1975-2000. Spain underperformed in the long run mostly due to its sluggish growth in specific phases of the century prior to 1950. Catching up took place in the late twentieth century, in which the years 1959-74 stand out. Structural change contributed significantly to growth acceleration while lack of exposition to international competition represents a recurrent element of retardation.

Keywords: Long-run growth, structural change, catching-up, Spain, Europe

JEL classification: N13, N14, N33, N34, O47, O52

INTRODUCTION

Accounts of economic performance in modern Spain tell a story of failure and retardation up to mid-twentieth century that led way to fast growth after 1960. The literature provides exogenous explanations in which inadequate natural resources, low human capital endowment, foreign «dependency», and inefficient institutions share the blame for the poor performance prior to mid-twentieth century but they fail to explain why the economic situation was reversed so dramatically thereafter¹.

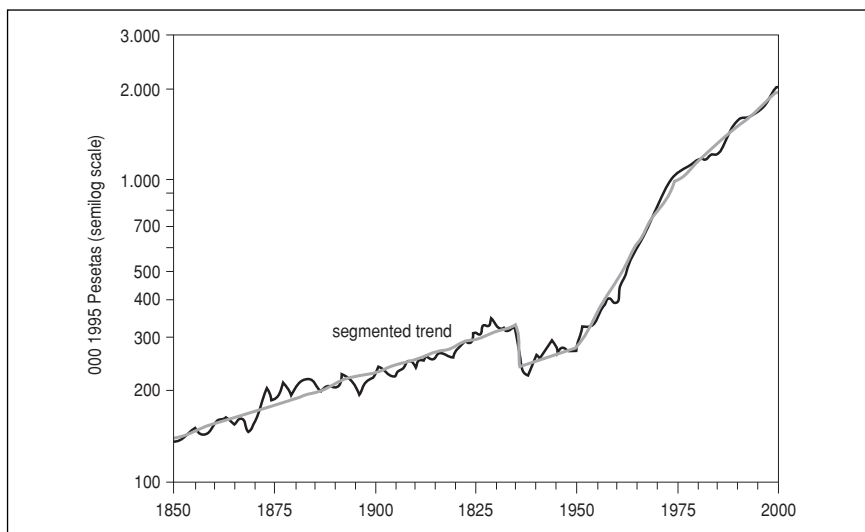
My goal in this paper is a more modest and preliminary one: I will try and assess long-run economic progress in modern Spain and place its performance during the Golden Age and its aftermath in historical perspective. In section I economic trends over the long run are described; the contribution of the demographic transition and structural change to growth is discussed in section II; section III offers an international perspective of Spain's performance. Section IV concludes.

I. LONG-RUN PERFORMANCE: AN OVERVIEW

Aggregate economic activity multiplied by 40 over one hundred and fifty years at trend growth rate of 2.4 percent per year. If we deduct a population increase of more than two and half times we find that, at the end of the twentieth century, per capita GDP was 15 times larger than at mid-nineteenth century (at a trend annual rate of 1.7 percent). Such a

¹ Cf. Tortella (1994b).

GRAPH 1
REAL PER CAPITA GDP, 1850-2000



significant improvement did not take place at a steady rate. Spain's GDP series is trend stationary with structural breaks in level (1936) and in trend (1951 and 1975) (See Appendix)². Three main phases: 1850-1950, 1951-1974 and 1975-2000, can be, then, established with a shift to a lower level during the first period resulting from the Civil War (1936-1939)³. In the Golden Age (1950-1974) GDP per capita rose seven times more rapidly than during the previous hundred years (1850-1950) and twice as fast as during the last quarter of the twentieth century. Thus the rate of growth experienced between 1850 and 1950 meant that product per person doubled every 99 years while the same increase was achieved every 13 years in 1951-1974 and every 27 years over 1975-2000 (Table 1).

² A change of trend indicates a break in the long-term rate of growth while a change in level represents an increase or, as in the case of the Civil War years, a drop in economic activity which does not alter the established growth rate. It should be distinguished between the trend growth rate and the GDP level, the former being the relevant one to establish a periodisation. Thus, the relevant fact for accepting 1951 as structural break is that the trend growth rate change after this year and not that the GDP level was lower in 1951 than in 1929.

³ If the slump caused by the Civil War were not taken into account the trend growth rate would reach 2.6 percent. The difference between these two figures, 0.2 percent, could be interpreted as the reduction in the long run annual growth rate caused by the civil conflict ($8\% [=0.2/2.4]$). If we consider the effect on product per person, the corresponding figure is 0.25 percent annually which represents a drop of almost 15 percent.

TABLE 1
PHASES OF GROWTH IN SPAIN, 1850-2000 (%)
 (Annual average logarithmic rates of change)

	GDP	Population	Per Capita GDP
1850-2000	2.4	0.6	1.8
1850-1950	1.3	0.6	0.7
1950-1974	6.4	1.0	5.4
1974-2000	3.0	0.4	2.6
1850-1883	1.8	0.4	1.4
1883-1920	1.2	0.6	0.6
1920-1929	3.5	1.0	2.6
1929-1952	0.6	0.9	-0.3
1952-1958	4.4	0.8	3.5
1958-1974	6.9	1.1	5.9
1974-1986	2.5	0.7	1.8
1986-2000	3.5	0.2	3.3

Sources: Prados de la Escosura (2003).

The view of continuity in Spain's economic growth between 1850 and 1950 contrasts with the widely held interpretation of the nineteenth century as a period of economic failure and that of the twentieth century as one of success (Tortella 1994a), while confirms previous findings for the period 1850-1935 (Cubel and Palafox 1998, Carreras 1987, 1992). Phases or long swings in which growth rates differ from the long-run trend as a result of economic policies, access to international markets and technological change can be distinguished⁴.

During the first phase, 1850-1883, the rate of growth of product per person was well above the nineteenth century's average. It can be partly attributed to a 'reconstruction effect' after the political instability and social unrest of the early nineteenth century in which demographic expansion would have cancelled out most of the moderate growth in output⁵. Institutional reforms and opening up to foreign capital and

⁴ The phases defined in the lower panel of Table 1 correspond with the time division arising from econometrically estimated deviations from the established trend (Prados de la Escosura 2003). Growth rates are measured as average annual logarithmic rates of change over periods delimited by peak years. These rates have a clearer meaning than trend growth rates based on statistical adjustment. In addition, they have additive properties.

⁵ The fact that per capita income improved little over 1815-1850 should not obscure the achievement of maintaining the standard of living despite the acceleration in population growth (Cf. Prados de la Escosura 1988 and Rosés 2003). Pérez Moreda (1999: 44) calculates a demographic growth of 0.76 percent between 1821 and 1860 compared with 0.42 percent for the eighteenth century.

international trade lie beneath the significant growth experienced during the next three decades. Inflows of foreign capital made it possible to break the close connection between investment and savings and contributed to the economic growth (Prados de la Escosura 2007a).

A slowdown in growth took place between the mid 1880s and 1920. This was a period of institutional stability that presumably provided a favourable environment for investment and growth yet both permanent and temporary factors worked against it.

Restrictions on both internal and external competition help to explain sluggish growth despite institutional stability during most of the Restauración (1875-1923) (Fraile Balbín 1998). Increasing tariff protection, together with exclusion from the prevailing international monetary system, the gold standard, represented a major obstacle to Spain's integration in the international economy⁶. The Cuban War of Independence, despite the already weakened economic links between the Spain and its colony, caused significant macroeconomic instability that brought forward the fall of the peseta and worsened Spain's international economic isolation⁷. Although the loss of Cuba had little direct economic impact, the protectionist and isolationist tendencies of the early twentieth century could have been its political consequence (Fraile Balbín and Escribano 1998). Macroeconomic instability reduced capital flows leading to the depreciation of the peseta—with a significant lag with respect to the cease of convertibility—that, in turn, increased the cost of emigrating and, hence reduced the outward flow of labour⁸. The move towards isolation can be seen in the evolution of relative factor prices. The land rent/wage ratio tended to fall between the early 1890s and the First World War (Prados de la Escosura 2006) while the opposite pattern is observed in open European countries (O'Rourke and Williamson 1999).

The pre-1914 years saw a brief period of increased activity coinciding with the peseta's recovery since 1905⁹. During World War I, instead, economic activity hardly progressed (below 0.6 percent annually) stagnating in per capita terms. This result is in stark contradiction with the conventional view that stresses its stimulating aggregate effects¹⁰.

⁶ Cf. Tena (1999), Palafox (1999) and Pardos (1998) on tariff protection and its effects. See Martín Aceña (1994) and Bordo and Rockoff (1996) on the gold standard.

⁷ See the discussion in Fraile and Escribano (1998), Maluquer de Motes (1999) and Prados de la Escosura (2007a).

⁸ Cf. Martín Aceña (1999) and Prados de la Escosura (2007a) on mobility of capital and Sánchez Alonso (2000) on emigration.

⁹ Between 1905 and 1913 absolute GDP grew at a rate of 2.5 percent while GDP per capita did so by 1.8 percent.

¹⁰ Cf. Roldán and García Delgado (1973) for the established view on the impact of the Great War on Spain.

The most intense growth of the period 1850-1950 was achieved in the 1920s, and as it coincided with the Primo de Rivera Dictatorship (1923-1929) economists and historians have inevitably tended to make connections. Intervention in and regulation of economic activity increased during the Dictatorship (Comín 1987, Fraile 1998). The hypothesis that Government intervention in the form of protectionist measures and regulation and through investment in infrastructure were decisive factors behind this growth has been widely accepted (Velarde 1968). The emphasis on tariff protectionism tends to neglect, however, that Spain opened up to international factor flows during the 1920s. A significant inflow of foreign capital allowed the purchase of capital goods and raw materials which contributed to growth acceleration (Prados de la Escosura 2007a)¹¹.

Lastly, a fourth long swing took place between 1929 and 1952. The effects of the Depression in aggregate terms were comparatively milder but more persistent¹². The lively performance of the 1920s, with rising GDP and private consumption per capita, does not support the old stereotype that deprivation and poverty, in a context of economic stagnation, led to the Civil War (1936-39). It could be argued that rapid growth led to a «war of attrition» over income distribution that intensified social and political tensions¹³. However, the fact that the Civil War (1936-39) happened after one and a half decades of inequality decline and poverty alleviation (Prados de la Escosura 2006) demands new explanatory hypotheses. Lagged perceptions of inequality and extreme poverty and unfulfilled expectations by those at the bottom of the distribution might lie at the roots of the civil conflict. Moreover, a process of polarization that triggered social and political conflict can be compatible with stable or declining inequality.

The weak recovery of the years from 1944 to 1952 stands out in the international context. In spite of World War II, European economies outperformed Spain (achieving an average growth rate of 1.4 compa-

¹¹ It has also been noted that the positive situation of the current account balance of payments during the First World War contributed to the boom of the 1920s (Sudrià 1990).

¹² In comparison with the nations which succeeded in abandoning the Gold Standard early (Eichengreen 1992), Spain did not experience a quick recovery. A restrictive public spending policy and the interruption of public projects in progress, together with political uncertainty has been pointed as the main causes of the 1930s crisis (Palafox 1991). Another view sustains, however, that expansionary monetary and anti-cyclical fiscal policies were tried to compensate for the fall in private investment and exports (Comín and Martín Aceña 1984, García Santos and Martín Aceña 1990).

¹³ There are historical examples of a link between relative deprivation and conflict following a period of economic expansion: France at the end of the 18th century (Crouzet 1967), Russia in the early years of the 20th century (Gregory 1994) and Mexico following the Porfiriato (Coatsworth 1990).

red with Spain's 0.6) during the 1940s (Crafts and Mills 1996: 421). Spain's economy did not recover pre-war GDP levels (1929) until 1951 (in absolute terms), and 1955 (in per capita terms); in Europe, in contrast, it only took an average of 6 years to return to the pre-war level of income per capita and by 1953 all Western European countries had done so¹⁴. True that post-bellum Spain was surrounded by countries at war (Velarde 1993), but the fact that its economy only grew at a rate of 2.4 percent between 1944 and 1952 shows that only a slow recovery took place after a relatively mild contraction. Actually, at the trough during the Civil War (1938) Spain's GDP was equal to that of 1920 (and in per capita terms, to that of 1910), while the corresponding year during World War II for France's GDP was equivalent to that of 1891 and for Italy and Germany, to that of 1908 (Crafts and Toniolo 1996: 4).

The war destruction of physical capital was suffered mainly in housing, the transport network and livestock with the effect in industrial areas being limited. The destruction of physical capital can be estimated at around 8 per cent of the existing stock of capital in 1935, which would represent an average level of destruction in the context of World War II, although the concentration on productive capital (especially transport material) meant that levels of destruction caused by the conflict in Spain were far from negligible (Prados de la Escosura and Rosés 2007)¹⁵. Exile after the Civil War and, possibly to a larger extent, internal exile resulting from political repression of Franco's dictatorship, meant the loss of a considerable amount of Spain's limited human capital (Núñez 2003, Ortega and Silvestre 2006)¹⁶.

The change in trend which began in 1951 ushered in an exceptional phase of rapid growth which lasted until 1974. It is worth highlighting the fact that during the Golden Age (1950-1973), the main spurt of economic growth in Spain, as in other countries in the European Periphery, was delayed until the 1960s (Maddison 2001).

During the 1950s, industrialisation in Spain was largely dependent on internal demand. Import capacity's volatility rendered investment risky and tended to penalise capital accumulation, while inflows of foreign capital and new technology were restricted. In a way, Spain's case supports the counterfactual which maintains that without the Marshall Plan, Inter-war commodity and factor markets intervention, including quantitative restrictions on international trade and exchange controls

¹⁴ According to Maddison (1996), Belgium, Holland and France did so in 1949, Italy in 1950 and Germany in 1953.

¹⁵ Cf. Barciela (1986), Catalan (1995), Malefakis (1987) and Sánchez Asiaín (1999).

¹⁶ Regarding interior and exterior exile cf. López (1991, 1996) and Plá (1994, 1999).

would have persisted as the main economic policies ¹⁷. The move towards a pro-market attitude with deregulation and the gradual opening up of the economy which began with the 1959 reforms resulted in sustained growth and catching up with Western Europe during the late twentieth century.

II. DEMOGRAPHIC TRANSITION, STRUCTURAL CHANGE, AND GROWTH

In developing countries the transition to a modern demographic regime and the reallocation of resources from agriculture towards sectors with higher productivity plays a significant part in accelerating economic growth. How large was their contribution in the historical case of Spain?

During the demographic transition, the increase in the dependency ratio caused by the rise in fertility will tend to reduce the potential workforce compared within the total population ¹⁸. Later, as those born during the demographic boom reach working age, the relative size of this potential workforce will increase before falling again as population ages. The potential effect of demographic change on per capita GDP is reflected in a time lag between the growth rate of the working-age population and that of the total population (Bloom and Williamson 1998) ¹⁹. Their annual rates of change, once short-term fluctuations were eliminated with a Hodrick-Prescott filter (Graph 2) show that such a time lag is clearly visible, especially around the mid nineteenth century, in the second quarter of the twentieth century and, again, during its last 20 years. Graph 3 shows the relation between the size of the working-age population and the dependent population, with this ratio increasing in the periods 1860-80, 1920-50, and 1980-2000.

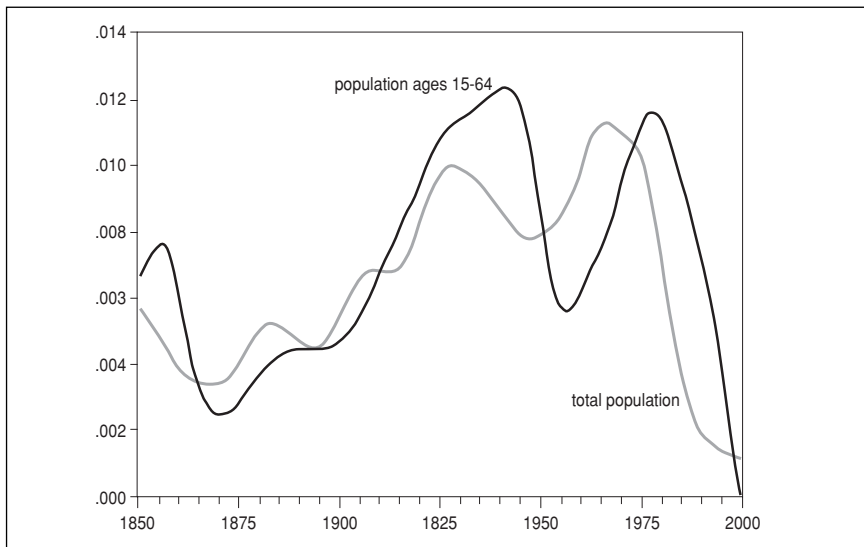
Another way to look at the contribution of the demographic transition to growth can be obtained by breaking down per capita GDP into its components using an identity in which Gross Domestic Product per person (GDP/N) equals product per occupied worker (GDP/L) times the rate of employment (L/EAP), times the activity rate (that is the ratio of the economically active population [EAP] to the population ages 15 to 64 or

¹⁷ The idea that the Marshall Plan's main contribution was to encourage a pro-market economic policy has been suggested by Eichengreen and Uzan (1992). Calvo (1999, 2001) has shown that in Spain there are similarities between the incentives for the market to operate as a mechanism of resource allocation provided by the USA-Spain agreements of 1953 and the Marshall Plan in Europe.

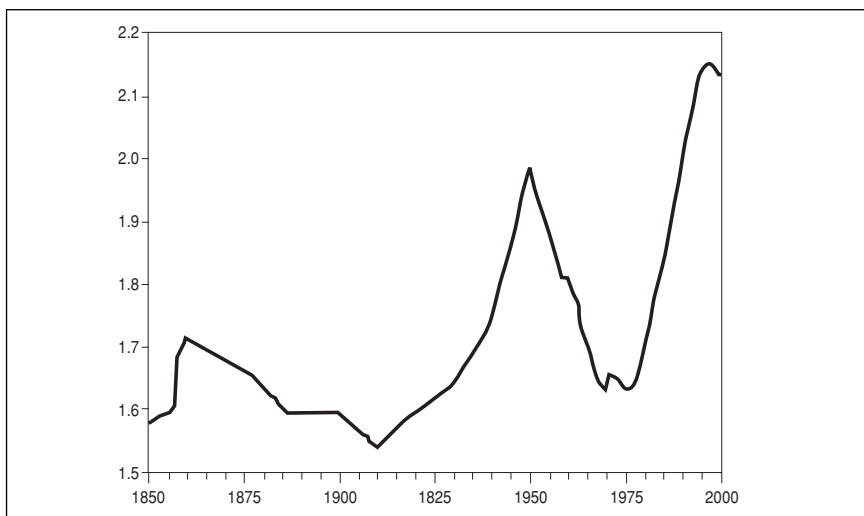
¹⁸ The dependency ratio is the proportion of the total population either under the age of 15 or over the age of 65.

¹⁹ Cf. Williamson (1998), and Higgins and Williamson (1997).

GRAPH 2
TOTAL POPULATION AND POTENTIALLY ACTIVE POPULATION (AGES 15-64):
SMOOTHED RATES OF VARIATION



GRAPH 3
POTENTIALLY ACTIVE POPULATION TO DEPENDENT
POPULATION RATIO, 1850-2000



potentially active population, [PAP]) times the ratio between the potential labour force (PAP) and the total population (N):

$$(1) \quad \text{GDP/N} = (\text{GDP/L}) * (\text{L/EAP}) * (\text{EAP/PAP}) * (\text{PAP/N})$$

and in rates of change expressed in lower case letters,

$$(2) \quad \text{gdp/n} = (\text{gdp/l}) + (\text{l/eap}) + (\text{eap/pap}) + (\text{pap/n})$$

Table 2 shows the evolution of product per person and each of its components, expressed in logarithmic rates of growth, for the long swings identified over the last century and a half ²⁰. A demographic gift—a larger share of working age population— was responsible for a significant part of the per capita GDP growth during 1850-1866 and 1886-2000. The demographic bonus also played a part in mitigating the economic slowdown during the 1930s and 1940s and, again, during the transition to democracy (1978-86). On the contrary, in the Golden Age a negative demographic impact effected per capita income growth.

A rising rate of activity reinforced the demographic gift in 1855-74 and 1886-2000. The increase in the activity rate also played a beneficial role during the Golden Age and after Spain's admission into the European Community. Its fall proved, however, an obstacle to growth

TABLE 2
DECOMPOSING PER CAPITA GDP GROWTH. 1850-2000

	Per Capita GDP	GDP/ employee	Employment /EAP	EAP /PAP	PAP/ Population
1850-2000	1.8	1.7	-0.1	0.1	0.1
1850-1950	0.7	0.7		0.0	0.1
1950-1974	5.4	5.3	0.0	0.4	-0.3
1974-2000	2.6	2.6	-0.5	0.2	0.4
1850-1883	1.4	1.3		0.1	0.0
1883-1920	0.6	0.7		0.0	0.0
1920-1929	2.6	2.4		0.0	0.1
1929-1952	-0.3	-0.5		-0.1	0.3
1952-1958	3.5	3.0	0.0	0.8	-0.4
1958-1974	5.9	6.0	-0.1	0.2	-0.3
1974-1986	1.8	4.0	-1.8	-0.8	0.4
1986-2000	3.3	1.4	0.6	1.0	0.3

Sources: Prados de la Escosura (2003).

EAP: Economically Active Population; PAP: Potentially Active Population (15 to 64 years).

²⁰ The evidence to substantiate the assertions in this paragraph and the next one is provided in Prados de la Escosura (2003), pp. 165-170.

during the Civil War and World War II, and again during the transition to democracy (1976-85) when it aggravated the negative impact of unemployment.

Labour productivity appears as the main determinant of per capita GDP growth and shadows it closely. Nonetheless, there are important exceptions: productivity overcame per capita GDP growth during 1959-74 and again the «transition to democracy» decade (1975-85). Conversely, from 1986 to 2000 productivity change lagged way behind per capita income growth. Employment creation (mostly in services) and productivity seem, thus, to exhibit an inverse relationship during the last quarter of the twentieth century.

The increase in aggregate productivity can be broken down into the part contributed by the increase in output per worker in each economic sector (internal productivity) and the part which is caused by the shift of labour from less productive to more productive sectors (structural change)²¹. The level of aggregate labour productivity (**A**), which is obtained by dividing product (**O**) by employment (**L**) for the economy as a whole in the year *t*, can be expressed as the result obtained by adding the productivity (**O_i/L_i**) for each economic sector **i** (**i** = 1, 2,... *n*), weighted according to each sector's contribution to total employment (**L_i/L**)²².

$$(3) \quad A_t = (O / L)_t = \Sigma(O_i/L_i)_t (L_i/L)_t = \Sigma(A_{it} U_{it})$$

Where **A_i** is product per worker in sector **i** and **U_i** is the contribution of sector **i** to total employment.

From a temporal perspective, using lower case letters to represent rates of change,

$$(4) \quad a_t = \Sigma a_{it} U_{it} + \Sigma A_{it} u_{it}$$

The method normally used for this calculation, *shift-share analysis*, involves estimating, in the first place, *internal* productivity growth (the first term on the right-hand side of equation (4)), that is the result obtai-

²¹ As correctly pointed out by Matthews, Feinstein and Odling-Smee (1982: 248-254), structural change is not really exogenous as it is caused by the interaction between the supply and demand of resources. In this sense the attempt to establish causal relationships between structural change and growth is flawed. From a historical point of view, however, perfect factor mobility does not exist and, consequently differences of marginal productivity between sectors tend to exist as the movement of resources from one sector to another does not take place automatically. For this reason improvements in resource allocation will contribute to growth during a given period of time. It is also the case that even when marginal productivity is the same in different industries, they will not all grow at the same rate. Growth will depend on their use of technological innovation and the existence of increasing returns.

²² I follow the procedure exposed by Broadberry (1998) in the subsequent paragraphs.

ned by adding the growth of output per worker in each economic sector without varying the initial composition of employment. The difference between aggregate productivity and internal productivity will then provide the contribution of structural change.

This procedure is based on the assumption that, in the absence of labour shift between sectors, the level of productivity and the corresponding growth rate for each sector would have been identical to the actual ones. This assumption is not realistic in a case like Spain's in which if labour is quickly absorbed by industry and services, productivity tends to remain stable or to fall²³. It would seem more reasonable to assume that agricultural productivity improved between 1950 and 1975 due to the reduction in the number of workers. It is also true that output per worker in industry between 1974 and 1986 would have grown more slowly if the number of workers had not fallen as a result of the industrial restructuring (*reconversión*) which eliminated less competitive branches reducing both the size of the sector and, consequently, industrial employment²⁴. For this reason the contribution of structural change to the increase in productivity obtained using the conventional *shift-share analysis* is presented as a *lower bound* in Table 3. An *upper bound* is obtained using a modified version of the conventional *shift-share analysis* which is obtained by subtracting from aggregate productivity the figure which would result by weighting product per worker growth in each sector according to its contribution to total employment in the initial year. An exception is made, however, for those sectors where contribution to employment falls (for example, agriculture over the whole period considered and industry since 1975); here the difference between the increase in aggregate employment and that of employment in that sector would be subtracted from output per worker growth²⁵. The result obtained using this method has been called an upper bound because it does not take into account differences in levels of physical and human capital per worker across economic sectors²⁶. As Table 3 shows, the differences between upper and lower bounds are considerable with the exception of the periods 1850-1883 and 1929-52.

²³ Broadberry (1998) puts forward the idea that if we accept, as proposed by Kindleberger (1967), that labour moving from agriculture to industry and services is surplus labour, then it must be assumed that the hypothetical return of this labour to the agricultural sector would have a negative effect on productivity.

²⁴ This is suggested by the calculations of Suárez (1992) and van Ark (1995) regarding total factor productivity and labour productivity respectively.

²⁵ This procedure is suggested by Broadberry (1998). In this case internal productivity would be calculated as $\sum a'_{it} U_{it}$, where $a'_{it} = a_{it} - (l_t - l_{it})$, if $u_{it} < 0$ (l representing employment)

²⁶ Actually, the contribution of structural change should be calculated in terms of total factor productivity rather than in terms of labour productivity. The available evidence confirms, however, the importance of structural change: between 1965 and 1975, total factor

TABLE 3
STRUCTURAL CHANGE AND LABOUR PRODUCTIVITY GROWTH. 1850-2000

	GDP/EAP	Internal Productivity (shift-share)	Structural Change (lower bound)	Internal Productivity (revised)	Structural Change (upper bound)
1850-2000	1.7	1.6	0.1	1.1	0.7
1850-1950	0.7	0.4	0.2	0.3	0.4
1950-1974	5.3	4.9	0.4	3.4	1.9
1974-2000	2.6	3.0	-0.4	1.9	0.7
1850-1883	1.3	1.1	0.2	1.1	0.2
1883-1920	0.7	0.6	0.1	0.4	0.3
1920-1929	2.4	2.1	0.4	1.1	1.3
1929-1952	-0.5	-0.5	0.0	-0.5	0.0
1952-1958	3.0	2.3	0.7	1.3	1.7
1958-1974	6.0	5.4	0.6	3.8	2.2
1974-1986	4.0	3.9	0.1	3.0	0.9
1986-2000	1.4	1.7	-0.3	0.9	0.5

Sources: Prados de la Escosura (2003).

According to the upper bound estimate, structural change would account for two-fifths of the aggregate productivity growth achieved over the last 150 years. This figure is in line with Broadberry's findings (1998) for Germany and the United States between 1870 and 1990²⁷. A closer look shows that between 1883 and 1929 structural change accounts for half of the increase in labour productivity and this figure rises to almost three quarters between 1873 and 1913. If we now focus on shorter cycles it can be shown that during periods of deceleration of growth such as 1883-1913, without a shift of agricultural labour towards industry and services, aggregate labour productivity would have grown by just 0.2 percent whilst the fall in level would have been even sharper in the early 1930s and the post-war recovery (1945-52) would have been even weaker. During the «Golden Age» one third of aggregate labour productivity was due to structural change, while in the 1950s this proportion represented more than a half²⁸. Over the last quarter of the twentieth century structural change has, once

productivity increased by 6.5 percent in industry compared with 2 percent in agriculture and 3.8 percent in aggregate terms (San Juan (1987); Gandoy (1988); Myro (1983); Suárez (1992)). See also the recent research by Sanchis (2001) for 1958-75.

²⁷ Broadberry (1998: 390) estimates that for the increases in productivity of 1.75 percent and 1.43 percent in Germany and the USA, structural change would account for a maximum of 45.7 percent and 50.3 percent respectively.

²⁸ The contribution of structural change is, it can be seen, far greater than the figure obtained by van Ark (1996: 96), using the conventional *shift-share analysis* method (with 22 percent as the upper limit).

more, accounted for one-fourth of the increase in aggregate labour productivity. In this phase, the slow transfer of labour away from agriculture (which still employed one in four workers in 1975) was accompanied by the destruction of employment in less competitive manufacturing industries, a situation which has led to more than a 50 percent increase in employment in the service sector. Much of the explanation for the rapid rise in labour productivity in agriculture since 1975 is to be found in this shift of labour²⁹. Structural change would also play a significant part in the increase in industrial productivity between 1974 and 1986³⁰.

III. SPAIN'S POSITION IN THE INTERNATIONAL ECONOMIC CONTEXT

Spain's long term growth appears similar to that of western nations (Table 4). At first glance, such a finding would lend support to the view that the roots of most of today's difference in living standards between Spain and other advanced countries should be searched for in the pre-1850 era. Things are more complex, however³¹. A closer look shows that long-run growth before 1950 was clearly lower than in the advanced countries, while the opposite was true for the second half of the twentieth century (Table 4, Panel A). Thus, Spain fell behind between 1850 and 1950. The second half of the nineteenth century witnessed sustained per capita GDP growth while paradoxically the gap with the industrialised countries widened over 1883-1913. Moreover, Spain did not catch up during the first half of the twentieth century. The progress made in the 1920s and the relatively mild impact of the 1930s crisis were more than outweighed by Spain's exclusion from the late 1930s recovery as a result of the Civil War. In the 1940s, despite being non-belligerent in World War II, she grew more slowly than the warring Western European nations. In the second half of the twentieth century, especially during the Golden Age, Spain outperformed the advanced nations improving her relative international position.

Nonetheless, to be properly assessed growth rates need to be related to the initial level of per capita GDP. Table 5 shows that at the begin-

²⁹ In the modified *shift-share analysis* method used here 4.7 percent (that is the difference between the growth of total employment and that of agricultural employment) of the 6.2 percent increase in agricultural labour productivity can be attributed to structural change.

³⁰ As explained in the case of agriculture in the previous note, using this calculation method, 2.2 percent of the 5 percent annual growth in industrial labour productivity would be caused by structural change (that is the difference between the growth rate for total employment and that for industrial employment). Between 1986 and 1992, this would represent 1.5 percent of a total of 2.7 percent.

³¹ A new assessment of pre-1850 Spain is provided by Álvarez-Nogal and Prados de la Escosura (2007).

TABLE 4
PER CAPITA GDP GROWTH IN SPAIN: AN INTERNATIONAL COMPARISON

	Spain	Advanced Europe	Continental Europe	U.K.	U.S.A.
1850-1998	1.8	1.7	1.7	1.4	1.8
1850-1950	0.7	1.2	1.2	1.1	1.7
1950-1998	4.0	2.7	2.8	2.1	2.2
1850-1913	1.0	1.3	1.3	1.2	1.7
1913-1950	0.2	1.2	1.3	0.9	1.6
1950-1974	5.4	3.6	3.7	2.3	2.3
1974-1998	2.5	1.8	1.8	1.9	2.1
1850-1883	1.4	1.2	1.2	1.4	1.8
1883-1913	0.6	1.4	1.4	1.0	1.6
1913-1920	0.8	-1.0	-1.0	-1.1	0.7
1920-1929	2.6	3.3	3.5	1.4	2.4
1929-1952	-0.3	0.9	0.9	0.9	1.3
1952-1958	3.5	3.5	3.6	2.0	0.5
1958-1974	5.9	3.7	3.9	2.5	2.7
1974-1986	1.8	1.9	1.9	1.8	2.1
1986-1998	3.3	0.8	0.8	0.7	0.8

Sources: Maddison (2001, 2003), except for Spain, Prados de la Escosura (2003).

* *Advanced Europe* (population weighted average): Germany, Austria, Belgium, Denmark, France, the Netherlands, U.K., Sweden, Italy, Finland, Norway, and Switzerland.

Continental Europe (unweighted): Advanced Europe, excluding the U.K.

ning of the Golden Age Spain's income per head was way below that of industrial nations. Thus, within a neoclassical growth framework although Spain reached western European pace of growth in the 1950s, a faster one could have been expected from her lower initial per capita income.

On the whole, Spain's relative position at the end of the twentieth century was worse than it had been in 1850 and hardly improved since the late nineteenth century. In the long run Spain exhibits a tendency to return to a stable position at around three quarters of Western European per capita income (and half that of the USA). In fact, after her relative position collapsing during the first two decades of Franco's dictatorship (1939-59) accelerated growth over 1960-75 allowed Spain to recover the international position she attained at the beginning of the twentieth century. After a worsening during the decade of «transition to democracy», a lively recovery led to much the same position in the late 1990s as at the time of Franco's death (1975). Does this mean that Spain's steady state is lower than that the advanced European nations? ³².

³² Since 2000 Spain has improved her position up to the relative level achieved by 1929.

TABLE 5
SPAIN'S RELATIVE LEVELS OF PER CAPITA GDP (%)
 (US Current Relative Prices)

	Advanced Europe*		Western Europe **	U.S.A.
	<i>8 countries</i>	<i>12 countries</i>	<i>14 countries</i>	
1850	91.0			64.2
1860	90.5			64.8
1870	75.8			56.0
1880	83.3	88.9	93.8	56.8
1890	79.4	85.1	89.9	56.8
1900	73.1	77.2	82.8	52.5
1913	72.3	75.9	80.8	51.1
1925	76.7	79.1	84.5	46.0
1929	75.1	77.6	82.9	46.2
1933	66.3	68.5	73.7	50.4
1938	46.4	47.8	51.3	33.8
1950	66.0	66.0	70.2	35.2
1955	64.9	64.8	69.0	36.4
1960	52.9	53.7	57.3	33.1
1965	60.9	61.7	65.8	42.1
1970	60.5	61.8	65.8	43.3
1975	71.1	72.0	76.7	57.3
1980	68.7	67.4	72.2	55.9
1985	68.6	67.6	72.1	48.1
1990	70.3	70.1	75.0	56.5
1996	71.7	70.3	74.3	54.7
1999	73.7	72.5	76.4	54.7

Sources: Prados de la Escosura (2000). 1850-1990; OECD (1999). 1996, 1999.

* *Advanced Europe:* 8 countries: Germany, Austria, Belgium, Denmark, France, the Netherlands, U.K., and Sweden, 12 countries: 8 countries plus, Italy, Finland, Norway, and Switzerland.

** *Western Europe:* 14 countries: 12 Advanced Europe's countries plus Greece and Portugal.

What did determine Spain's position relative to western European economies? In an attempt to provide an answer I have estimated a growth model for modern Europe in which per capita GDP growth is associated to the initial levels of (log of) per capita income and primary and secondary school enrolment (as proxies for initial physical and human capital endowment), the average investment ratio to GDP and the growth of population (as proxies for changes in the stock of physical capital and labour), resource allocation indicators (that include the shift of resources away from agriculture, proxied by the initial share of active population in agriculture and by the (log of) average ratio of agricultural to industrial output), and the change in openness (as measured by the rate of variation of the export share in GDP) (Prados de la Escosura 2007b). A time trend dummy was added to capture temporal changes in

the dependent variable not associated with variations in the independent variables (and to eliminate all variation between periods that makes the result correspond to that of a weighted cross section).

Additionally, I allowed for a boost to growth from post-war episodes of reconstruction (in the 1920s and 1950s) in an attempt to clarify the part of growth not easily explained by the conventional variables of the (basic and augmented) neo-classical model. The post-war to pre-war ratio of physical capital per person, and changes in the human to physical capital endowment ratio have been used in historical studies of European reconstruction (Crafts 1992, Dumke 1990). In the former case I approximated it with the post-war to pre-war income per head ratio (1920/1913 and 1950/1938) and its quadratic term to incorporate its diminishing impact on growth. For the latter, as no data on human and physical capital stocks were available for all countries in the sample I used schooling and investment flows as proxies. Lagged values of the independent variables have been used as instruments to take endogeneity into account. The regression results (Table 6) shows a good fit with only over one-fourth of the variance unexplained. A strong conditional convergence effect appears to exist as measured by the negative and high coefficient of the initial level of income (and shown by the speed of convergence), and the remaining coefficients present the expected relations, positive for accumulation and openness, and negative for tying resources to agriculture.

Per capita GDP growth for Spain can be predicted using equations alternatively representing the unconditional convergence, the basic and augmented (with human capital) Solow, and structural models, the latter incorporating resource allocation, openness, and a «reconstruction» effect (in the two alternative specifications described above) (Table 7). This way the intuitive interpretation of Spain's historical performance presented earlier in this paper can be tested.

The predicted rate of per capita GDP growth for Spain represents the «potential» growth within a European historical context under a common set of restrictions. The comparison of the different predictions for Spain resulting from alternative growth models deserves a few remarks. In the first place, with the exception of the Golden Age, the unconditional convergence forecasts a faster per capita growth (col. I) than the Solow model one (col. II), a finding that suggests that the rate of capital accumulation was lower in Spain than in the European case. Prior to 1920, weaker human capital accumulation also contributes to explain the systematically lower growth forecasted by the augmented Solow model (col. III) relative to the unconditional convergence one. The potential for growth that results from structural change is highlighted by the fact that the predictions of the models including resource allocation,

TABLE 6
DETERMINANTS OF GROWTH IN EUROPE, 1820-1990
(TSLS pool regression)

	(1)	(2)	(3)	(4)	(5)
Constant	0.0811 (5.490)	0.1030 (6.296)	0.1064 (6.156)	0.2630 (6.966)	0.2292 (5.141)
LY90	-0.0119 (-5.392)	-0.0157 (-6.597)	-0.0171 (-6.264)	-0.0353 (-7.694)	-0.0307 (-5.594)
SINVT		0.1158 (5.025)	0.1089 (4.233)	0.1074 (4.428)	0.1151 (4.856)
GPOP1		0.1252 (0.548)	0.1685 (0.365)	0.1330 (0.516)	0.0133 (0.042)
ESCOLAR			0.0038 (0.365)	-0.0036 (-0.387)	-0.0021 (-0.215)
AGLAB				-0.0263 (-1.605)	-0.0228 (-1.369)
LSPOI				-0.0075 (-2.825)	-0.0068 (-2.573)
GXB				0.0786 (2.241)	0.1067 (2.814)
TBIAS	0.0003 (8.944)	0.0002 (5.135)	0.0003 (4.831)	0.0003 (4.982)	0.0002 (3.241)
RCNSTRC				-0.0141 (-1.467)	
RCNSTRC2				0.1018 (2.364)	
HPK					0.0053 (2.330)
N° Obs.	163	127	108	89	85
R²	0.364	0.516	0.525	0.722	0.689
S.E. Regression	0.012	0.010	0.010	0.008	0.008
F-Statistic	47.455	34.628	24.615	23.874	21.688
Speed of Convergence	0.0127	0.0170	0.0187	0.0435	0.0359

Instruments: Lagged and initial values of regressors. (t statistics in brackets). **Dependent Variable:** Per Capita GDP growth rate (%) **Constant:** Constant term. **LY90:** Log of real per capita GDP at the beginning of each period, in 1990 US \$, PPP. **SINVT:** Ratio of gross domestic investment to GDP, calculated as ten-year averages. **GPOP1:** Rate of population of growth. **ESCOLAR:** Primary and secondary school enrolment as a ratio to population aged 5 to 19 at the beginning of each period. **AGLAB:** Labour force in agriculture as a ratio to total labour force at the beginning of each period. **LSPOI:** Index of production orientation (Log of Agricultural-Industrial output ratio), calculated as ten-year averages. **GXB:** Growth rate of exports ratio to GDP. **TBIAS:** Time trend. **RCNSTRC:** Dummy of reconstruction processes. For 1950-1960, it is the log of 1950/1938 per capita income ratio; for 1920- 1929, the log of 1920/1913 per capita income ratio; otherwise, takes zero value. **RCNSTRC2:** Square of RCNSTRC. **HPK:** Human Capital to Physical Capital Ratio, proxied by the Post-World War ESCOLAR/SINVT to the to Pre-World War ESCOLAR/SINVT ratio. For 1950-1960, it is the 1950/1938 ratio; for 1920, the 1920/1913 ratio; otherwise takes zero value

Source: Prados de la Escosura (2007b)

TABLE 7
PER CAPITA GDP GROWTH IN SPAIN: PREDICTED AND ACTUAL RATES (%)

	(I) Unconditional convergence	(II) Solow	(III) Augmented Solow	(IV) Structural (Include Reconstruction Effect)	(V) Structural (HPK ratio)	(VI) Actual growth
Panel A. Long-run trends						
1850-2000	2.7	2.4	3.0	3.4	2.7	1.8
1850-1952	2.4	1.9	2.3	2.7	2.1	0.9
1952-1974	3.7	4.2	5.1	6.4	5.3	5.2
1974-2000	3.1	2.7	3.8	3.7	3.0	2.6
Panel B. Long swings						
1850-1883	1.9	1.6	1.7	2.7	2.3	1.4
1883-1920	2.4	1.7	2.1	2.4	1.7	0.6
1920-1929	2.8	2.5	3.1	3.0	2.7	2.6
1929-1952	3.0	2.4	3.2	3.0	2.1	-0.3
1952-1958	3.5	3.8	4.7	4.5	3.0	3.5
1958-1974	3.6	4.0	4.9	6.6	5.7	5.9
1974-1986	2.9	2.6	3.6	3.3	2.6	1.8
1986-2000	3.0	2.5	3.6	3.6	2.9	3.3

Sources: Columns I-V computed with equations 1-5 from Table 6. Column VI, from Table 1.

openness, and a «reconstruction» effect are systematically above those of the unconditional convergence model for periods of accelerating growth such as 1850-83 and 1958-74³³. In fact, the growth differential in the predictions of the two structural models (cols. IV and V) is very revealing, with a lower growth rate cast by the structural model that uses the human capital to physical capital ratio as a proxy for the «reconstruction» effect (col. V). Human capital endowment appears to be the key and model V provides the best prediction of Spain's economic performance in the second half of the twentieth century. In Spain, (as opposed to German or Japanese experiences), the destruction of human capital was higher than that of physical capital during the Spanish Civil War and its repressive aftermath (the exile and, especially, the internal exile), and this fact helps explain the weaker performance of Spain's economy during the 1940s and the early Golden Age.

When the models' predicted growth are confronted with the actual rates, it clearly appears that Spain underperformed over the long run

³³ And, if the structural model presented in equation (4) (col. IV of Table 7) is employed, also for the 1920s, the 1950s, and 1974-2000.

mostly due to its sluggish growth in the hundred years up to 1950, more specifically in the periods 1883-1913 and 1929-1952. The Golden Age, especially, the period 1958-74, and the last one and a half decades of the twentieth century stand out as years of outstanding performance (with the 1920s just below it!). A closer look singles out 1866-73, 1964-74, and 1986-92 as cycles of overachievement. The *Restauración* (namely 1875-1923 but arbitrarily restricted here to 1883-1920), the 1930s and 1940s, and the transition to democracy after Franco's death (1975-85) stand out, in turn, as those phases responsible for Spain's poorer economic performance relative to western Europe ³⁴.

How much did structural change contribute to the model's predicted growth can be established, for example, by simulating *ceteris paribus* the impact of maintaining fixed either the sectoral resource allocation, the change in openness, or the rate of capital accumulation of, say, the previous period, on the rate of forecasted growth. Thus, it appears that without the moderate shift of resources away from agriculture that took place in the *Restauración* growth would have been slightly over three-fourths of the model's predicted rate. In the decade of «transition to democracy» (1976-85) it would have represented two-thirds of the forecasted growth (when the shift away from agriculture and non competitive industry is taken into account). Capital accumulation, in turn, mattered especially during the 1920s and 1950s and the counterfactual growth that would have been achieved with the investment rate of the previous period represents three-fourths and two-thirds, respectively, of the predicted per capita GDP growth. Finally, the increasing openness represented that, in 1958-74, the model's predicted growth practically doubled the counterfactual rate obtained by keeping constant the pace of openness that prevailed in the 1950s.

The change in the rate of forecasted growth between successive long swings can be decomposed, using equation (5) of Table 6, into the contributions of a catching-up effect (which includes the initial values of income and schooling, and the impact of 'reconstruction'), and those resulting from capital accumulation, population growth, sectoral resource allocation, and changes in the degree of openness (Table 8).

It appears that the deceleration during the *Restauración* (reduced to 1883-1920 here) resulted from a weakening of the catching-up effect and the closing of the economy that tended to offset the timid shift of resources away from agriculture. In the 1920s the increase in capital accumulation seems to have been the main element behind growth acceleration and, once again, the mild reallocation of resources was cancelled out by

³⁴ The evidence to substantiate the assertions in this paragraph and the last one comes from Prados de la Escosura (2003), pp. 168-182.

TABLE 8
DECOMPOSING CHANGES IN PREDICTED PER CAPITA GDP GROWTH

<i>Change in Predicted Growth Rate due to</i>						
	Catching-up Effect	Capital Accumulation	Population Growth	Resource Allocation	Openness Growth Rate	Predicted Growth
1883/1920-1850/1883	-0.8	0.1	0.0	0.3	-0.3	-0.6
1920/1929-1883/1920	0.3	0.6	0.0	0.4	-0.3	1.0
1929/1952-1920/1929	-0.9	0.0	0.0	0.1	0.2	-0.6
1952/1958-1929/1952	0.8	1.0	0.0	0.2	-1.1	1.0
1958/1974-1952/1958	-0.4	0.2	0.0	0.4	2.5	2.6
1974/1986-1958/1974	-3.0	-0.2	0.0	0.9	-0.9	-3.1
1986/2000-1974/1986	-0.4	0.1	0.0	0.4	0.2	0.3
<i>Percentage Change in Predicted Growth due to</i>						
	Catching-up Effect	Capital Accumulation	Population Growth	Resource Allocation	Openness Growth Rate	
1883/1920-1850/1883	124.7	-17.9	-0.3	-59.7	53.3	
1920/1929-1883/1920	27.6	65.1	0.6	38.9	-32.1	
1929/1952-1920/1929	154.7	-2.8	0.3	-14.1	-38.1	
1952/1958-1929/1952	82.1	105.4	0.0	24.2	-111.8	
1958/1974-1952/1958	-16.5	7.3	0.1	14.2	94.9	
1974/1986-1958/1974	95.2	4.7	0.1	-28.7	28.7	
1986/2000-1974/1986	-136.5	34.9	-2.5	129.9	74.2	

the lower exposition to international competition. During the 1950s, in turn, growth acceleration appears associated to increasing investment and to catching up after the isolation of the previous decades. Nonetheless, lack of openness, is suggested, still represented a brake on growth. It was during the decade and a half of accelerated growth that followed the Stabilization Plan (1958-74) when increasing openness was its main contributor. Spain's poor adjustment to international competition following the oil crises of the 1970s evidenced the delayed negative consequences of Francoist interventionism and protectionism. Shifts of resources away from agriculture and non competitive industry (that had grown under the protectionist umbrella) mitigated the slowdown of the decade of transition to democracy (to which the lack of openness contributed) and stimulated growth after Spain's admission in the European Community, to which increasing openness and capital accumulation also contributed. In any case, the results in Tables 7 and 8 provide more questions than answers and constitute an agenda for further research.

IV. CONCLUDING REMARKS

Over one and a half centuries, the level of economic activity increased forty times while income per person rose to 15 times its initial level. The distinction of three main phases: 1850-1950, 1951-1974 and 1975-2000 confirms the continuity of growth between 1850 and 1950, in contrast with the widespread view of a nineteenth century characterised by failure and a twentieth century of economic success.

Per capita GDP growth cannot be attributed exclusively to the Golden Age as there is evidence of significant growth during 1850-1883 and in the 1920s. Alternatively, 1883-1920, 1929-1952 and 1974-1986 represent phases of sluggish growth.

Spain underperformed over the long run mostly due to its sluggish growth in specific periods (1884-1913, 1930-52) of the hundred years up to 1950. Higher destruction of human capital than of physical capital during the Spanish Civil War and its aftermath help explain her performance during the 1940s and 1950s. Spain's economy has been catching up with advanced countries over the last fifty years in which 1959-74 stand out as a period of outstanding performance and the transition to democracy (1975-85) as the exception. Structural change appears to have contributed significantly to growth acceleration while lack of exposition to international competition represents a recurrent element of retardation.

APPENDIX

Statistical characteristics of the new GDP series

Whether a series is deterministic (trend stationary [TS]) or stochastic (difference stationary [DS]) which then requires transformation to become stationary, has important economic implications. While in the case of a trend stationary series an external shock will not affect its long run performance, merely setting in motion a cyclical episode before returning to the established trend, in the difference stationary case shocks lead to permanent consequences. That is, the past has a stronger influence on the present when the series are non stationary. From the point of view of growth theory such a distinction means that while the trend stationary GDP follows the neo-classical model, the difference stationary trend is closer to endogenous growth models (Crafts and Mills 1996, Ben-David, Lumsdaine and Papell 1996).

Nevertheless, faced with a long macroeconomic series which has a unit root i.e. a series which in principle is not stationary, the possibility that it may, actually, be a stationary series with one or several permanent changes of level or trend (Perron 1989, Campbell and Perron 1991) exists. This possibility is clearly closer to the idea of growth held by economic historians³⁵.

The first results of the conventional unit root tests indicate that GDP, in levels, displays non-stationary characteristics. The results of the augmented Dickey-Fuller test confirm that both the absolute and the per capita GDP series are DS (Table A.1), that is to say only the first differences are stationary. The GDP series would contain a unit root. This

TABLE A.1
UNIT ROOT TESTS

	Ln(Yt-1)	D(Yt-1)
GDP	-0.64 (1)	-9.99 (1)
Per Capita GDP	-0.46 (1)	-10.05 (1)

Note: Values for the t statistic that belongs to the coefficient of the lagged variable Yt-1 derived with the augmented Dickey-Fuller test $\Delta Y_t = \mu + \beta t + \gamma Y_{t-1} + \sum \delta_i \Delta Y_{t-j+1} + \varepsilon_t$

Figures in brackets correspond to the number of lags in the dependent variable required to eliminate autocorrelation. Critical significant values at 1, 5 y 10 percent are, respectively, -4,02, -3,44 and -3,14.

³⁵ Crafts and Mills (1996) add that, from a European perspective, discontinuities in the historical GDP series are highlighted.

indicates that the mean of the series varies depending on the period considered. Nevertheless, whether we are, in fact, dealing with stationary series which suffer changes of level or trend in the long term needs to be investigated. In order to check for structural changes it is necessary to establish the moment such a change would be expected. Once again, there are two alternative options: to assign a specific date for the structural change hypothesis or allow the structural break to be decided endogenously using recursive, sequential or other procedures. While econometricians and time series analysts usually prefer the second approach, historians tend to plump for the first ³⁶. The reason for this preference for a formally imperfect system is to be found in the fact that time series analysis provides a powerful tool which allows us to test historical hypotheses related to the existence of phases of growth ³⁷.

In order to confirm the existence of a segmented series the model which appears in Table A.2 has been tested, that includes dummy varia-

TABLE A.2
UNIT ROOT TESTS INCLUDING EXOGENOUS STRUCTURAL BREAKS
(dependent variable: ΔY_t)

variable	GDP		Per Capita GDP	
	coefficient	t statistic	coefficient	t statistic
constant	-7.7362	(-4.08) ^b	-5.6285	(-4.29) ^a
time	0.0057	(4.11) ^b	0.0042	(4.37) ^a
$\ln Y_{t-1}$	-0.3628	(-4.12) ^c	-0.4175	(-4.49) ^b
ΔY_{t-1}	0.2205	(2.99) ^a	0.2320	(3.30) ^a
DU_{1935}	-0.0867	(-2.82) ^b	-0.1323	(-3.54) ^a
DT_{1950}	0.0181	(4.10) ^b	0.0182	(4.49) ^a
DT_{1974}	-0.0131	(-4.35) ^a	-0.0116	(-4.59) ^a
R^2 adjusted	0.34		0.37	
Durbin-Watson	1.87		1.83	
F statistic	13.55		15.49	

Notes: The Augmented Dickey-Fuller that incorporates structural breaks implies a regression as

$$\Delta Y_t = \mu + \beta t + \alpha Y_{t-1} + \sum c_j \Delta Y_{t-j} + \theta DU_{it} + \gamma DT_{it} + \varepsilon_t$$

^a, ^b and ^c indicate significance levels at 1, 5 y 10 percent, respectively, as result from the critical values established after 1,500 Monte Carlo iterations.

³⁶ Cf. Zivot and Andrews (1992) and Ben-David, Lumsdaine and Papell (1996), for the consideration of *a priori* unknown breaks, while Perron (1989) and Crafts and Mills (1996), contrast previously defined breaks. Cubel and Palafox (1998) and, more recently, Pons and Tirado (2006) use the endogenous procedure to establish structural breaks in their historical studies of Spain.

³⁷ There is also a practical reason: a purely statistical approach to the series could mean establishing break points which in fact are caused simply by measurement errors.

bles in the trend (DT_i) and the level (DU_i) which take on the values $DT_i = (t - TB_i)$ and $DU_i = 1$, if $t \geq TB_i$, and 0, otherwise; where TB_i ($i = 1, 2$) is the specific time of the break. The structural breaks have been introduced exogenously and different alternatives have been chosen according to the conventional cut-off dates suggested by economic historians³⁸. The break dates accepted are those which maximize the value for the statistic t in the parameter corresponding to the lagged GDP variable. The statistical significance of the breaks compares favourably with the critical values obtained using a Monte Carlo simulation³⁹. The value of the statistic t for the lagged variable (Y_{t-1}) has significance levels of 10 and 5 percent for absolute GDP and GDP per capita respectively. It follows that as the lagged variable is significantly different from 0, the existence of a unit root in the presence of structural change can be rejected. The proposed structural breaks are all significant at 5 and 1 percent. The absolute and per capita GDP series are trend stationary with structural breaks in level (1936) and in trend (1951 and 1975)⁴⁰. The segmented trend of the economy is obtained using the regression equation featured in Table A.3. The growth rates for each of the main phases identified for Spain's economic progress were derived by adding cumulatively the parameters of each dummy variable indicating a break in trend (DT_{it}) to the parameter of the time variable. The change in level (DU_{it}) caused by the Civil War influences these values.

TABLE A.3
TREND GROWTH REGRESSION, 1850-2000
(dependent variable: $\ln Y_t$)

variable	GDP		Per Capita GDP	
	coefficient	t statistic	coefficient	t statistic
constant	-21.0503	-43.04	-13.4825	-33.65
time	0.0155	59.84	0.0100	47.21
DU_{1936}	-0.2338	-11.42	-0.3163	-19.53
DT_{1951}	0.0480	62.65	0.0423	58.34
DT_{1975}	-0.0319	-26.62	-0.0252	-20.81
R^2 adjusted	0.997		0.995	
F statistic	12392		7024	

³⁸ The dates for which structural breaks (TB_i) have been investigated are: 1866-68, 1871-73, 1883-85, 1891-92, 1898-1900, 1913-14, 1919-20, 1929-30, 1935, 1940, 1950-51, 1960-61, 1973-75, 1985-86, 1991-92.

³⁹ I Thank Isabel Sanz for her help with these Monte Carlo experiments.

⁴⁰ Pons and Tirado (2006) find structural breaks in 1935, 1940 and 1960

Procedures and Sources for Table 6

Econometric Procedures

Growth of income per head is determined by a distinctive set of economic variables:

$$GY = g_1[\alpha, C_{it}] + g_2[\beta, A_{it}] + g_3[\gamma, R_{it}] + g_4[\mu_i, V_{it}]$$

where α , β and γ are vectors of time and cross-country invariant parameters; C_{it} is the set of variables representing catching up or conditional convergence, that is, the initial levels of income and schooling; A_{it} is a set of variables which represents the accumulation process, i.e., the ratio of investment to GDP and population growth; and R_{it} is a set of variables representing resource allocation processes. Finally, μ_i is a time invariant, but cross-country variant, vector of parameters, and V_{it} represents a set of explanatory variables, including a stochastic disturbance (which incorporates policy, institutions, political instability and so on).

The aim of our econometric exercise is to find empirical regularities in economic growth for our set of European countries. Thus, according to our specification, the rate of growth of income per head is determined by a set of economic variables accounting for conditional convergence, accumulation and resource allocation, and a residual that incorporates institutional change. Behind the equation lies, nevertheless, a reduced form of a non-specified growth model. This approach raises theoretical problems, as regards the interpretation of the parameters. Table 6 reports regression results for the growth rate of real per capita GDP. The same econometric specification has been estimated for all the countries in the sample. Equations 1 to 3 show equations in which the growth rate of GDP per capita, as the dependent variable, is regressed on the initial levels of (log of) income (LY90) and primary and secondary school enrolment (ESCOLAR), as a proxy to human capital, the ratio of gross domestic investment to GDP, which enters into the regressions as a decade average (in order to represent the steady-state level of investment) (SINVT). Finally, a time trend dummy was included to capture temporal changes in the dependent variable not associated with variation in the independent variable (TBIAS). Lagged and initial values of the explanatory variables have been used as instruments.

Resource allocation indicators are added in Equations 4 and 5 to take into account the shift of resources away from agriculture, and they are proxied by the initial share of labour force in agriculture (AGLAB) and the average ratio of agricultural to industrial output (LSPOI). Moreover, openness has been measured by the growth rate of the exports ratio to GDP (GXB). Finally, I allowed for a boost to growth from post-war episodes of reconstruction, the 1920's and 1950's, using alternatively, as pro-

xies, the post-war / pre-war per capita income ratio (i.e., 1920/1913 income ratio for the 1920s and 1950/1938 income ratio for the 1950s) (RCNSTRC), and its quadratic term (RCNSTRC2) to incorporate its diminishing impact on growth (Equation 4), and, then, a human to physical capital ratio (HPK), proxied by the post-war to the pre-war (ESCOLAR / SINVT) ratio. Thus, for the 1950s, it is the 1950/1938 ratio, and for the 1920s, the 1920/1913 ratio, otherwise takes zero value.

The estimated coefficient of the initial level of per capita real GDP is negative, meaning that countries with a lower starting GDP per head grow faster. When we accept that countries have different steady-state equilibrium, convergence accelerates. Thus, the magnitude of the implicit speed of convergence implied by equations (1) to (3) is slightly below the usual 2 percent, but when structural change indicators are included in equations (4) and (5), the speed of convergence is higher. Fixed effects, correlated with the initial level of income, seem to be captured by the structural indicators and this accounts for the large differential in the speed of convergence between equations (1) to (3) and (4) and (5).

The remaining coefficients show the expected relations, positive for accumulation and openness, and negative for tying up resources to agriculture. For the coefficient of LSPOI, it suggests that countries with a high agricultural-industrial output ratio tend to grow more slowly. A surprising finding is the coefficient of AGLAB, since it suggests that a large initial share of labour force in agriculture reduces the growth rate, when just the opposite would be expected, i.e., countries with a large agricultural sector in the initial period would have more opportunities to grow faster by shifting labour towards the industrial sector. The reconstruction dummies suggest that reconstruction processes had a positive effect on growth.

As regards the lack of statistical significance of the human capital proxy, two possible explanations can be suggested: that it is a flow variable and, hence, captures poorly a stock variable. Unfortunately years of education are lacking for such a long time span. The alternative, the literacy rate, loses its meaning as a human capital measure as we approach the present and all countries become literate. Another explanation could be that human capital is somehow (inversely) captured by AGLAB, as the higher the share of labour in agriculture, one can presume, the lower the endowment of human capital. This would, then, explain the negative sign of AGLAB

Sources

GDP per head (LY90): For each country, levels of Gross Domestic Product per capita expressed in 1990 Geary-Khamis dollars adjusted for purchasing power (OECD, National Accounts, 1960-1990. Main Aggregates. Paris: OECD 1992, vol. 1) have been projected backwards

with volume series derived from historical national accounts. Data derive from the sources listed below. Otherwise they come from Maddison, World Economy.

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