Gerschenkron Revisited: European Patterns of Development in Historical Perspective[*]

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Abstract

Patterns of development that associate structural change to variations in GDP per head and population, are constructed along the lines of Chenery & Syrquin (1975) pathbreaking work, to test whether a common set of development processes was observable for the whole of Europe. Europe provides a suitable scenario for testing regularities of growth since all countries share a common set of institutions, policies, and resource endowments. These development patterns help us to investigate the extent to which the differential behaviour in accumulation, resource allocation, and demographic transition are behind the distinctive, retarded performance of Peripheral countries. Our results confirm most of Gerschenkron's (1962) perceptions of the different nature of development among late-comers.

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The search for an optimal path of development, usually associated to the German Historical School, goes back to the Classical economists and can be traced back to the philosophers of the Enlightenment[1]. A stage approach to historical development was suggested by Adam Smith, and Karl Marx quoted twice Horace's verses to emphasise the extent to which Britain's industrialising experience forecasted the future of Germany, by then, a late comer[2]. In the post-World War II years economists became once more interested in long-term growth and turned to history searching for a laboratory of natural experiments[3]. Stylised facts, short-cuts towards the optimal path of development were explored during the Golden Age (1950-73) by a generation of applied, historically minded economists.[4] One of their achievements was the construction of patterns of development that rely on theoretical findings but lack an *a priori* model and, in the Clark/Kuznets tradition, are rooted in stylised facts.[5] It is here, where economic theorising does not provide an explanation that the contribution of economic history is more needed.

Modern Europe provides a sound basis for testing empirical regularities of growth as it offers a consistent and homogeneous set of countries which, to some extent, have shared resource endowments, institutions, and economic policies. Nonetheless, the map of Europe over the last two centuries shows, as Gerschenkron (1962: 353) expressively put it, "a motley picture of countries varying with regard to the degree of their backwardness" and these initial differences have been "of crucial significance for the nature of subsequent development" as economic structure, institutions, and ideologies all vary directly with them.[6]

In this paper it is my purpose to put the existence of a common path of development in modern Europe to the test with the help of the stylised patterns of structural change designed by Chenery and Syrquin (1975). However, Gerschenkron's (1962) emphasis on the fact that countries which had a late start would follow a different path of development with respect to early starters will be taken on board. The

1 Cf. O'Brien (1975); Meier and Baldwin (1957), Schumpeter (1954).
2 Smith (1776); Marx (1867). Marx (1867, I, preface) writes, "the industrially more developed country presents to the less developed country a picture of the latter's future".
3 Cf. McCloskey (1981).
4 Clark (1940), Lewis (1954), Solow (1956, 1957), Gerschenkron (1962), Kuznets (1956/67, 1966, 1971), Chenery (1960, 1968, 1975), Rostow (1960), Denison (1962, 1967), pioneered a positive approach to the determinants of economic development.
5 That is, "income-related changes for which the available evidence suggests considerable uniformity but for which there is yet no well defined body of theory" (Chenery and Syrquin, 1975: 6).
6 We cannot presume, therefore, that European nations went throughout similar stages of development á la Rostow (1960). Cf. the path breaking work of Patrick O'Brien and Çaglar Keyder (1978).

divergence between early starters and late comers originates in their structure of production, that results, in turn, from different institutions that substituted for the missing pre-requisites of the first wave of industrialization.[7] The existence of distinctive development patterns for different epochs in Modern European history, such as the liberal era prior to World War I, the neo-mercantilist Interwar Years, and the post-World War II return to liberalism, will be, therefore, investigated, and by widening the scope of the paper to include both the nineteenth and the twentieth century Gerschenkron's qualifications about the distinctive paths of development followed by early starters and latecomers will be revisited.[8] It is worth stressing that the historical approach in a relatively homogenous region, such as Europe, that combines cross-section and time series data provides a superior choice to the usual cross-section analysis for the recent past, in which low income countries are associated to early phases of development regardless (over-time and cross-country) differences in preferences and tastes.[9]

A Chenery and Syrquin Approach to European Development Patterns

Modern economic development is seen as an identifiable process of growth and change whose main features are the same across countries (Solow, 1977: 491)[10] and can be defined as "an interrelated set of long-run processes of structural transformation that accompany growth" (Syrquin, 1988: 205).[11] A structural transformation consists of a set of changes in the composition of demand, production, trade, and employment, each reflecting different aspects of shifts in resource allocation that takes place as income levels rise. Thus, a development pattern may be defined as any systematic variation in the economic and social structure associated to a rising level of per capita income. Structural changes interact with the pattern of productivity growth in a general equilibrium system to determine the rate and pace of growth (Syrquin, 1986a: 436-37).

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7 As Chenery (1975: 458) pointed, "late comers are different.. [the difference] stems from the existence of the advanced countries as a source of technology, capital and manufactured imports, as well as markets for exports".

8 The paper follows the lead established two decades ago by Irma Adelman and Cynthia Taft Morris (1984) and Nick Crafts (1984) to cover earlier epochs than the statistically convenient late twentieth century world, usually neglected by development economists. Crafts (1984: 449) already perceived in Nineteenth Century Europe Gerschenkronian "tendencies towards a different kind of structural change in the later developing countries".

9 Cf. Branson, Guerrero, and Gunter (1998) for the latest substantive addition to this literature.

10 The rationale for this approach, as exposed by Kuznets (1959: 170), "is conditioned on the existence of common, transnational factors, and a mechanism of interaction among nations that will produce some systematic order in the way modern economic growth can be expected to spread around the world".

11 A more comprehensive definition of economic development has been put forward by Adelman and Morris (1984: 46), as "the process of institutional transformation by which structural change is achieved and gains and losses are distributed".

In the patterns of development framework, each country is treated as an integrated, interdependent component of the international economy. Such an assumption is only acceptable in Modern Europe after 1846 when, after the repeal of the Corn Laws, the basis of the liberal international order was established. By then, however, more than three centuries of mercantilism, warfare and experience with internal and imperial markets had placed the countries of Europe at rather diverse levels of development.

The patterns of development approach has been subjected to systematic criticism[12]. It has been argued that Chenery-Syrquin equations derive from an unspecified model of development in which we cannot tell supply from demand determinants. Moreover, development patterns do not reveal a unique path to industrialisation since comparative advantage, policy and institutions matter. A country's trade and production patterns, as Bhagwati (1977: 491) reminded us, are "the result of an interaction between the country's own endowments and demands and the rest-of-the-world's endowments and demands", a fact apparently not accounted for in the Chenery patterns. The challenge, therefore, would be, instead, to assess "the ability of an economy to reach its full potential, that is, to come close to optimal growth" (Williamson, 1986). Another line of criticism relates to the econometric approach as causality may run in either direction: from the level of per capita income to the structural variable or vice-versa (Branson et al., 1998).

In the development patterns, however, there is no implication that a single, unique path, through which all economies have to pass, have to exist. On the contrary, Chenery and his associates were always aware that, by treating development within a uniform framework, systematic differences in development patterns among nations would be identified.[13] In fact, they distinguish between two components of a country's pattern of development: the normal effect of universal factors (that accounts for most of the observed structural variation among countries) and the effects of a country's individual history (that can be more readily evaluated after allowing for the uniform elements in each development pattern) (Chenery and Syrquin (1975: 5).

Nonetheless, the only feasible way to approach historical reality, as Gerschenkron (1962) wrote, is through the search for certain regularities or uniformities, and the analysis of deviations to the norm. Since development occurs with

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12 Cf. for instance, Díaz Alejandro (1976) and Perkins (1981). Williamson (1986) wrote, "in uncritical moments we tend to gauge an economy's performance by its ability to replicate or even exceed those stylized patterns".

13 As Chenery (1988:60) put it, "the search for uniform features of development almost inevitably leads to a division of countries into more homogeneous groups".

sufficient uniformity among countries to produce a consistent pattern of change in resource allocation, factor use, and other structural features as the level of *per capita* income rises, a set of basic processes only restricted by the lack of empirical evidence has been selected[14]. All variables are expressed as shares (of GDP, total employment, etc.) since it is the relative variation which determines structural change. Shares are calculated at nominal prices since the decisions of individuals and firms are more meaningfully analysed at current, rather than at constant, prices. The development processes studied can be divided into three main categories: a) **accumulation**, that deals with the resources used to increase an economy's productive capacity, for which we have gathered information on stocks (literacy) and on increases in stocks (gross domestic investment and school enrolment); b) **resource allocation**, which interacting with accumulation, produces systematic changes in the composition of domestic demand, foreign trade, production, and employment, as real product per head rises[15] ; c) **demographic transition**. Here they are summarized:

1. Domestic Demand (percentage of GDP): gross domestic investment, private consumption, and government consumption.
2. Education: primary and secondary school enrolment (percentage of population aged 5 to 19) and literacy (percentage of population over 7 years old).
3. Output Structure (percentage of GDP): value added in agriculture, industry (including mining, construction and utilities), and services.
4. Labour Allocation (percentage of total labour force): labour force in agriculture, industry, and services.
5. Foreign Trade (percentage of GDP): exports, imports, openness (exports plus imports), primary exports, manufactured exports.
6. Urbanization (percentage of population in towns over 20,000 inhabitants).
7. Demographic transition: crude birth and death rates (per thousand inhabitants), gross fertility (children per woman), infant mortality (per thousand births), net fertility[16].

Data on structural change across Europe derives mostly from national sources, in particular, from reconstructed national accounts (see Appendix A). A major feature of the data set is that non-market economies have been excluded given the conceptual and data problems involved (different economic categories, low reliability, and, especially, a different set of incentives for economic agents).

[14] Chenery and Syrquin (1975: 11). In a next version of the paper additional structural variables (financial, monetary, and social) will be added.
[15] As Chenery and Syrquin (1975: 33) put it, "theses patterns result from the interaction between the demand effects of rising income and the supply effect of changes in factor proportions and technology".
[16] Net fertility = (1 - infant mortality rate) * gross fertility.

GDP per head is expressed here in 1990 U.S. dollars (converted at the Geary-Khamis purchasing power parity) and countries' series have been built by projecting backwards 1990 levels (calculated at international prices) with each country growth rates (estimated at national prices) and, regrettably, the resulting series suffer from a serious index number problem since their economic meaning weakens as we move away from the 1990 benchmark (Prados de la Escosura, 2000).[17]

Methodology

In this section the econometric methods used for the construction of patterns of development are exposed. We start from the method designed by Chenery and Syrquin (1975), and since the statistical procedure has to be applied to a wide range of structural processes and countries, the scope for a more refined econometric specification is constrained by the availability of data.[18]

In addition to confirming the existence of patterns of development common to modern Europe, a major goal of this essay is to separate the effects of universal factors, common to all countries, from particular characteristics of each one, in order to highlight national deviations from the European patterns of development. I, therefore, assume that any indicator of structural change, $\mathbf{I_{it}}$, for **i**=country, and **t**=time period, can be divided into two different parts:

$$\mathbf{I}_{it} = \mathbf{f}_1\left[a, \mathbf{U}_{it}\right] + \mathbf{f}_2\left[b_i, \mathbf{V}_{it}\right] \qquad (1)$$

where, a is a $\mathbf{k} * \mathbf{1}$ vector of time and cross-country invariant parameters; $\mathbf{U_{it}}$ is a vector of explanatory variables representing the level of development, market size, economies of scale, etc. in country **i** at period **t**; b_i is a time invariant but cross-country variant vector of parameters; and $\mathbf{V_{it}}$ represents a set of explanatory variables, including a stochastic disturbance (which incorporates war, political unification, etc.). $\mathbf{U_{it}}$ includes the explanatory variables in Chenery and Syrquin (1975), to which others for country size and a time-trend component have been added:

$$\mathbf{U'_{it}} = [c, LnY_{it}, (LnY_{it})^2, LnN_{it}, (LnN_{it})^2, INFL_{it}, LnSize_i, TREND_t] \qquad (2)$$

where **c** is a constant term; $\mathbf{Y_{it}}$, real income per head; $\mathbf{N_{it}}$, population; $\mathbf{INFL_{it}}$, net imports as a share of GDP; $\mathbf{Size_i}$, country **i**'s extension in square kilometres; $\mathbf{TREND_t}$, time trend dummy.

[17] In a next version, patterns constructed with deflated current GDP values (expressed in purchasing power parities) will be alternatively used.

[18] Branson et al. (1998) faced the same constraint for the last quarter of the twentieth century.

Under these conditions, $\mathbf{f_1(}\alpha\mathbf{,U_{it})}$ will be the part of the structural variable $\mathbf{I_{it}}$ that can be explained by the pattern of development common to all countries, while the divergence of country **i** from the pattern will be $\mathbf{f_2(}\beta_i\mathbf{,V_{it})}$. Then, assuming that α exists amounts to accepting that a common pattern does exist. Next the necessary assumptions to estimate the patterns of development properly have to be established. I have preferred the semi-log to the double-log formulation in order to retain the additive property for the different components of aggregates (i.e., sectoral shares of output must add to 100). In addition, it will be assumed that $\mathbf{f_1(}\alpha\mathbf{,U_{it})} = \alpha\mathbf{*U_{it}}$. Under these conditions, we have:

$$\mathbf{I_{it}} = \alpha_0 + \alpha_1\mathbf{*\,LnY_{it}} + \alpha_2\mathbf{*\,LnY_{it}^2} + \alpha_3\mathbf{*\,LnN_{it}} + \alpha_4\mathbf{*\,LnN_{it}^2} + \alpha_5\mathbf{*\,INFL_{it}} + \alpha_6\mathbf{*\,LnSIZE_i} + \alpha_6\mathbf{*\,LnTREND_i} + \mathbf{f_2}\,(\beta_i, \mathbf{V_{it}}) \qquad (3)$$

Following Chenery and Syrquin (1975), income per head works as an overall index of development and as a measure of output. Population represents the market size and captures the effect of economies of scale and transport costs on patterns of production and trade. These effects are independent of the income level, since no correlation is expected between market size and level. In addition, quadratic terms are included to allow for non-linearities. In our sample, each country's population size changes substantially as our time coverage is of one and a half centuries, and a new country-size variable that represents the surface of the country helps to control for it, while it works at the same time as a country-dummy. The time-trend variable should capture universal changes over time not associated with the other independent variables (e.g., institutions, policies, etc.) that affect all countries alike. The time-trend dummy eliminates all variation between time periods so that the original panel data sample can easily be treated like a simple pool of cross-section data, as regards the econometric approach.

The target now will be to estimate the $[\alpha_0, \alpha_1, \alpha_2, \ldots \alpha_7]$ vector. For this estimate to be consistent, I will assume that there is no correlation between variables included in $\mathbf{U_{it}}$ and $\mathbf{V_{it}}$. This is a very strong assumption that may not be true in practice and, therefore, one must be very cautious when interpreting the econometric results.[19] If such an assumption holds true, I will be able to isolate additively and

[19] To avoid this problem, it could have been assumed that $V_{it} = V_i$, " t and $f_2(\beta_i, V_i) = \beta_i' * V_i$. This linear specification would permit to eliminate the term $f_2(\beta_i, V_i)$ taking deviations with respect to the mean in the time-varying dimension (within-group estimator). But, in that case, I would also get rid of α_0. This would not be present a major problem if I were sure that α_0 is really a constant because, in such a case several estimation techniques could be used consistently. However, it is easy to guess that α_0 will present several structural changes in its long time-varying dimension, and testing this hypothesis is another goal of this

consistently the part of the structural variable that can be explained by a common pattern of development, and obtain $\mathbf{f_2(b_i, V_{it})}$ as a residual that measures the particular divergence of each country's structural indicator from the pattern.

The formulation described so far is what I will call the single pattern because the time-varying regressors are supposed to have homogeneous effects on each structural variable over the whole time span. A second and more historically relevant approach has been introduced to test and, in its case, to detect the existence of structural changes in the constant term and in the slopes of **LnY** and **LnN** in different sub-periods of our sample. This method allows us to go beyond the time-trend dummy that stands for an exogenous uniform shift but is unable to discriminate among periods (Chenery and Syrquin, 1975: 154). The outcome is the adjusted pattern. Three historical periods were chosen to test structural breaks: the period prior to World War I, the Interwar years, 1920-1938, and the post-World War II period up to 1990.[20] To allow for different possibilities of structural change over these historical periods, dummy variables are defined in Table 1.

Regression Analysis

The econometric results for both single and adjusted patterns, presented in Appendix B, deserve some comments. The main finding is that existence of patterns of development common to modern European countries appears to be confirmed. Adjusted R squared and statistical tests indicate so. If accumulation and resource allocation processes are examined we can find, for example, that as regards the composition of demand, both coefficients of income and population present the expected sign, as income is negatively related to consumption (total and private) and positively to domestic investment, while the opposite occurs to population. Size and trend dummies also correlate positively to investment and negatively to consumption (only to private consumption for the time trend). Larger countries appear to invest more at given levels of income and investment rates increase as time goes by, regardless of income (while the opposite happens to private consumption). In the adjusted patterns, a dummy variable for the slope of **LnY** in different periods allow us to locate structural breaks,

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essay. For such a reason, I finally decided to assume the lack of correlation between U_{it} and V_{it}, and to go on with the initial specification.

[20] The choice of 1990 as the end year in this investigation is due to the fact that the demise of communism in Europe changed borders and was followed by a transition to the market in central and eastern European countries that have not been taken on board while they were command economies and accumulation and resource allocation were not ruled by market forces. Thus, this paper cover the late nineteenth century (1850-1913) and, to use Hobsbawn's expression, 'the short' twentieth century (1914-1990).

from which emerges that, for investment, as it could be expected, the estimated coefficient of income reached the highest value in the post-World War II era, and the lowest in the interwar years. The same happens (but with a negative sign) to private consumption, with larger absolute values for the post-1950 period, and a positive coefficient for the interwar years.

The supply side offers the expected correlation between income and population on the one hand, and agricultural shares in output and employment on the other, i.e., negative for income and positive for population, while a positive one appears for industry shares in output and employment with respect to income[21]. When the estimated coefficient on the quadratic term shows an opposite sign to that of the linear term, it means that the relation between structural change and income level attenuates as GDP per head rises. The time-trend and size dummies show a positive sign for agricultural shares in output and employment, independently from the level of income (while the opposite is observed for industry). In the case of agriculture, the estimated coefficient for income, negative, is higher in absolute terms for the period prior to World War I (as the adjusted coefficients reveal).

Urbanization, as expected, is positively related to income and population and also to net imports (a proxy for capital inflow), while is negatively correlated to the country's size. Human capital indicators (school enrolment and literacy) consistently show positive correlations with income and negative ones to population and size. The time trend appears to be positive for primary and secondary schooling although the income coefficient was higher before World War I.

The demographic transition shows the expected negative relation to income for birth and death (including infant mortality). For the adjusted pattern, fertility (both gross and net) is positively related to income. Such a result suggests that findings for the post-1960 world, i.e., a negative relation between net fertility and income (Barro (1991:422)), cannot be simply extrapolated to earlier periods in which economic development helped to reduce infant mortality and, therefore, increased net fertility. A clear negative time trend appears for all demographic indicators.

Finally, foreign trade indicators unanimously show a positive relation to income (with larger estimated coefficients as time goes by), and a negative one to population and size, as well as a negative time trend. The exception is the positive link between

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[21] When quadratic terms exist, the resulting overall value has been obtained by weighting coefficients for quadratic and non quadratic terms with income values ranging from 1,000 to 15,000 US dollars at 1990 prices (PPP). Not clear relationship appears for population and industry shares in output and employment (positive for the single pattern, negative for the adjusted pattern). For services shares, there is a negative correlation for population, while for income it is only negative for the single pattern.

population and manufacturing exports that might suggest a Linder's (1961) scenario of representative demand, in which producing industrial goods for home consumption appears as a pre-requisite for exporting them.

Normal Structural Variation with the Level of Development.

Table 2 presents the structural transformation that occurs as real GDP per head grows. Simulations are provided for all development processes within an income range from 1,000 to 12,000 dollars (at 1990 'international' prices (PPP)), when most of the transition from a pre-industrial to a modern society occurs. Three development processes are considered, i.e., accumulation, resource allocation, and demographic transition. Together with the normal structural change associated to a rise in GDP per head, growth elasticities have been computed for given levels of per capita income and its changes (Table 3).

Most development processes were half-completed at early stages of development, somewhere in between 3,000 and 4,000 dollars, and four-fifths of the transformation had occurred by a 8,000 dollar income[22]. The implication is that growth in post-World War II Europe, the period from where most economic theorists derived their stylised facts, is weakly related to resource allocation[23].

In the accumulation process, proxies for physical and human capital have been considered. Information on GDP expenditure components permitted to derive net imports of goods and services as a residual which, in turn, proxied capital net inflow, and, as a result, to derive the rate of national saving (expressed as a share of GDP). The comparison between investment and saving suggests a life-cycle behaviour, in which domestic saving is lower than investment demand at initial levels of the transition, with the gap closing as income rises. In both cases, the share of GDP increases as income rises, multiplying over the total income range considered by a ratio of 3.5 in the case of saving (2.4 times up to $4,000, the mid-transition point), and by 2.8 in the case of investment (2.0 up to $4,000), that is, representing a gain of 16.3 percentage points for saving, and 14.7 for investment (9.1 and 8.2 by $4,000, when half the transition was completed). Proximate indices for human capital also show large increases, multiplying by 2 over the transition (1.6 by half of it), that is, up to 52.5 percentage points for literacy, and 33.8 for schooling, (29.3 and 18.8 up to $4,000).

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[22] Pro-memoria: A *per capita* income of $4,000 was reached by the U.K. in the 1890s, and by France in the mid-1920's; a level of $8,000 was reached by the UK or Germany in the early 1960s; and $12,000 was the income of France and Germany in the early 1970s (Maddison, 2003).

[23] Such an empirical fact reinforced perhaps the neoclassical assumption that adjustments within the economy were immediate and frictionless.

Associated to growth, there are structural shifts in the allocation of resources. Resource allocation interacts with factor endowments, economic policies and productivity growth to condition the path of development. We can analyse demand and supply changes separately. Overall consumption fell by 20 per cent throughout the transition (10 per cent when half of it was achieved), that is, declining from over 90 per cent of aggregate demand to around three-fourths. Trends in private and government consumption followed, however, opposite directions, while the former fell by 31 per cent, the latter rose by 188 per cent (-17 and 105 per cent, respectively, over the first half of the transition). In percentage points, the variations represent 27.3 percentage points of decline for private and 10.9 of rise for public consumption (-15.2 and 6.1 by half the transition).

On the supply side, a decline occurs in agriculture's shares in output and employment, while, for industry and services, there is an increase. It is worth mentioning that absolute increases are more noticeably in the shares of services (28.8 and 38.7 percentage points gained for output and employment, respectively, over the transition) than for industry (12.1 and 17.1, respectively), in particular, at higher income levels (over $4,000). Agriculture's supremacy in output and employment disappears by $3,000, and $4,000, respectively. Interestingly enough, the proportional change implied by the transition differs from output to employment. It means that relative (average) labour productivity (that is, the ratio of each sector's share in output to that in employment) differs across sectors and, consequently, that efficiency improvements in the use of labour do not proceed at the same pace across sectors. In agriculture, a sharper decline can be noticed for its output's share (-41.1 percentage points) than for its employment's share (-55.8) (where a relative and, then, an absolute decline is experienced), which explains why the productivity gap widens as income rises. The lagged shift of labour out of agriculture due to low mobility of the workforce, as it is the case when surplus labour in agriculture exists, contributes to explaining the productivity gap. Besides, partial productivity differences appear in most industrialization experiences as investment and technological change occur more often in modern industry and services[24]. Had all sectors the same production function, average labour productivity would equalise across them, provided the same factor prices and a complete resource mobility for all (Chenery, 1988: 256). Data constraints, however, do not allow me to address differentials in marginal productivity. A caveat to be made about relative labour productivity derives from the weakness of statistical data for

[24] Cf. Chenery and Syrquin (1975: 48).

employment in agriculture. In fact, at lower income levels, when the division of labour is not widely diffused yet, figures for economically active population in agriculture (the main historical source for employment) tend to be over-exaggerated, as part-time labourers in industry and services tend to register under their main professions, e.g., farmers and, hence, figures for industry and services understated[25].

The share of population living in towns over 20,000 inhabitants is the arbitrary threshold used here to assess the degree of urbanization. A rapid increase in urbanization takes place as income rises. A multiplier of 3.9 applies for the entire transition (2.6 for half of it), representing a 36 percentage point rise (20 up to $4,000). Besides, a decline in the proportion of agricultural labour within rural population (measured as the ratio of the agricultural share in total employment to the rural share in total population) occurs as GDP per head improves, suggesting that people living in the countryside tends to work increasingly outside agriculture as economic growth proceeds (from three quarters to one-fifth over the transition).

Development patterns for international trade help us to search for the sources of a country's comparative advantage and its changes as income grows. Historically, natural resource endowments, factor proportions, and economic policies have conditioned trade specialisation. Examination of trade patterns shows a close link between the rise in GDP per head and that in trade ratio to GDP (33.7 percentage point gain for openness, that is, exports plus imports), though the gain of imports exceeds that of exports. A possible explanation for the latter would be that as income grows, a commodity trade deficit appears, that has to be balanced either by a surplus in services trade (as in nineteenth century Century Britain (Imlah, 1958) or by an inflow of capital (Spain in the 1860s-1880s (Prados de la Escosura, 2005)). Changes in comparative advantage from primary production to manufacturing are revealed by the composition of exports as income grows. Manufactured exports overcome those of primary goods around $4,000 of income. Meanwhile, industry's share in GDP becomes larger than agriculture's at $3,000. Such a lag suggests that, in Europe, the emergence of a domestic market for industrial goods is previous to that of foreign markets.

Finally, the demographic transition suggests a decline in both natality and mortality, in which the former experienced a deeper absolute fall, with the result of a slowing down in the rate of natural increase (by 6.6 percentage points), as income per

[25] Cf. O'Brien and Prados de la Escosura (1992). Adjustment for actual days worked would further reduce the size of labour force in agriculture. Cf. Prados de la Escosura and Rosés (2005) for an exploration of the Spanish case.

head improves. Meanwhile, a decline in gross fertility is softened in net terms by the more rapid reduction in infant mortality.

So far only tendencies have been pointed out. Table 3 provides a more precise measurement of the responsiveness of structural transformation to changes in GDP per head for each development process. Elasticities have been computed both at a given level of per capita income (point estimates) and for income changes (discrete estimates), covering most of the transition from a pre-industrial into a modern economy. It appears that, in both estimates, the lower the income level, the higher the value of the coefficient for growth elasticity, with the exception of those cases in which a negative relationship exists, where the opposite occurs. Differences in the structural response to increases in income are worth noticing. Both measures of (absolute) elasticities are higher, at low income levels, for investment and government consumption, the share of services in total employment and urbanization and manufactured exports, while the opposite occurs for agriculture's shares in output and employment, fertility (gross and net), infant mortality and crude birth and death rates.

Early Starters and Latecomers

Up to this point, the discussion has been carried out on the basis of development patterns common to Modern Europe over one and a half centuries. However, when such a large time span is being considered, distinctive structural behaviour at different historical periods should be expected. The adjusted patterns of development allow for historical differences in performance between early starters and late comers as suggested by Gerschenkron and, as a result, patterns can derived for late nineteenth and early twentieth century Europe. A similar approach to the one used in the construction of average single patterns has been followed. Table 4 presents the patterns, while growth elasticities appear in Table 5. For the sake of simplicity, only the $1,000-$4,000 income range has been considered as, actually, most European countries had not reached the upper level by 1913.

Gerschenkron provided a set of propositions that can be tested with the help of the adjusted development patterns. Thus, he asserted that, the more backwards a country is, **a)** the faster the growth of industrial output; **b)** more intense the stress on bigness of both industrial plant and enterprise; **c)** the greater the stress upon producers' goods; **d)** the stronger the pressure on private consumption levels; **e)** the greater the role of institutional factors in promoting industrialization (banks, the State), and **f)** the less

active the role of agriculture in industrialization, that is, its provision of a market for industry by rising labour productivity (Gerschenkron, 1962: 353-54).[26]

Unfortunately, only some of Gerschenkron's hypotheses about European development can be subjected to quantitative testing: The evidence presented here provides an empirical test if we associate proposition **a)**, to the size (and the increases) in the share of industry in output and employment; hypotheses **b), c)** and **d)** to the shares of GDP allocated to investment and private consumption, respectively; proposition **e)**, to the share of GDP assigned to government consumption, and, finally, hypothesis **f)** to the productivity gap and the relative size of agriculture in GDP and labour force.

From the comparison between Pre-World War I and the average single patterns of development for 19th and 20th centuries some interesting findings can be reported. As regards propositions **b)** and **c)**, accumulation in both human and physical capital proceeded at a different pace before the Great War (Table 4); it was larger at low income levels and smaller at high ones, i.e., pre-1914 investment was higher below a per capita income of $2,000, as it was the case of literacy and schooling below a $3,000 income. Thus, the lower investment rates in physical and human capital for the late nineteenth and early twentieth century provides support to Gerschenkron's contention of latecomers' emphasis on producers' goods.

Differences observed for resource allocation processes offer an answer to propositions **d)** and **e)**. Thus, the composition of expenditure prior to World War I points to a higher (overall) consumption over $2,000, with the share of private consumption larger and that of government consumption smaller above $1,000. It means that early starters suffer from a lower pressure on private consumption while the size of Government, usually correlated to its activist role, was smaller, as Gerschenkron's asserted.

The supply side shows noticeable differences for the pre-1914 patterns and provides responses to propositions **a)** and **f)**. Before the Great War, European agriculture presents a larger size of GDP for any income level, and a smaller labour force over a $1,000 income, than the average single pattern. As a result, a lower productivity gap emerges, which tends to close as income rises. In other words, early starters exhibit a smaller agriculture in terms of employment and a larger size in terms of output and, hence, relative average labour productivity in agriculture was higher than in the case of the late comers. The lagged shift of labour out of agriculture and its higher

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26 A critical assessment of Gerschenkron's views can be found in O'Brien (1986). Gerschenkron's views are examined in the light of research during the late twentieth century in Sylla and Toniolo (1992).

productivity gap confirm Gerschenkron's (1962) contention that late comers' agriculture had a less active role in economic growth.

Industry and services lower shares in GDP (the latter up to $3,000) and higher ones in employment (over $1,000 in the case of industry) complete a more balanced labour allocation prior to the Great War. Besides, a more urbanized society and a smaller proportion of its rural population involved in agricultural activities appears above $2,000 in the pre-World War I patterns. However, in the case of the latecomers, the relative size of industrial output grew faster within the same income range, supporting Gerschenkron's contention of more intense industrial growth in the case of latecomers.

Differences in international trade also appear between average and pre-World War I patterns of development, as the latter exhibits a more open economy over $1,000 in which the larger share of manufacturing exports reveals its comparative advantage. The systematic commodity trade surplus in early starters in contrast with the deficit in latecomers (that emerges from the average, single, pattern) points to a higher investment demand than domestic saving in the case of latecomers while the opposite appears to occur in that of early starters (nineteenth century Britain and France provide good examples) (Imlah, 1958; Lévy-Leboyer, 1978).

Higher birth and death rates, and lower population pressure below $4,000, plus higher fertility and infant mortality, are the main demographic differences for pre-1914 Europe when compared with average, single patterns.

Comparing growth elasticities for each structural variable at given income levels, or as income increases for different historical phases, is most illuminating. Values (in absolute terms) for both measures of elasticity are shown in Table 5 for the pre-World War I era. The comparison with those of elasticities for the average patterns of development (Table 3) indicates that, in the income range $1,000-4,000 lower values are found for both the shares of investment and of industry in GDP. It might be suggested that such a result is associated to latecomers' catching up with early starters and lends support to Gerschenkron's propositions **a)**, **b)**, and **c)**. Nonetheless, larger growth elasticity for human capital formation and for openness, two ingredients of successful industrialization, are exhibited in the pre-World War I patterns. Moreover, a much lower value of the growth elasticity for Government consumption in early starters tends to confirm the idea of the State's stronger stand in latecomers. Finally, the higher (absolute) value of the growth elasticity for the agricultural share in employment and for the urbanization rate among the early starters reinforces the view of a less dynamic rural sector in the case of latecomers.

It can be inferred, then, that Gerschenkron's views are not rejected by the empirical evidence provided by the historical patterns of European development.

Concluding Remarks

In this paper European development patterns, that associate structural change to variations in GDP per head and population, have been examined in historical perspective. Europe provides a suitable scenario for testing regularities of growth since its nations share a common set of institutions, policies, and resource endowments. Some lessons can be derived.

Patterns of structural change, constructed along the lines of Chenery and Syrquin (1975) pathbreaking work, confirm the existence of a common set of development processes associated to rising per capita income for the whole of Europe. However, distinctive features of development patterns are noticeable for different epochs in modern European history: the liberal era prior to World War I, the neo-mercantilist Interwar Years, and the post-World War II return to liberalism. These adjusted patterns allow us to confirm differences in path of development between early starters and latecomers, as postulated by Gerschenkron (1962).

Differences between stylised features of development in early starters and latecomers raise interesting questions for further research. Are latecomers penalised by the fact that their investment and consumption shares of GDP are larger and lower than for an early starter, respectively, at the same level of income per head?. Or do they, actually, result from a wider range of investment opportunities?.[27] Demonstration effects and the awareness that a higher rate of investment helps to catch-up are perhaps behind such a differential. As Gerschenkron (1962: 8) put it, "the opportunities inherent in industrialization (..) vary directly with the backwardness of the country".

Chenery and Syrquin (1975: 64) reminded us that "the analysis of the uniformity of development patterns constitutes a first step towards identifying the sources of diversity". Each country's deviations from the estimated patterns at a given level of income per head and population, are associated to country-specific characteristics such as resource endowments, institutions, and policies, and the extent to which such a differential behaviour in accumulation, resource allocation, and demographic transition is behind the distinctive performance of latecomers deserves to be fully investigated within the framework of modern growth literature.

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[27] Chenery (1977: 458). Besides, in recent times larger investment seems to be required to reach economies of scale and scope in modern industry and services.

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TABLE 1

STRUCTURAL CHANGE TESTS: DUMMY VARIABLES

D13: value 1 from 1820 to 1913, and 0, thereafter.

D2090: value 0, 1820-1913; 1, 1920-1990.

D38: value 1, 1820-1938; 0, thereafter.

D5090: value 0, 1820-1938; 1, 1950-1990.

D2038: value 0, 1820-1913 and 1950-1990; 1, 1920-1938.

LnY13= D13*lnY

LnY38=D38*LnY

LnY2038=D2038*LnY

LnN13= D13*lnN

LnN38=D38*LnN

LnN2038=D2038*LnN

TABLE 2

ALL COUNTRIES

NORMAL VARIATION IN ECONOMIC STRUCTURE WITH THE LEVEL OF DEVELOPMENT
-Predicted Values at Different Income Levels-
US 1990 $ PPP (G-K)

PROCESSES	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
ACCUMULATION												
Investment (% GDP)												
SAVING	6.5	11.0	13.7	15.6	17.1	18.3	19.3	20.2	21.0	21.6	22.3	22.8
INVESTMENT	8.3	12.4	14.8	16.5	17.8	18.9	19.8	20.6	21.3	21.9	22.5	23.0
CAPITAL INFLOW	1.8	1.4	1.1	0.9	0.7	0.6	0.5	0.4	0.3	0.3	0.2	0.2
Education (%)												
LITERACY	51.1	65.8	74.3	80.4	85.1	89.0	92.2	95.1	97.6	99.8	101.8	103.6
SCHOOLING	31.7	41.1	46.6	50.5	53.6	56.1	58.2	60.0	61.6	63.0	64.3	65.5
RESOURCE ALLOCATION												
Demand (% GDP)												
PRIVATE CONSUMPTION	87.7	80.1	75.7	72.5	70.0	68.0	66.3	64.9	63.6	62.4	61.4	60.4
GOVT. CONSUMPTION	5.8	8.8	10.6	11.9	12.9	13.7	14.4	14.9	15.5	15.9	16.3	16.7
Production (% GDP)												
AGRICULTURE	44.6	33.2	26.4	21.7	18.0	15.0	12.4	10.2	8.3	6.5	5.0	3.5
INDUSTRY	26.4	29.8	31.8	33.2	34.3	35.2	36.0	36.7	37.2	37.8	38.2	38.7
SERVICES	29.0	37.0	41.8	45.1	47.7	49.8	51.6	53.1	54.5	55.7	56.8	57.8
Labour Force (%)												
AGRICULTURE	65.7	50.1	41.0	34.6	29.5	25.5	22.0	19.0	16.4	14.0	11.9	9.9
INDUSTRY	21.1	25.9	28.7	30.6	32.2	33.4	34.5	35.4	36.2	36.9	37.6	38.2
SERVICES	13.2	24.0	30.3	34.8	38.3	41.1	43.5	45.6	47.4	49.1	50.5	51.9
Urbanization (%)												
URBAN POPULATION	12.6	22.6	28.5	32.7	35.9	38.5	40.8	42.7	44.4	45.9	47.3	48.6
Relative Labour Productivity (%)												
AGRICULTURE	68.0	66.2	64.5	62.7	60.9	58.8	56.4	53.7	50.5	46.5	41.6	35.3
Trade (% GDP)												
EXPORTS OF GOODS	11.6	15.4	17.6	19.1	20.3	21.4	22.2	22.9	23.6	24.1	24.6	25.1
PRIMARY EXPORTS	11.6	10.9	10.0	9.4	8.9	8.6	8.2	7.9	7.7	7.5	7.3	7.1
MANUFACTURED EXPORTS	0.0	4.5	7.6	9.7	11.4	12.8	14.0	15.0	15.9	16.6	17.3	18.0
IMPORTS OF GOODS	10.9	16.0	18.9	21.1	22.7	24.0	25.2	26.2	27.0	27.8	28.5	29.1
OPENNESS	20.5	31.4	36.5	40.2	43.0	45.4	47.4	49.1	50.6	51.9	53.1	54.2
DEMOGRAPHIC TRANSITION												
BIRTH RATE (o/oo)	33.2	27.7	24.5	22.2	20.4	19.0	17.7	16.7	15.7	14.9	14.1	13.5
DEATH RATE (o/oo)	22.2	18.6	16.4	14.9	13.7	12.8	11.9	11.2	10.6	10.0	9.5	9.1
RATE NATURAL INCREASE (o/oo)	11.0	9.1	8.1	7.3	6.7	6.2	5.8	5.5	5.1	4.9	4.6	4.4
FERTILITY	4.6	3.9	3.4	3.1	2.9	2.7	2.5	2.3	2.2	2.1	2.0	1.9
INFANT MORTALITY (o/oo)	186.8	136.8	107.5	86.7	70.6	57.4	46.3	36.6	28.1	20.5	13.6	7.3
NET FERTILITY [FERTILITY*[1-INFMORT/1000]]	3.8	3.3	3.0	2.8	2.6	2.5	2.4	2.2	2.1	2.0	2.0	1.9

TABLE 3
ALL COUNTRIES
NORMAL VARIATION IN GROWTH ELASTICITIES WITH THE LEVEL OF DEVELOPMENT
-Predicted Values at Different Income Levels-
US 1990 $ PPP (G-K)

PROCESSES	Point Elasticities*				Discrete Elasticities**	
	1000	2000	4000	8000	1000-4000	4000-8000
ACCUMULATION						
Investment (% GDP)						
SAVING					0.632	0.373
INVESTMENT	0.71	0.48	0.36	0.29	0.496	0.320
CAPITAL INFLOW						
Education (%)						
LITERACY	0.41	0.32	0.26	0.22	0.327	0.242
SCHOOLING	0.43	0.33	0.27	0.23	0.336	0.249
RESOURCE ALLOCATION						
Demand (% GDP)						
PRIVATE CONSUMPTION	-0.13	-0.14	-0.15	-0.17	-0.137	-0.160
GOVT. CONSUMPTION	0.80	0.50	0.37	0.30	0.518	0.324
Production (% GDP)						
AGRICULTURE	-0.37	-0.50	-0.76	-01.62	-0.520	-1.089
INDUSTRY	0.23	0.20	0.18	0.16	0.165	0.145
SERVICES	0.40	0.31	0.26	0.22	0.319	0.236
Labour Force (%)						
AGRICULTURE	-0.34	-0.45	-0.65	-1.18	-0.463	-0.840
INDUSTRY	0.33	0.27	0.23	0.20	0.268	0.210
SERVICES	1.18	0.65	0.45	0.34	0.699	0.390
Urbanization (%)						
URBAN POPULATION	1.15	0.64	0.44	0.34	0.688	0.385
Trade (% GDP)						
EXPORTS OF GOODS	0.47	0.35	0.28	0.24	0.361	0.262
PRIMARY EXPORTS	-	-	-	-	-0.152	-0.251
MANUFACTURED EXPORTS	-	1.67	0.78	0.50	1.639	0.629
IMPORTS OF GOODS	0.55	0.38	0.28	0.23	0.477	0.312
OPENNESS	0.62	0.41	0.32	0.26	0.486	0.289
DEMOGRAPHIC TRANSITION						
BIRTH RATE (o/oo)	-0.24	-0.29	-0.36	-0.48	-0.290	-0.411
DEATH RATE (o/oo)	-0.24	-0.28	-0.36	-0.47	-0.288	-0.412
FERTILITY	-0.24	-0.28	-0.35	-0.48	-0.285	-0.431
INFANT MORTALITY (o/oo)	-0.39	-0.53	-0.83	-1.97	-0.554	-1.244
NET FERTILITY [FERTILITY*[1-INFMORT/1000]]	-0.20	-0.23	-0.27	-0.34	-0.220	-0.348

* Computed as $\varepsilon_{x_t, y_t} = \frac{\alpha_1 + 2\alpha_2 \ln Y_t}{x_t}$, where α_1 and α_2 are the coefficients for lineal and quadratic terms of income (Y_t) in the regresssion, and x_t is the predicted value corresponding to the level of income at which the elasticity is being computed.

** Elasticities with respect to GDP per head computed from Table 6 by dividing log differences:

$$[\text{Ln } X_T / X_0 / \text{ Ln } Y_T / Y_0]$$

TABLE 4

ALL COUNTRIES: PRE-WORLD WAR I

NORMAL VARIATION IN ECONOMIC STRUCTURE WITH THE LEVEL OF DEVELOPMENT
-Predicted Values at Different Income Levels-
US 1990 $ PPP (G-K)

PROCESSES	1000	1250	1500	1750	2000	2250	2500	2750	3000	3250	3500	4000
ACCUMULATION												
Investment (% GDP)												
SAVING												
INVESTMENT	8.8	9.5	10.1	10.6	11.1	11.4	11.8	12.1	12.4	12.6	12.9	13.3
CAPITAL INFLOW												
Education (%)												
LITERACY	33.7	43.1	50.7	57.2	62.8	67.7	72.2	76.2	79.8	83.2	86.3	91.9
SCHOOLING	28.2	31.9	34.9	37.4	39.6	41.6	43.3	44.9	46.3	47.6	48.8	51.0
RESOURCE ALLOCATION												
Demand (% GDP)												
PRIVATE CONSUMPTION	84.7	83.8	83.1	82.5	82.0	81.6	81.2	80.8	80.5	80.2	79.9	79.4
GOVT. CONSUMPTION	6.2	6.4	6.6	6.8	6.9	7.0	7.1	7.2	7.3	7.4	7.5	7.6
Production (% GDP)												
AGRICULTURE	47.9	43.9	40.5	37.7	35.3	33.1	31.2	29.5	27.9	26.4	25.1	22.7
INDUSTRY	25.5	26.4	27.2	27.8	28.3	28.9	29.3	29.7	30.0	30.4	30.7	31.2
SERVICES	26.6	29.7	32.3	34.5	36.4	38.0	39.5	40.8	42.1	43.2	44.2	46.1
Labour Force (%)												
AGRICULTURE	67.6	61.5	56.4	52.2	48.5	45.2	42.3	39.7	37.3	35.1	33.0	29.3
INDUSTRY	17.4	20.2	22.6	24.5	26.2	27.7	29.0	30.2	31.3	32.3	33.3	35.0
SERVICES	15.0	18.3	21.0	23.3	25.3	27.1	28.7	30.1	31.4	32.6	33.7	35.7
Urbanization (%)												
URBAN POPULATION	7.7	12.5	16.4	19.8	22.7	25.3	27.6	29.6	31.5	33.3	34.9	37.8
Relative Labour Productivity (%)												
AGRICULTURE	70.8	71.3	71.8	72.3	72.8	73.3	73.8	74.3	74.8	75.4	76.0	77.2
Trade (% GDP)												
EXPORTS OF GOODS	9.8	12.5	14.7	16.6	18.3	19.7	21.0	22.2	23.3	24.3	25.2	26.8
PRIMARY EXPORTS	9.8	11.1	11.5	11.8	12.1	12.3	12.5	12.7	13.0	13.1	13.3	13.5
MANUFACTURED EXPORTS	0.0	1.4	3.2	4.8	6.2	7.4	8.5	9.5	10.3	11.2	11.9	13.3
IMPORTS OF GOODS	6.8	9.9	12.5	14.6	16.4	18.1	19.6	20.9	22.1	23.2	24.2	26.1
OPENNESS	16.6	22.4	27.2	31.2	34.7	37.8	40.6	43.1	45.4	47.5	49.4	52.9
DEMOGRAPHIC TRANSITION												
BIRTH RATE (o/oo)	34.6	33.3	32.1	31.2	30.4	29.6	29.0	28.4	27.8	27.3	26.9	26.1
DEATH RATE (o/oo)	24.1	23.3	22.6	22.0	21.5	21.0	20.6	20.3	19.9	19.6	19.3	18.8
RATE NATURAL INCREASE (o/oo)	10.5	10.0	9.5	9.2	8.9	8.6	8.4	8.1	7.9	7.7	7.6	7.3
FERTILITY	4.7	4.6	4.5	4.4	4.3	4.2	4.2	4.1	4.1	4.0	4.0	3.9
INFANT MORTALITY (o/oo)	194.8	183.4	174.0	166.2	159.3	153.3	147.9	143.0	138.5	134.4	130.6	123.9
NET FERTILITY [FERTILITY*[1-INFMORT/1000]]	3.8	3.7	3.7	3.7	3.6	3.6	3.6	3.5	3.5	3.5	3.5	3.4

TABLE 5

ALL COUNTRIES: PRE-WORLD WAR I

NORMAL VARIATION IN GROWTH ELASTICITIES WITH THE LEVEL OF DEVELOPMENT
-Predicted Values at Different Income Levels-
US 1990 $ PPP (G-K)

PROCESSES	Point Elasticities*			Discrete Elasticities **
	1000	2000	4000	1000 -4000
ACCUMULATION				
Investment (% GDP)				
SAVING				-
INVESTMENT	0.37	0.29	0.24	0.298
CAPITAL INFLOW				
Education (%)				
LITERACY	1.24	0.67	0.46	0.724
SCHOOLING	0.58	0.41	0.32	0.427
RESOURCE ALLOCATION				
Demand (% GDP)				
PRIVATE CONSUMPTION	-0.05	-0.05	-0.05	-0.047
GOVT. CONSUMPTION	0.17	0.15	0.14	0.147
Production (% GDP)				
AGRICULTURE	-0.38	-0.52	-0.80	-0.539
INDUSTRY	0.18	0.16	0.15	0.146
SERVICES	0.53	0.39	0.31	0.397
Labour Force (%)				
AGRICULTURE	-0.41	-0.57	-0.94	-0.603
INDUSTRY	0.72	0.48	0.36	0.504
SERVICES	1.00	0.59	0.42	0.626
Urbanization (%)				
URBAN POPULATION	2.82	0.96	0.57	1.148
Trade (% GDP)				
EXPORTS OF GOODS	1.25	0.67	0.46	0.726
PRIMARY EXPORTS	-	-	-	0.231
MANUFACTURED EXPORTS	-	1.64	0.77	1.866
IMPORTS OF GOODS	2.31	0.96	0.60	0.970
OPENNESS	1.58	0.76	0.50	0.836
DEMOGRAPHIC TRANSITION				
BIRTH RATE (o/oo)	-0.18	-0.20	-0.24	-0.203
DEATH RATE (o/oo)	-0.16	-0.18	-0.20	-0.179
FERTILITY	-0.12	-0.14	-0.15	-0.135
INFANT MORTALITY (o/oo)	-0.96	-0.32	-0.41	-0.326
NET FERTILITY [FERTILITY*[1-INFMORT/1000]]	-0.09	-0.09	-0.10	-0.080

* Computed as $\varepsilon_{x_t, y_t} = \frac{\alpha_1 + 2\alpha_2 \ln Y_t}{x_t}$, where α_1 and α_2 are the coefficients for lineal and quadratic terms of income (Y_t) in the regression, and x_t is the predicted value corresponding to the level of income at which the elasticity is being computed.

** Elasticities with respect to GDP per head computed from Table 8 by dividing log differences:
$[\text{Ln } X_T / X_0 / \text{Ln } Y_T / Y_0]$

Sources

GDP: Levels of Gross Domestic Product are expressed in US $ at 1990 international prices adjusted for the purchasing power from OECD (1992). This aggregate covers the output of goods and services at market prices for the whole economy excluding income received from, or paid for, foreign investment. Figures derive from Maddison (2003) for most of the countries in the sample. We have completed Maddison's data for some countries. Thus, for Italy, from Rossi, Sorgatto and Toniolo (1992) for 1890-1990. For Portugal, Lains (2005). For Russia, Checoslovakia and Hungary, Gregory (1982), Lethbridge (1985) and Eckstein (1955). For Spain, Prados de la Escosura (2003).

Population: All figures are adjusted to refer mid-year and to take into account the territorial changes and are derived from Maddison (2003) and Mitchell (1992). Nicolau (1989) completes the figures for Spain.

Demand Structure : Domestic Investment, Private and Public Consumption in current prices, as percentages of GDP, are taken from Mitchell (1992), Flora (1987), Maddison (1990), and OECD, *National Accounts* (1960-1990), for most of the countries. Spanish figures are from Prados de la Escosura (2003). French figures were derived from Lévy-Leboyer and Bourguignon (1985) up to 1913, and Carré, Dubois and Malinvaud (1976) for the remaining years. Figures for Italy are from Ercolani (1978) for 1861-1890 and Rossi, Sorgato and Toniolo (1992) for 1890-1990. In the case of Portugal, Cartaxo and Da Rosa (1986) and Nunes, Mata and Valerio (1989) were the references used. For United Kingdom, Feinstein (1972).

Output Structure Sectoral origin of national product. Three major economic sectors are distinguished: Agriculture (which includes forestry and fishing), Industry (mining, manufacture, construction and utilities) and services (commerce, transport and communications, banking and private services, and public administration). Figures are provided as percentages of GDP at current prices. Most figures are taken from Mitchell (1992), Flora (1987) and OECD, *Historical Statistics.* In the case of Spain, Prados de la Escosura (2003). For France and Germany prior to World War I, Levy-Leboyer and Bourguignon (1985) , and Tilly (1978) and Fremdling (1988).

Labour Allocation: Distribution of working population by economic sectors. Three major economic sectors are distinguished: Agriculture (which includes forestry and fishing), Industry (mining, manufacture, construction and utilities) and services (commerce, transport and communications, banking and private services, and public administration). Figures are provided in the form of percentage of total labour force from Bairoch (1968), Flora (1987), Mitchell (1992) and OECD, *Labour Force Statistics,* 1969-1989. National figures were completed with

Lains (1992) and Nunes (1991) for Portugal; Toutain (1977) for France; Zamagni (1987) and Vitali (1970) for Italy; Prados de la Escosura (2003) for Spain.

Foreign Trade : Figures for exports and imports are from Bairoch (1976), Kuznets (1967), Mitchell (1992) and OECD, *National Accounts* and *Monthly Statistics of Foreign Trade*. For Portugal figures are derived from Nunes, Mata and Valerio (1989). Spanish figures are from Prados de la Escosura (1988, 2003) and Tena (1992).

With respect to manufactured export figures, we used Maizels (1963), Batchelor, Major and Morgan (1980), Baldwin (1958), Spiegelglas (1959), Deustsch and Eckstein (1961), Lamartine Yates (1959) and Kuznets (1967). Data for particular countries were completed with Prados de la Escosura (1988, 2003), Tena (1987) for Spain; Davis (1979), Schlote (1952) for United Kingdom; Levy-Leboyer and Bourguignon (1985) and Toutain (1977) for France; Eddie (1977) for Hungary; Lains (1992) for Portugal, and Cappana and Mesori (1940) for Italy.

Education: School enrollment refers to population attending primary and secundary school as a percentage of total population between 5 and 19 years old. Figures are from Mitchell (1992), Flora (1987), World Bank (1989, 1990 and 1991), United Nations, *Statistical Yearbook*, and *Demographic Yearbook*. *As* regards Literacy, it represents the percentage of literate population (those who can read and write) with respect to total population over 7 years old. In this case, figures are from Flora (1973), Mitchell (1992) and Hayami and Ruttan (1985). For Italy, Zamagai (1993); for Spain, Nunez (1992), and for Russia, Mironov (1991).

Urbanization: Population living in towns of 20.000 of inhabitants or more, as a percentage of total population. Figures are from Flora (1973, 1987).

Demographic Transition: Birth rate and death rates are defined as number of births and deaths per thousand of population. Infant mortality rate is the number of deaths per thousand births. Finally, fertility rate refers to the number of births per thousand of female population. Figures are from Chesnais (1986), Mitchell (1992), World Bank, *Social Indicators of Development* (1988, 1989 and 1990), *World Tables* (1989, 1990 and 1991), and United Nations, *Statistical Yearbook* (1987, 1988), and for Spain Nicolau (1989).

LIST OF DEPENDENT VARIABLES

C/GDP:	Private Consumption in current prices as a percentage of GDP.
UGDP:	Domestic Investment in current prices as a percentage of GDP.
G/GDP:	Public Consumption in current prices as a percentage of GDP.
YAgr/GDP:	Output in agriculture in current prices as a percentage of GDP.
YInd/GDP:	Output in industry in current prices as a percentage of GDP.
YSer/GDP:	Output in services in current prices as a percentage of GDP.
LAgr/L:	Labour force in agriculture as a percentage of total labour force.
LInd/L:	Labour force in industry as a percentage of total labour force.
LSer/L:	Labour force in services as a percentage of total labour force.
Xt/GDP:	Exports of goods as a percentage of GDP.
Mt/GDP:	Imports of goods as a percentage of GDP.
Open:	Exports of goods plus imports of goods as a percentage of GDP.
XInd/GDP:	Manufactured exports as a percentage of GDP.
XPrim/GDP:	Primary exports as a percentage of GDP.

LIST OF EXPLANATORY VARIABLES

C:	Constant term.
LnY:	Log of real *per capita,* GDP in 1990 US $, PPP.
$(LnY)^2$:	Square of the log of real *per capita* GDP in 1990 US $, PPP.
LnN:	Log of population.
$(LnN)^2$:	Square of the log of real *per capita* GDP in 1990 US $, PPP.
INFL:	Net imports (imports-exports of goods) as a share of GDP.
D13:	Value 1 from 1820 to 1913, and 0, thereafter.
D2038:	Value 0 from 1820 to 1913 and from 1950 to 1990, and 1 from 1920 to 1938.
D5090:	Value 0 from 1820 to 1938 and 1 from 1950 to 1990.
D2090:	Value 0 from 1820 to 1913 and 1 from 1920 to 1990.
D38:	Value 1 from 1820 to 1938 and 0, thereafter.
LnY13:	D13 * LnY.
LnY203S:	D2038 * LnY.
LnY38:	D38 * LnY.
TREND:	Time trend dummy.
LnN13:	D13 * LnN.
LnN38:	D38 * LnN.
LnN2038:	D2038 * LnN.
LnSize:	Log of each country's extension in squared kilometres.

DEMAND STRUCTURE

	SINGLE PATTERN			ADJUSTED PATTERN		
	(C/GDP)	(IGDP)	(G/GDP)	(C/GDP)	(I/GDP)	(G/GDP)
C	153.323	-28.891	83.579			
	(15.149)	(-3.789)	(2.620)			
LnY	-6.801	3.259	-18.126	-8.147	3.905	-9.913
	(-5.956)	(3.808)	(-2.514)	(-8.622)	(5.712)	(-2.250)
(LlY)'			1.009			0.578
			(2.430)			(2.233)
LnN	0.985	-0.808	0.370	32.610	-7.488	9.468
	(2.482)	(-2.569)	(1.369)	(17.787)	(-5.619)	(2.351)
(LnN)^{i}				-1.699	0.382	-0.487
				(-17.750)	(5.455)	(-2.292)
INFL	0.307	0.299		0.338	0.284	
	(4.348)	(5.393)		(5.265)	(5.873)	
D13				-37.259	33.989	
				(-3.862)	(4.656)	
D2038				-66.099		
				(-2.568)		
D5090				-9.876	7.811	
				(-7.386)	(8.040)	
D2090						
D38						2.518
						(2.727)
LnY13				1.668	-1.937	
				(1.923)	(-2.967)	
LnY2038				12.350	-2.017	
				(3.996)	(-2.843)	
LnY38						
TREND	-0.793	0.519	0.726			0.485
	(-5.982)	(5.180)	(8.625)			(4.502)
LnN13				2.380	-1.884	
				(3.791)	(-3.925)	
LnN2038				-3.993	1.864	
				(-5.148)	(3.100)	
LnN38						
LnSize	-1.918	1.405	-0.434	-0.890	1.277	
	(-4.620)	(4.327)	(-1.537)	(-2.482)	(4.732)	
Adj R^2	0.740	0.582	0.494	0.785	0.680	0.503
N· of obs.	262	265	285	262	265	285
S.E.Regression	5.597	4.447	3.903	5.085	3.889	3.872
F-Stat.	149.752	74.592	56.645	87.948	57.249	58.443

(t-ratios in parentheses)

SINGLE PATTERN

	OUTPUT STRUCTURE			LABOUR ALLOCATION		
	(YAgr/GDP)	(YInd/GDP)	(YSer/GDP)	(LAgr/L)	(Llnd/L)	(LSer/L)
C	476.119	-545.224	165.154	105.368	-342.291	297.843
	(8.962)	(-9.653)	(2.967)	(1.873)	(-7.865)	(5.361)
LnY	-90.407	126.737	-36.257	-26.835	81.886	-58.321
	(-7.201)	(9.516)	(-2.746)	(-19.134)	(8.030)	(-5.352)
$(InY)^z$	4.232	-7.069	2.837		-4.194	4.379
	(5.768)	(-9.100)	(3.643)		(-6.997)	(6.807)
LaN		2.304	-1.933	25.391	3.054	-16.915
		(5.838)	(-4.951)	(2.281)	(7.025)	(-2.126)
$(D_1V$				-1.433		0.836
				(-2.432)		(2.002)
INFL	-0.272	-0.172	0.466	-0.321		0.254
	(-3.354)	(-1.944)	(5.289)	(-3.362)		(3.356)
TREND	0.239	-0.257		0.752	-0.716	
	(1.774)	(-1.768)		(4.260)	(-5.858)	
LaSize				2.608	-2.773	
				(4.059)	(-6.282)	
A'	0.823	0.450	0.679	0.847	0.597	0.836
No of Obs.	253	253	252	237	237	236
S.E. Regression	5.952	6.299	6.307	7.602	6.017	5.601
F-Stat	293.871	42.237	133.572	218.891	81.537	241.500

(t-ratios in parentheses)

ADJUSTED PATTERN

	OUTPUT STRUCTURE			LABOUR ALLOCATION		
	(YAgr/GDP)	(YInd/GDP)	(YSer/GDP)	(LAar/L)	(LInd/L)	(LSer/L)
C				105.368		
				(1.873)		
LnY	-16.309	23.461	-12.382	-26.835	30.260	-3.654
	(-11.992)	(3.355)	(-1.538)	(-19.134)	(3.599)	(-2.856)
$(LnY)^L$		-1.058	1.320		-1.108	1.237
		(-2.522)	(2.747)		(-2.169)	(12.975)
LnN	31.996	-21.593	12.731	25.391	-24.006	-2.072
	(14.218)	(-3.398)	(1.774)	(2.281)	(-3.375)	(-3.888)
0411')1	-1.789	1.357	-0.778	-1.433	1.424	
	(-16.192)	(4.007)	(-2.072)	(-2.432)	(3.804)	
INFL	-0.380		0.419	-0.321	0.157	0.147
	(-4.711)		(4.957)	(-3.362)	(1.953)	(1.965)
D13		24.000	-47.442			-15.394
		(3.436)	(-4.133)			(-2.153)
D2038		9.101				
		(5.662)				
D5090		13.616	-7.572			
		(5.881)	(-3.125)			
D2090	-7.770				8.029	-3.129
	(-4.700)				(4.748)	(-2.646)
D38						
LnY13	-1.937		3.793			
	(-2.852)		(3.566)			
IAY2038			1.895			
			(1.691)			
TREND	0.572	-0.892	0.529	0.752	-1.255	
	(2.981)	(-4.263)	(2.393)	(4.260)	(-6.627)	
InN13	2.014	-2.916	1.699			1.643
	(3.332)	(-3.965)	(2.224)			(2.185)
LnN2038			-1.807			
			(-1.929)			
LnN38						
LnSize	1.106			2.608	-2.692	
	(2.479)			(4.059)	(-5.459)	
R2	0.816	0.507	0.709	0.847	0.569	0.823
N· of obs.	253	277	252	237	236	236
S.E. Regression	6.063	6.171	6.005	7.602	5.924	5.823
F-Stat	140.983	36.541	56.554	218.891	45.350	183.545

(t-ratios in parentheses)

SINGLE PATTERN

	DEMOGRAPHIC TRANSITION					EDUCATION		URBANIZATION
	BIRTH RATE	DEATH RATE	FERTILITY RATE	NET FERTILITY RATE	INFANT MORTALITY RATE	SCHOOLING	LITERACY	
C	109.860	206.986	20.390	14.366	1200.945	-146.501	-472.170	-114.948
	(3.336)	(10.978)	(3.395)	(3.974)	(5.053)	(-1.611)	(-3.832)	(-7.342)
LnY	-30.772	-44.856	-3.465	-0.256	-346.803	107.198	286.794	13.269
	(-5.011)	(-9.953)	(-2.494)	(-2.667)	(-7.230)	(6.048)	(11.081)	(10.665)
(LnY)'	1.628	2.563	0.179		18.062	-5.888	-15.801	
	(4.510)	(9.551)	(2.251)		(6.369)	(-5.596)	(-10.256)	
LnN	13.359	1.159		-1.774	122.560	-62.769	-145.541	8.142
	(2.941)	(7.145)		(-2.400)	(3.767)	(-5.292)	(-8.644)	(10.038)
$(I.nN)^i$	-0.685			0.089	-5.704	3.273	7.420	
	$(-^{2.860})$			(2.306)	(-3.313)	(5.214)	(8.352)	
INFL	0.129	-0.063	0.022	0.019	-1.093		-0.423	0.825
	(3.124)	(-1.852)	(3.237)	(3.148)	(-3.370)		(-2.074)	(5.726)
TREND	-0.690	-0.567	-0.080	-0.063	-5.427	0.906		
	(-9.863)	(-10.107)	(-5.952)	(-5.160)	(-9.755)	(5.347)		
LnN13								
LnSize					-3.736		-1.919	-3.536
					(-1.895)		(-1.874)	(-4.056)
I R2	0.783	0.770	0.625	0.561	0.835	0.594	0.792	0.748
N'ofohs.	285	291	224	220	278	269	154	117
S.E. Regre don.	3.358	2.770	0.519	0.460	25.679	8.240	10.008	7.757
F-Sht	171.972	195.135	94.118	56.884	201.533	79.466	97.977	86.924

(t-ratios in parentheses)

ADJUSTED PATTERN

	DEMOGRAPHIC TRANSITION				EDUCATION			URBANIZATION
	BIRTH RATE	DEATH RATE	FERTILITY RATE	NET FERTILITY RATE	INFANT MORTALITY RATE	SCHOOLING	LITERACY	
C							-472.170	-114.949
							(-3.832)	(-7.342)
LnY	-2.482	-16.819	1.852	1.522	-125.464	95.595	286.794	13.269
	(-3.855)	(-4.905)	(21.728)	(17.884)	(-4.259)	(8.691)	(11.081)	(10.665)
$(LnY)^2$		0.998	-0.130	-0.104	5.971	-5.452	-15.801	
		(4.834)	(-14.853)	(-12.398)	(3.427)	(-8.025)	(-10.256)	
LnN	16.392	17.460	-0.099	-0.058	161.252	-77.983	-145.541	8.142
	(14.422)	(6.032)	(-3.349)	(-2.109)	(6.059)	(4.249)	(4.644)	(10.038)
$(LnN)^2$	-0.850	-0.914			4.227	4.125	7.420	
	(-14.045)	(-5.966)			(-5.906)	(8.210)	(8.352)	
INFL	0.130	-0.073		0.014	-1.195		-0.423	0.825
	(3.384)	(-2.185)		(2.760)	(-4.181)		(-2.074)	(5.727)
D13	1.033		0.130			-45.904		
	(2.746)		(2.177)			(-3.627)		
D2038	-2.565	21.819			191.984	-2.753		
	(-3.125)	(2.655)			(2.645)	(-2.433)		
D5090	-27.751	-5.553			-54.512			
	(-3.776)	(-5.612)			(-6.044)			
D2090			-0.788	-0.518				
			(-6.099)	(-4.297)				
LnY13		-1.231			-11.662	5.083.6		
		(-4.436)			(-4.619)	(3.356)		
LnY2038		-3.148			-26.688			
		(-3.123)			(-3.008)			
LaY38	-3.267		-0.084	-0.091				
	(-3.615)		(-5.965)	(-7.209)				
TREND	-0.616	-0.296	-0.101	-0.096	-2.601	0.997		
	(-5.986)	(-3.329)	(-5.436)	(-5.722)	(-3.045)	(5.955)		
LnN13		1.092			11.632			
		(4.385)			(5.088)			
LnSlze		0.881				-1.009	-1.919	-3.537
		(4.480)				(-1.720)	(-1.874)	(-4.056)
RZ	0.813	0.786	0.764	0.675	0.863	0.629	0.792	0.748
No of ohs.	285	291	245	220	278	269	154	117
S.E.Regression	3.115	2.673	0.464	0.396	23.367	7.875	10.008	7.757
F-Stat	155.819	97.742	132.962	76.682	176.284	57.881	97.977	86.924

(t-ratios in parentheses)

SINGLE PATTERN

EXTERNAL TRADE

	(Xt/GDP)	(Mt/GDP)	OPEN	(XInd/GDP)	
		Xprim/GDP [a]			
C	117.739	138.837	277.674	-241.242	125.322
	(2.542)	(2.970)	(2.970)	(-5.521)	(2.405)
LnY	8.988	8.542	17.084	10.591	19.809
	(7.556)	(7.140)	(7.140)	(8.939)	(2.276)
$(LnY)^i$					-1.217
					(-2.362)
LnN	-24.329	-27.116	-54.231	43.342	-32.507
	(-2.667)	(-2.967)	(-2.967)	(4.900)	(-4.050)
(LnNY'	1.187	1.325	2.649	-2.263	1.557
	(2.451)	(2.733)	(2.733)	(-4.858)	(3.687)
INFL		0.790	0.580		-0.167
		(9.001)	(3.306)		(-2.225)
TREND	-0.517	-0.475	-0.950	-0.581	
	(-3.423)	(-3.141)	(-3.141)	(-4.097)	
Ln SIZE	-3.645	-3.912	-7.824	-2.746	-2.461
	(-6.589)	(-6.974)	(-6.974)	(-5.896)	(-5.796)
Rs	0.484	0.599	0.525	0.599	0.477
N' of obs.	297	295	295	218	216
SE. Rep[r]ession	7.530	7.483	14.965	5.331	4.818
F-Stat.	56.544	74.087	55.171	65.963	
	33.709				

(t-ratios in parentheses)

ADJUSTED PATTERN

EXTERNAL TRADE

	(Xt/GDP)	(Mt/GDP)	OPEN	(Xlnd/GDP)	Xprhn/GDP
C					
LnY	**10.429**	**10.664**	21.212	**-21.431**	**37.907**
	(17.638)	**(17.553)**	**(17.568)**	**(-3.059)**	**(5.853)**
$(LnY)^1$				1.778	**-2.139**
				(4.235)	**(-5.566)**
LnN	-2.192	-2.325	**-4.682**	**17.649**	**-23.668**
	(-4.356)	**(-4.559)**	**(-4.586)**	**(2.740)**	**(-4.198)**
(LnN)`				**-0.943**	**1.076**
				(-2.850)	**(3.657)**
INFL		**0.864**	0.734		**-0.210**
		(10.798)	**(4.588)**		**(-2.904)**
D13	21.415	**21.997**	**45.396**	-1.553	15.177
	(2.565)	**(2.599)**	**(2.684)**	**(-2.149)**	**(2.098)**
D2038	-7.196			-3.917	
	(-5.565)			(-3.182)	
D5090	**-9.654**	**-9.852**		**18.928**	
	(-6.517)	**(-6.572)**		(2.579)	
D2090			**-19.305**		**-3.935**
			(-6.537)		**(-3.639)**
D38					
LnY13	**-2.570**	**-2.648**	**-5.454**		**-1.650**
	(-2.621)	**(-2.666)**	**(-2.748)**		**(-1.964)**
LnY2038		**-0.872**	**0.648**		
		(-5.422)	**(2.286)**		
LnY38					
TREND					
^{LnN}13					
^{X}2038					
^{LnN}38				**2.595**	
				(3.499)	
LnSize	-3.472	**-3.475**	**-6.868**	-3.134	**-2.386**
	(-8.176)	**(-8.140)**	**(-8.075)**	**(-7.012)**	**(-5.706)**
R =	**0.523**	**0.625**	**0.555**	**0.624**	**0.502**
N- **of obi.**	297	**295**	**295**	**218**	216
S.E. Regression	**7.239**	**7.236**	**14.482**	**5.162**	4.703
F-Stat.	**55.134**	**70.905**	53.433	**46.110**	**28.093**

(t-ratios in parentheses)