SPAIN'S GROSS DOMESTIC PRODUCT, 1850-1990:
A NEW SERIES

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I. INTRODUCTION

To assess long-run economic performance across countries economists and historians require macroeconomic series from which to start international comparisons. A major feature in Spanish economic history is the lack of a comparative approach, and the absence of a consistent, reliable and homogeneous macroeconomic data set is the main reason[1]. Nevertheless, quantitative evidence on major macroeconomic variables has been gathered and several attempts to estimate Spanish GDP prior to 1954, the first year for which national accounts are available, have taken place over the last two decades.

Two main features emerge from the available historical GDP benchmark and annual series. On the one hand, most estimates are concerned with the construction of indices representing the pace of growth, but not the actual levels of output[2]. On the other, strong discrepancies in the perception of Spain's long-run economic growth emerge from alternative GDP estimates. So far, no consensus has been reached about economic performance during the inter-war years, the impact

1 Explicit and systematic attempts to compare Spain's performance to other European experiences or models have hardly taken place. Cf. as exceptions Molinas & Prados (1989); Fraile (1991); Prados (1992); Tortella (1992); Carreras (1992).

2 This is the case of all available series including Schwartz's (1977) who derive levels of output through indirect indicators.

of Civil War or the rate of growth during the 1940's. Such a lack of agreement suggests a still weak and incomplete quantitative basis.

The goal in this paper is to supply a new index for Spanish GDP from the supply side that widens and improves the data base used in previous estimates. A distinctive feature of the new series is that services, neglected by earlier estimates, are included[3]. The point of departure is a highly disaggregated data base resulting from detailed research undertaken by economic historians over the last two decades. My aim is to reconcile the existing knowledge about sectoral performance with an aggregated view of economic activity. The resulting new series improves the picture of Spanish economic performance in the century prior to 1950, in particular for the early twentieth century.

The paper is organized as follows: historical estimates of Spanish GDP are surveyed in section II, and the procedures and sources used to derive an index for real product are described in section III. Section IV presents the new series within the context of earlier estimates showing the extent to which old perceptions of Spanish long-run economic performance are revised. International comparisons of real product per head provide a sensitivity test for the consistency and reliability of the new series in section V.

[3] An exception is Schwartz (1977).

Finally, an attempt is made in section VI to provide a annual series of nominal GDP by reflating real product with newly built sectoral price indices.

II. ESTIMATES OF REAL GDP: A REVIEW OF THE EVIDENCE.

In this section historical research on Spain's real product is surveyed[4]. Unfortunately, only contemporary observers have so far produced direct benchmark estimates of national income for the period prior to 1954[5]. All available GDP estimates are real output indices derived from indicators of economic activity suffering from the index number problem, and their economic significance, therefore, tends to decline as one moves away from the base year.

<u>Annual series</u>

In 1944 the **Consejo de Economía Nacional** (CEN), was asked to estimate a set of national accounts for Spain[6]. Three were three main targets: to provide income figures for

[4] Surveys of GDP estimates can be found in Carreras (1987), Coll (1992) and Bustelo (1993).

[5] Cf. Schwartz (1977) for a collection of early 20th century contemporary national income estimates.

[6] In fact, there was an earlier attempt to derive national income estimates on an yearly basis. Castañeda (1945) provided the first historical estimate of real product covering the years 1901 to 1934. His procedure was a very simple one: from a sample of indirect taxes and government's monopoly revenues he calculated a proxy for national expenditure deflated by a wholesale price index that allowed him to obtain an annual real GDP series.

the years prior to the Civil War (1936-1939), to evaluate 1940 GDP on a very fragile statistical basis, and to design a direct method to estimate National Income for the years to come.

CEN (1945) built up two production indices for agriculture and industry, from which an aggregate index was derived to proxy national income, with no regard paid to services. Implicitly such a procedure assumes that output in services performed as a weighted average of agricultural and industrial production. Most crops (though no livestock output) were incorporated into the agricultural production index, while in the industrial production index mining had a good coverage, but neither manufacturing nor construction were adequately represented. Agricultural and industrial output were summarized into a single index using their average market prices for the years 1913-1928 as weights. From 1929 onwards a change in the composition of both indices was introduced: new crops were included into the agricultural index, and the coverage of the industrial index widened though manufacturing and construction remained unsatisfactorily represented[7]. Agricultural farm-gate prices and industrial value added units for 1929 were used as weights in the construction of agricultural and industrial output indices. These indices were merged into an index of

[7] In order to reduce the downward bias for manufacturing CEN overweighted the electricity output.

total production through a rather arbitrary procedure: weights were assumed to be 60 per cent for agriculture and 40 per cent for industry before 1929, and 50 per cent afterwards. In addition, for the years 1906-1929 a de-trended nuptiality index was incorporated to allow for short-term fluctuations.

In a second stage, CEN (1965) obtained a national income series at constant prices by linking the average value of two sets of contemporary national income estimates for 1923 to the *quantum* index previously built up[8]. National income at current prices was derived by reflating constant values with a wholesale price index. The same procedure was kept by CEN for 1940-1956 although the nuptiality index was removed since it was considered to be inadequate as a proxy for post-war yearly fluctuations. Finally, CEN obtained national income directly for the years 1957-1964 with only minor adjustments in its methods[9].

[8] CEN assumed that Caamaño (1924) and Vandellòs (1925) estimates were independent from each other.

[9] Improvements to CEN figures were attempted for shorter periods. Two of them are worth mentioning. The Información Comercial Española (ICE (1962)) series only covered the years 1951 to 1960 but represented an improvement in the index quality. ICE built up a "general index of total production", i.e. real G.D.P. The coverage of the primary sector was very complete. The secondary sector, with 227 elementary series, was far better covered than in the CEN estimate. The tertiary sector, with 45 series, was covered for the first time. The weighting scheme was based on the gross value added at factor cost, taken from the Spanish input-output table of 1958.
Another estimate, the one by Comisaría del Plan de Desarrollo (CPD (1972)) covered the period 1942-1954. The CPD retained the indexes of agricultural and industrial production calculated by the CEN, and introduced a new index for

A revision of the CEN series for the period 1901-1954 was attempted by Alcaide (1976), who tried to smooth CEN's index which, in his view, presented an implausible cyclical behaviour. For the period 1901-1935, Alcaide derived an index of domestic production using 1906 weights (0.4 for agriculture, 0.25 for industry, and 0.35 for services) and CEN indices for agricultural and industrial output, plus total employment in services as a proxy for its output[10]. In Alcaide's estimate, however, both the revision's procedure and the implicit assumption of zero growth in labour productivity in services (since, by construction, output per worker in services remains constant over time) remain unclear[11].

Another attempt at improving CEN's estimates was carried out by Schwartz (1977) for the period 1940-1960. Schwartz collected new empirical evidence and used more transparent methods than Alcaide. In the new series, indirect methods and

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services, aggregation was obtained by using sectoral shares in gross value added derived from official national accounts for 1954. This index was linked to the National Account (CNE) series starting in 1954, and GDP values for the period 1942-1954 at 1954 prices were derived. An estimate at current prices was calculated using a price index representing the average of the wholesale and the cost-of-living price indices with 70 and 30 per cent weights respectively.

10 Since historical active population figures are only available by decades (in census years) either Alcaide interpolated census data or applied participation rates to available annual figures for total population.

11 Services output moved, according to Alcaide, with the labour force employed in the sector. For a critique of Alcaide's estimates see Tortella (1987).

regression analysis were blended to derive gross value added for every major sector in the economy, at both current and constant prices, that were added up to get gross domestic product. Schwartz' series overlapped with the official national accounts for the last seven years allowing him to regress sectoral indicators with their value added.

Naredo's (1991) contribution originates from an apparent inconsistency in Spanish official (CEN) series that, in the author's view, underestimates national income for the post-bellum years. He proposes an alternative new GDP series for 1920-1950. His argument is based upon the CEN's implicit low income-elasticity of demand for imports over the post-Civil War period. Naredo proceeded to correct the official estimates by adopting values for the income-elasticity of imports, but because those values were arbitrary, his results were seriously weakened.

The most original and ambitious attempt to derive a new GDP series was produced by Carreras (1985) who built up an index from the demand side[12]. Carreras followed a new approach within the context of earlier historical works covering a longer time span, 1849-1958. Weights for the main aggregates (private and public consumption, investment, net exports) were derived for the 1958 benchmark from the

[12] Carreras (1985) claims to have built up an index for G<u>N</u>P (from the expenditure side) when he actually estimated G<u>D</u>P since no regard was paid to net property income from abroad.

National Accounts, while the 1958 Input-Output Table allowed the breakdown of each series into its main components. Some shortcomings in the series are noticeable, i.e. the consumption series only cover food, beverages and tobacco and clothing while services are neglected[13]. Again the trade balance only covers commodities[14]. In fact, consumption growth might possibly be biased downwards since the goods included in the series (food and clothing) are those of lower income elasticity of demand[15]. In addition, the use of end-year (1958) fixed weights could bias GDP growth downwards since relative prices for capital goods, the fastest growing component of expenditure, declined over time rendering a lower weight for investment in 1958 than would be the case with any previous year's prices.

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13 Food and clothing represent 70 per cent of total consumption in the benchmark year (1958) in 1958. However, the sample of consumption goods used in the construction of the annual index only reaches a coverage of 20 per cent up to 1928, and 41 per cent thereafter, as measured for the 1958 benchmark (Carreras (1985), pp. 38-39, 45).

14 Carreras uses official values for exports and imports that exagerate commodity trade deficit for most of the period up to 1913 (Cf. Prados de la Escosura (1986); Tena (1992)). It might be the case, however, that the official merchandise trade balance is a better proxy for the goods and services trade balance than the reconstructed estimates (Prados (1986) since a 19th century deficit in services trade seems to be plausible.

15 Actually income elasticity of demand values for housing, durables, personal care, transport, recreation, etc. were higher than for food and clothing in 1958 Spain (Lluch (1969), pp. 68 and 78).

Benchmark estimates

Mulhall (1880-1896) provided late 19th century estimates of national income for most European countries. Following Deane (1957), Prados de la Escosura (1982) reconstructed Mulhall figures in a consistent way and a set of benchmark estimates of Spanish national income for 1832-1894 was derived. In addition, GDP estimates for seven benchmarks over the period 1800-1930, following the output approach (and including services), were constructed by Prados de la Escosura (1988)[16].

III. A NEW ESTIMATE OF SPANISH REAL GDP, 1850-1964

The aim of this section is to describe the construction procedure of a new index for Spanish real gross domestic product from 1850 to 1964. The purpose in providing a new yearly series of real output is to offer an alternative to existing series that incorporates some aspects previously neglected. The new GDP index has been obtained from the supply side, and it starts from a disaggregated data base

[16] The method proposed in this paper extends this approach to produce an annual series. Also, Bairoch (1976) and Crafts (1983, 1984) obtained benchmark estimates for 19th Century Spain through an indirect approach along Beckerman and Bacon (1966) lines. Crafts (1983, 1984) produced decenial real income per head for Spain, 1860-1910, using patterns common to a set of European countries. In his estimate real product per head is a function of five variables: letters posted per person, ratio of population aged 15-64 to total population, coal consumed per capita, infant mortality rate, and time.

that incorporates the results of major independent research on agriculture, manufacturing and services over the last two decades. The aggregate index has been built up from spliced homogeneous series for agriculture, industry and services in an attempt to include changes in the product mix and in the price structure. Gross domestic product was obtained by combining real output series for primary, secondary and tertiary sectors using their shares in 1958 total gross value added as weights[17]. The historical index overlaps with the official national accounts figures for a decade so it can be tested against them. Finally the new series has been linked to the official national account series in order to provide a long-run view of Spain's economic performance[18].

AGRICULTURE.

An annual series for agricultural final output, that is, total production less seed and animal feed, was derived from a large sample of goods representing crops and livestock output. Gross value added was derived by substracting purchases of industrial and services' inputs from final output.

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[17] The source for 1958 sectoral shares in GDP is official national accounts (I.E.F. (1969)). Alternative estimates using 1870, 1890, 1913. and 1929 weights derived from sectoral shares in nominal GDP (see section VI of this paper) did produce almost identical results, and I preferred to maintained the aditive single-weighted (1958) series. The reason seems to be that real product indices succesfully incorporate (by their method of construction) structural changes.

[18] Corrales and Taguas (1991), revised and updated by David Taguas who kindly allow me to use it.

Unfortunately, annual data on output of crops and livestock are incomplete and their coverage uneven over time. However, available data allowed me to value physical output for each product at farm-gate prices and to derive agricultural final output for different benchmarks: *circa* 1890, 1909/13, 1929/33, 1950 and 1960/64[19]. Therefore, in order to obtain a yearly series both annual data on a large sample of agricultural produce and more complete evidence on aggregate final production for each benchmark were combined. A two-stage procedure was followed: first, groups of products were defined, and independent indices were constructed for each group in an attempt to prevent undesired over-representation of particular crops[20]. Thus, index numbers were built for major groups of products: cereals, pulses, vegetables, raw materials, fruits & nuts, wine (must), olive oil, meat, poultry & eggs, and milk & honey[21]. For different

[19] Estimates come from Prados de la Escosura (forthcoming). There are earlier estimates of benchmarks for total production, 1891-1931 by Gehr (1983) and Simpson (1989), and index numbers for total production, 1891-1935 by Comín (1987) and GEHR (1987). Ratios of final output to total production for crops are shown in Appendix 1, Table A.1. Coefficients to transform livestock output into quantities of meat, wool and milk appear in Appendix A, Table A.2.

[20] Obviously this procedure does not avoid adding guesses to the data since it is assumed that within each group those products not included in our sample moved exactly like those that were part of it. However, the more homogeneous the group of goods the less strong the implicit assumptions of this method. When total output is directly estimated from a sample of single products, the assumptions implicitly made are stronger than in my two-stage calculation procedure (Cf. Fenoaltea (1988)).

[21] Physical quantities derived mostly from GEHR (1989, 1991), completed with Comín (1985a), Simpson (1986, 1989

periods, physical quantities in each group of goods were valued at their prices in the benchmark-year and the aggregated value expressed in index form with 100 for the base year[22]. Secondly, an index for final agricultural output was obtained as a weighted average of output indices for the different agricultural groups in which their shares in the benchmark-year's total agricultural final output were used as weights[23]. Since for each period final output indices were computed using different sets of farm-gate prices, splicing was required in order to derive a chain *quantum* index.

(unpublished data set)) and Carreras (1983) for the pre-Civil War years; Barciela (1989) and Mº de Agricultura (1979a) for the 1940-1964 period. Prices are taken from GEHR (1989), Simpson (unpublished) and Mº de Agricultura (1979a).

[22] Products included in each group are shown in Prados de la Escosura (forthcoming). Table A.3, in Appendix A, presents for every benchmark-year the coverage of each group in the annual indices.

[23] For a more formal description of the method see section on industry.

TABLE 1

Benchmark composition of agricultural final output, 1890-1964
(percentages) (current prices)

	c.1890	c.1900	1909/13	1929/33	1950	1960/64
Cereals	28.7	34.9	31.3	25.4	25.6	16.2
Pulses	3.8	3.1	3.3	3.2	3.0	2.0
Vegetables	12.4	13.5	13.1	16.5	17.2	16.4
Raw Materials	2.3	3.4	3.3	3.7	3.9	6.8
Fruits & nuts	2.2	7.3	8.3	11.0	11.0	12.7
Wine (must)	19.1	11.3	6.8	6.3	6.4	4.1
Olive oil	8.2	5.9	6.0	5.9	2.6	4.9
Meat	11.9	10.5	13.9	15.5	11.1	14.7
Poultry & eggs	6.0	5.3	7.0	5.4	8.2	14.2
Milk & honey	5.4	4.8	7.0	7.1	11.0	8.0
Animal[a]	24.8	21.8	29.3	28.8	31.6	37.7
Non-animal[a]	75.2	78.2	70.7	71.2	68.4	62.3

Note: [a] When adjustments (see text below) for livestock underestimation are introduced the resulting shares are:

Animal	29.8	27.2	34.7
Non-animal	70.2	72.8	65.3.

Sources: Prados de la Escosura (forthcoming).

Estimates for pre-1891 agricultural output deserve a few comments regarding the construction procedures used. Data coverage of crop output for 1882-1890 is lower than for the following years, and production for different agricultural groups was proxied by available information on output for wheat, barley, wine, olive oil and sugar beets, plus data on exports for almonds and oranges[24]. Incomplete (or lack of) data for the years prior to 1882 led me to proxy non-animal agricultural output by commercialisation series for major

[24] Output was interpolated for missing years for wheat (1887) and olive oil (1887 and 1889). The coverage of goods for which data is available for 1882-1890 represents 64 per cent of final production in 1890.

crops using maritime and rail transportation figures. Accepting figures for agricultural traded goods as proxies for final production implies the arguable assumption of a highly commercialised agriculture in which both distribution and production show similar trends[25]. The commercialisation series includes cereals, wine, olive oil, fruits & nuts (oranges and almonds), raw materials (cane & beet sugar)[26]. The same calculating procedure as for direct estimates was followed[27]. In order to test the reliability of a trading index as a proxy for agricultural output their correlation and determination coefficients were calculated for the period 1891-1906, when both series overlap and output is obtained on a more sound statistical basis, with satisfactory results[28].

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25 Cfr. Simpson (1989, 1992a, 1992b) for objections to this point of view, but see also Federico (1986) for the wide diffusion of the market economy in another 19th century Mediterranean agriculture, Italy. If, as posited by Simpson, trading in agricultural products rose faster than output the resulting index would incorporate an upward bias.

26 Specific commercialisation series used were transportation by rail (metric tons/km.) for cereals (wheat and rice); rail and sea (including coastal and foreign trade) transport for wine; maritime transport for olive oil; coastal transportation for cane and beet sugar; exports for oranges and almonds. Information (except for fruits & nuts) was derived from Carreras (1983, i, 386-502) eliminating the one-year lag introduced by this author to represent the commercialisation of output.

27 The same calculating procedure as for direct estimates was followed: 1890 prices were applied to physical output and the resulting annual values added up as previously defined groups of products and expressed in index number form.

28 For 1891-1906, the correlation coefficient (R) was 0.8307; and the regression results:

$$\ln \text{output} = \underset{(-0.712)}{-0.6927} + \underset{(5.584)}{1.1578} \ln \text{trading}; \quad \text{adjusted } R^2\text{: } 0.6680$$

with t statistics in parenthesis.

Unfortunately evidence on livestock prior to 1905 is only available for 1865 and 1891[29]. Meat, wool and milk output was obtained through the application of conversion coefficients to livestock numbers for 1865, 1891 and 1905/09 and valued at 1890 prices. Since it has been argued that livestock numbers are underestimated for the 1891-1916 period conversion coefficients for the late 1920's and early 1930's were used[30]. Interpolation between these benchmarks allowed me to derive annual figures for livestock output. The case for accepting such a crude procedure is to reach a wider coverage by incorporating livestock output, which had an opposite trend to crop output over the late 19th century, in final agricultural production. An additional reason stems from the fact that livestock output seems to be less volatile than crop output, and by including it, over-exaggerated fluctuations in agricultural output can be avoided.

Output for the years 1850-1855 was derived by regressing estimated final production on population and prices over the period 1856-1913[31]. The parameters from this equation were

[29] Less reliable estimates for livestock numbers are available for 1859 and 1888 (cf. Mitchell (1992) for data and GEHR (1978/1979, 1991) for a critique of the sources.

[30] Simpson (1989); GEHR (1978/1979, 1991). 1865 animal produce was derived from livestock numbers applying Simpson (1989) conversion co-efficients.

[31] The coefficients from a log linear regression with agricultural output as the dependent variable are the following (with t statistics in parenthesis):

Constant	ln Pop	ln Agricultural price	ln Industrial price	R^2 adjusted	d.w.
-5.7208	2.1578	0.2735	-0.1788	0.8082	1.4857
(-4.886)	(15.270)	(1.582)	(-2.008)		

used with relevant population and price data to derive production figures[32]. The resulting series for 1850-1881 and the post-1882 direct estimates were spliced into a single annual index.

The index for final agricultural output was derived by splicing different indices with their ratios for overlapping years: for 1850-1890, an index at 1890 prices; for 1890-1909, a geometric average of series at 1890 and 1910 prices; for 1909-1913, at 1910 prices; for 1913-1929, a geometric average of series at 1910 and 1930 prices; for 1929-1936, at 1929 prices; for 1936-1940, a geometric mean of indices at 1930 and 1950 prices; for 1940-1950, at 1950 prices; for 1950-1960, a geometric mean of sub-series at 1950 and 1960 prices; for 1960-1964, at 1960 prices.

Population figures are from Nicolau (1989) from 1857 onwards and my own estimates for 1850-1856 are interpolated from Madoz (1846-50) estimates for 1845 and population census data for 1857. Agricultural and industrial price indices are decribed in section VI.

[32] Not including income among the regressors weakens the results from a demand function point of view since it represents the implicit assumption of either zero income elasticity or no income growth. I am assuming the latter is a more plausible assumption for such a short period of time.

TABLE 2

Construction of agricultural final output indices, 1850-1964

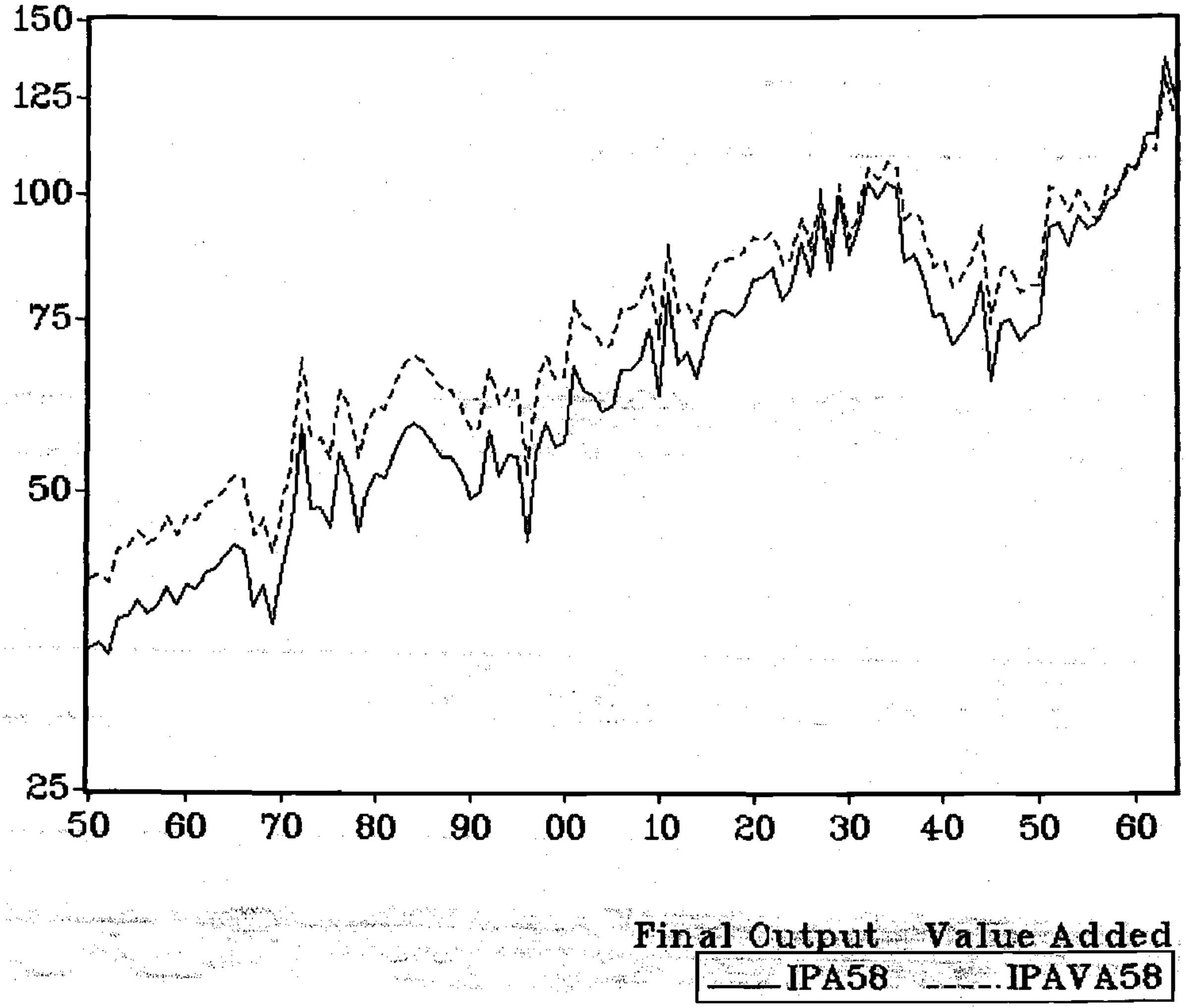
periods	base year's weighting prices	coverage of the annual index in the benchmark year(%)
1850-1909	1891/93	76.7
1890-1929	1909/13	86.8
1913-1940	1929/33	86.1
1936-1960	1950	86.5
1950-1964	1960	85.1

Note: Coverage in 1890 and 1909/13 has been adjusted for livestock underestimation (see the text). Unadjusted shares are shown in Table A.3.
Sources: Appendix A, Table A.3.

Despite the detailed procedure followed in the construction of the agricultural output index, biases of unknown size and direction may be introduced by incomplete coverage. A test can be carried out using data from six benchmarks: *circa* 1890, c. 1900, 1909/13, 1929/33, 1950 and 1960/64, for which a wider coverage was reached and *quantum* chain indices can be computed[33]. These benchmarks would allow us to check the bias introduced by over-representation of the basic produce series into the final agricultural output index. Unfortunately no means to check the incomplete coverage bias in industry a ` services indices for Spain was found, and I had to rely on the basic sample of annual series for both sectors. Therefore, in order to maintain the internal consistency of the resulting series for Gross

[33] Using sets of prices for each benchmark chain Laspeyres, Paasche and Fisher 'ideal' *quantum* indices were built.

GRAPH 1. AGRICULTURAL FINAL OUTPUT AND GROSS VALUE ADDED, 1850-1964 (1958=100)



Domestic Product, no adjustment has been attempted for the agricultural series. Nevertheless, annual series' deviations from benchmark values could be taken as representative of potential biases in the GDP series[34]. Data in Table 3 shows that biases are lower than 10 per cent in all cases but one (column 5).

TABLE 3

Agricultural final output: annual index's deviations from benchmark levels.

Benchmarks	(1) Annual index	(2) Benchmark levels	(3) Benchmark corrected	(4) Deviations ln((1)/(2))	(5) Deviations ln((1)/(3))
1891/1895	76.3	88.6	87.6	-0.15	-0.14
1898/1902	85.5	89.8	89.3	-0.05	-0.04
1909/1913	100.0	100.0	100.0	-	-
1929/1933	136.5	135.2	125.2	0.01	0.09
1950	105.5	118.9	110.2	-0.12	-0.04
1960/1964	169.7	196.3	180.3	-0.15	-0.06

Note: Benchmark levels result from a Fisher index. Benchmark corrected for livestock underestimation prior to 1916 (see text).
Sources: for the annual index, text; for benchmark levels, Prados de la Escosura (forthcoming).

Finally, gross value added at factor costs, that is, final output less purchases outside the agricultural sector, was obtained. Estimates of purchases from the non-agricultural sector were derived from Vandellòs (1925) for 1913 (4.3 per cent of final production) and from national

34 This is a *ceteris paribus* condition since opposite biases in agricultural, industrial and services' indices could actually tend to offset each other.

accounts for 1964 (21.8 per cent), and linked to an index of yearly fluctuations in real purchases of industrial inputs[35].

For forestry evidence is available since 1901 and quantities of wood, firewood, resin, cork and esparto grass were valued at 1912/13, 1929/33 and 1960 prices and added up into single values from which a chain index was derived[36].

Finally, for fishing, quantity and current value series are available from 1904 onwards (although data are missing for 1935-39), but only scattered information exists for 1878, 1883 and 1888-1892[37]. A volume index was derived from quantities of fresh fish captured[38]. Missing output data back to 1850 was log-linearly interpolated from data for the scattered years (1878, 1883, 1888-1892) and 1904-1913. Gross

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35 See Appendix A.

36 The index was derived from splicing four sub-indices: 1901-1913, values at 1912/13 prices; 1913-1929, geometric average of values at 1912/13 and 1929/33 prices; 1929-1940, values at 1929/33 prices; 1940-1964, values at 1960 prices. Splicing the sub-series was done by using ratios for overlapping years. Sources used were GEHR (1989, 1991), Barciela (1989) and Mº de Agricultura (1979).

37 Sources used are Giráldez (1991) for 1883-1934, completed with unpublished data obtained by Gómez Mendoza (1983) for 1878, 1888-92 and 1904-07; and Barciela (1989) for 1940-1964.

38 A wholesale price index for fresh fish is available from 1913 onwards (Cfr. Paris Eguilaz (1943) and Schwartz (1977)) and was used by Schwartz (1977) to deflate current values. This procedure to derive a constant-price series seems to be preferable to the alternative of using total quantity of fish to build up an index. The reason is that it allows for changes in the product mix. Unfortunately, however, for the pre-1913 period no deflator was available, and I preferred to produce a homogeneous index from quantities of fish captured for the whole period.

value added, it has been suggested, represented about 50 per cent of the value of total production[39]. However, there are good reasons to suspect a substantial undervaluation of total production, and I have assumed that available estimates for the value of production are an acceptable proxy for gross value added in fishing[40].

An aggregate index for primary output was derived as a weighted average of agriculture, forestry and fishing indices with the sub-sectors' shares in 1958 agriculture, forestry and fishing gross value added as weights[41].

INDUSTRY.

Carreras' (1983) pathbreaking research on industry provides the data base for the new series of industrial output excluding construction[42]. The Input-Output Table for 1958 supplied the weights that Carreras extrapolated backwards to 1929 and 1913 with industrial prices under the

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39 Hemberg (1955), p. 289, quotes and applies this percentage proposed by Ros Jimeno for 1950.

40 Giráldez (1991), pp. 520-521. I assume that the undervaluation of total production and the purchases of industrial inputs and services cancel out each other.

41 Gross value added comes from National Accounts (I.E.F. (1969). The resulting shares for 1958 were: agriculture, 0.8963; forestry, 0.0722; fishing, 0.0315. For the period 1850-1900 when forestry data is missing, agriculture's share was increased correspondingly. For the Civil War years it was assumed that primary production evolved as agriculture.

42 The sources for industrial output are Carreras (1983, 1984, 1991). Independent manufacturing and mining series for 1861-1964 were kindly supplied to me by Albert Carreras.

assumption that price behaviour was similar to that of value added per unit of output[43]. Unfortunately, this author was unable to establish earlier base years for the 19th century, so the further back in time we move from 1913, the less representative of industrial performance his index becomes as no regard is paid to relative price (unit value added) changes.

An alternative estimate can be found in Prados de la Escosura (1988), who calculated Fisher indices using 1856, 1900 and 1920 weights for 1860, 1890 and 1910 benchmarks. The comparison between Carreras and Prados growth rates shows a high degree of coincidence over 1860-1910: Carreras, 2.2 and Prados, 1.8-2.0 per cent[44]. When sub-periods are distinguished Carreras' index grows at 2.3 and 2.2 per cent over 1860-90 and 1890-1910, while Prados' does it at 1.9-2.3 and 1.5 per cent, respectively. A noticeable discrepancy appears, therefore, around the turn of the century that can be attributed to the higher weight allocated to capital goods in Carreras' index[45].

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[43] The actual procedure followed by Carreras (1983, 1984) to derive value added units for 1913 and 1929 was to apply the 1958 gross value added at factor costs/total value ratio to 1913 and 1929 prices for industrial goods.

[44] Prados de la Escosura (1988), chap. 4, also estimated a Divisia index for which growth rates were very close to those of the Fisher index: 1.8-2.1% for 1860-1910; 1.8-2.3% for 1860-90; and 1.6% for 1890-1910.

[45] This difference is more precisely due to higher weighting of metal transforming industries in Carreras' industrial index. Metal manufacturing is allocated a share of 15.1% within industrial value added in Carreras (1983) and only 9.6% in Prados (1988). A similar discrepancy can be found

Besides fixed weights, limited coverage is a major liability for any industrial index, and in the case of Carreras' series it reaches 65 per cent in the 1958 benckmark and could be established around 52 and 70 per cent for 1929 and 1913, respectively[46]. The coverage, though acceptable, is still way below that for agriculture and other countries' industrial production indices[47].

An additional and more severe shortcoming of Carreras' series stems from the method used for building the industrial production index. In the construction of his index, Carreras weighted annual physical output for every product by its gross value added unit at each benchmark (1913, 1929, 1958, and 1975), adding up the resulting values into an aggregate series and splicing the series into a single chain index[48].

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between Hoffmann's (1955) and Lewis' (1978) industrial production indices for the United Kingdom.

46 Industrial gross value added was derived from Vandellòs (1925) for 1913 and de Miguel (1935) for 1927. Our coverage figures for 1913 and 1929 are higher than those provided by Carreras (1983) because of our choice of aggregate industrial value added.

47 For the coverage of the agricultural index, see Table 2. The coverage of Carreras' industrial production index is much lower than, i.e., the one constructed by Lewis (1978) for the U.K. which covered 91 per cent of manufacturing and mining value added in 1907.

48 Implicitly, Carreras assumes that for each industry, production indices are representative of real value added indices, as it is usually done in historical national accounts. Cf. Holtfrerich (1983). The final index results from linking the series for 1831-1913 built using the 1913 benchmark, with the series for 1913-1935 (1929 benchmark), the series for 1935-1958 (1958 benchmark), and the series 1958-1981 (1975 benchmark) (Carreras (1991), pp. 74-75).

This series approximates overall industrial performance insofar as the sample of goods from which the industrial output index is derived remains "representative" of the whole industry. Unfortunately, the coverage of different sectors is asymmetrical in Carreras' index and, as one moves backwards in time, the coverage declines and becomes more uneven, increasing the risk of undesired over-representation of particular products since a mere fraction of a subsector can eventually dominate the overall index[49].

An illustration for this argument is provided in Table 4 where the coverage of Carreras' index is shown for the 1958 benchmark. A glance at the table allow us to notice the extent to which its coverage is asymmetrical. Metal industries (basic and transformation) are clearly over-represented and this feature will condition the aggregate industrial index when computed directly as in Carreras' case. Industrial growth will tend to be upwardly biased as a consequence of over-weighting capital goods, since their growth rate is higher than the industry's average[50].

49 Cf. Harley (1982) and Fremdling (1988) for a critique of analogous problems in British and German industrial production indices built by Hoffmann (1955, 1965). A debate on industrial growth in early 19th century Spain along these lines can be found in Prados de la Escosura (1988), chap. 4 and Carreras (1991), chap. 3 (addenda).

50 However, as Morellá (1992) suggests, the Gerschenkron effect, that is, the downward bias in the growth rate introduced by end-year weigthing, may to some extent cancel the over-exaggeration in industrial growth rates caused by capital goods' over-weighting.

TABLE 4

Manufacturing Value Added Shares by Main Sectors in 1958

	(1) Carreras Index's Sample	(2) Manufacturing Gross Value Added	(3) Deviation [ln((1)/(2))]
Chemical	4.15	10.24	-0.90
Cement	1.45	4.42	-1.11
Metal, basic	12.72	6.23	0.71
Metal, transformation	40.75	24.89	0.49
Timber & furniture	0.37	7.11	-2.96
Paper & printing	1.91	4.37	-0.83
Food, beverages	18.09	16.97	0.06
Textile & clothing	17.12	21.14	-0.21
Others	3.44	4.63	-0.30

Sources: Prados de la Escosura (forthcoming) and Carreras (1983).

An alternative procedure is to calculate indices for industrial branches ($IQ_{i,t}$) from which the aggregate index (IQ^{*}_{t}) is derived as a weighted average, using the benchmark shares of each branch within total industrial value added as weights[51].

That is, $$IQ_{i,t} = \Sigma\, q^{i}_{jt}\, p^{i}_{jo} / \Sigma\, q^{i}_{jo}\, p^{i}_{jo} \qquad [1]$$

where q and p represent quantities and prices; o is the benchmark year and t any other year; $j = 1,\ldots,n$, are goods, and $i = 1,\ldots,s$, are sectors; Superindex i denotes quantities and prices of goods included in sector i. Goods in sector i are not included in any other sector.

And $$IQ^{*}_{t} = \Sigma\, IQ_{i,t}\, IP_{i,o} / \Sigma\, IQ_{i,o}\, IP_{i,o} \qquad [2]$$

[51] As it has been shown above the same method was applied in the construction of the agricultural final output series.

where $$IP_{i,o} = \sum p^{i}_{jo} q^{i}_{jo} / \sum p_{jo} q_{jo} \qquad [3]$$

In this case, the problem of representativeness is less acute since the assumptions that each branch's total output evolves as its main components and that its coverage remains unchanged over a given period, are more easily acceptable at branch level than when the whole industry is being considered (as is the case in Carreras' index).

Therefore, in the construction of an index of manufacturing production a two-stage procedure in which the aggregate series is derived as a weighted average of sectoral indices has been followed. Discrepancies between the new index and Carreras' series will stem from disparities in the coverage of industrial branches which, in turn, originate in the method followed for their construction[52].

Quantitative evidence from Carreras (1983) was the basis for the construction of output indices for utilities, manufacturing and mining. For manufacturing ten sub-sectors have been distinguished (those on Table 4 plus rubber and leather industries). Basic series of physical quantities used in Carreras' index have been supplemented with additional

52 In a recent paper, Morellá (1992) has followed this alternative approach and built up an industrial output index for 1935-1958 using, with minor improvements, Carreras' basic series weighted with value added data obtained from the 1958 input-output table. I am grateful to Enric Morellá for having provided me with his unpublished data that I used in an earlier version of this paper.

series for production of wine, alcohol, brandy, beer, meat slaughtering, and timber[53]. Unit value added for a large sample of products in 1913, derived by Carreras (1983) have been extrapolated backwards to 1890 and 1870[54]. Whenever possible directly estimates of unit value added were applied[55]. Also improvements by Morellá (1992) over Carreras (1983) for 1958 unit value added were accepted. Within each industrial sector aggregate series were built at unit value added from different benchmarks and were spliced into single chain indices[56].

Finally, to derive aggregate index numbers for manufacturing (and for mining) sub-sectoral series at 1913, 1929 and 1958 prices (unit value added) were combined to produce chain indices using their ratios for overlapping years. Weights used for these benchmarks were obtained by reflating sectoral output values at 1958 prices (derived from

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53 The sources are Carreras (1983, 1989) and Almarcha et al. (1975). For details and discussion, cf. Prados de la Escosura (forthcoming).

54 Backwards extrapolated with price indices under the assumption that value added/total value ratios remain stable over time, as Carreras (1983) did himself for 1913 and 1929 (cf. Prados de la Escosura (forthcoming)).

55 Estimates for mining, cement and metal industries derived from Coll (1985, 1986), Escudero (1989) and Gómez Mendoza (1984).

56 Thus, for 1850-1870, sectoral indices built using 1870 benchmark's unit value added; for 1870-1890, the geometric mean of indices at 1870 and 1890 unit value added; for 1890-1913, the geometric average of 1890 and 1913 unit value added; for 1913-1929, geometric mean of 1913 and 1929 unit value added; for 1929-1936, at 1929 unit value added; for 1936-1940, geometric average of 1929 and 1958 unit value added; for 1940-1964, at 1958 unit value added (cf. Prados de la Escosura (forthcoming)).

backward extrapolation of 1958 levels with their *quantum* indices) and calculating shares in total manufacturing current value added (see Table A.5)[57]. Thus, 1913 weighted indices were used for 1850-1913; geometrical averages of 1913 and 1929 weigthed indices, for the years 1913-1929; 1929 weighted indices, for 1929-1935; geometrical averages of 1929 and 1958 weighted indices, for 1935-1940; 1958 weighted indices, for 1940-1964. For utilities only gas and electricity output series were available and an aggregate index was obtained with water, gas and electricity contributions to sectoral value added for 1958 in which gas was allocated a larger share to include water supply[58].

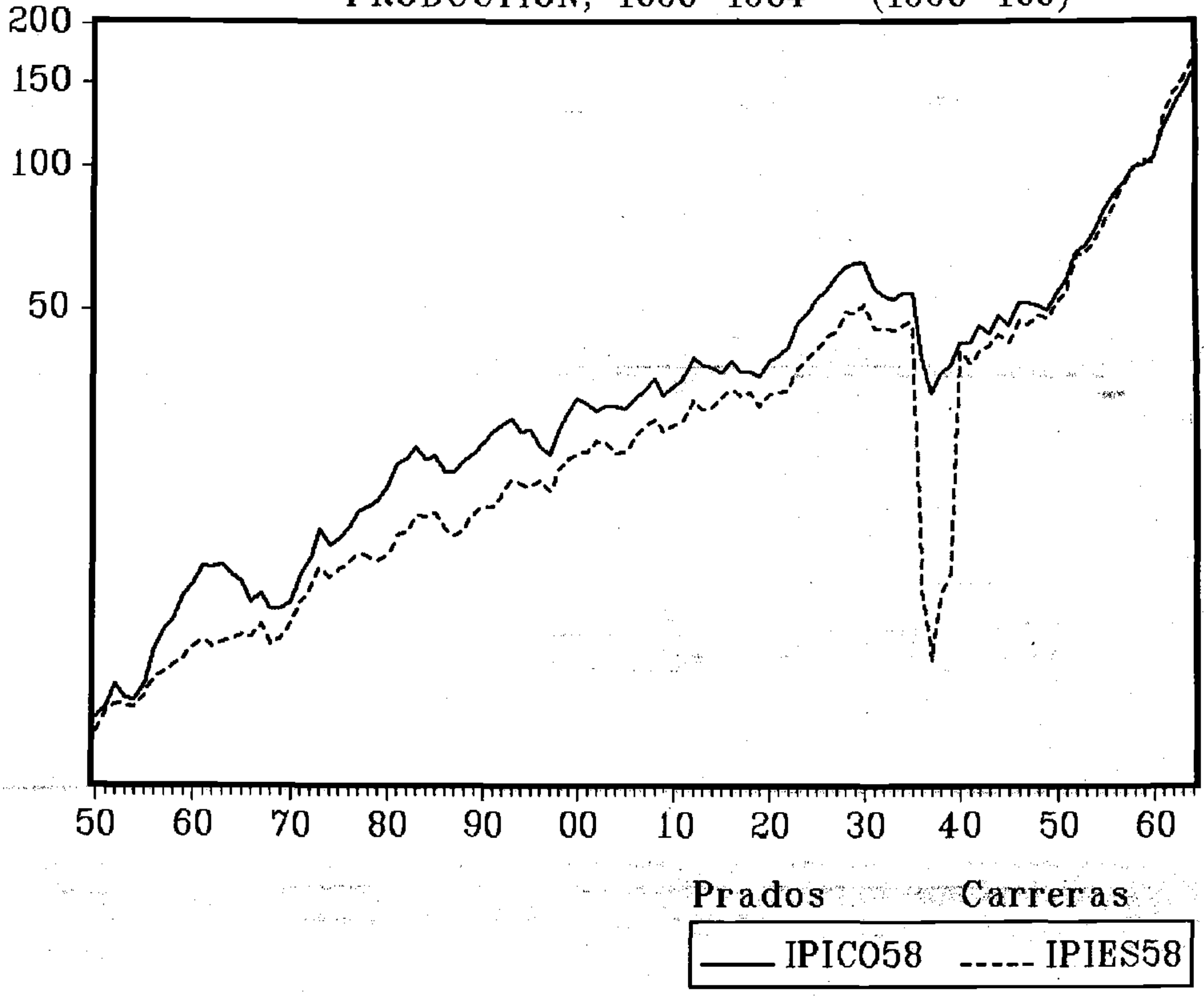
Table 5 and Graph 2B compare industrial performance using Carreras' index and my new series. Though no strong discrepancies appear in the long-run, a more acute cyclical component seems to exist in the new index. Short-term differences between them are noticeable. In the new index a more expansive early period was interrupted after 1890 and up to World War I[59]. Again, a faster recovery up to 1929 was followed by a deeper depression in the early 1930's. Finally,

[57] Prices indices were built from a large sample of detailed price series (cf. Prados de la Escosura (forthcoming)).

[58] In allocating a higher weight to gas, to compensate for the lack of data on water supply, I followed a suggestion by Fenoaltea (1982), p. 627. An alternative index obtained by weigthing gas and electricity output with their prices (unit value added) in 1913, 1929 and 1958 and deriving a chain index from these sub-series casts very close results to those obtained here.

[59] The slowing down for the years 1890-1913 confirms the estimates by Prados de la Escosura (1988) (see above).

GRAPH 1B. ALTERNATIVE INDICES OF INDUSTRIAL PRODUCTION, 1850–1964 (1958=100)



a sharper fall in industrial activity results from the Civil War and the autarchy's years (1940-1958) witnessed a lighter recovery.

TABLE 5

Industrial Growth: Alternative Estimates, 1850-1964
(annual growth rates by exponential fitting (%))

	Carreras	Prados
1850-1870	2.4	3.2
1870-1890	2.3	3.4
1890-1913	2.1	1.5
1913-1929	2.9	3.6
1929-1935	-1.1	-2.9
1935-1940*	-3.1	-4.8
1940-1950	2.6	2.3
1950-1960	7.3	6.8
1850-1890	2.7	3.1
1850-1913	2.4	2.5
1913-1935	2.4	2.5
1940-1960	5.3	4.8
1850-1935	2.3	2.3
1890-1960	1.7	1.5
1850-1964	2.1	2.0

Note: * point-to-point calculation. Carreras' different base-year's indices have been spliced following the same method as for Prados (see above).
Sources: Carreras (1984); text.

For the construction industry three subsectors were distinguished: residential and commercial, railways, and road building. In the case of residential and commercial construction an annual index was obtained by combining data on the stock of urban houses at census dates (augmented by 0.5 per cent per year to account for demolitions and improvements) from which a smooth annual series representing the long-run trend was derived by log-linear interpolation between benchmarks, and data derived from consumption of inputs to allow for yearly fluctuations[60]. Figures for the apparent consumption of cement and timber were available on an annual basis and 1913 and 1929 prices allowed me to produce two weighted indices[61]. The final inputs consumption index is derived by using the 1913 weighted series for 1850-1913, a geometric average of the 1913 and 1929 series for the 1913-1928 period, and the 1929 weigthed series for the years up to 1964. A three-year moving average from the resulting series for inputs consumption was log-linearly regressed against time and the residuals obtained were accepted as an indicator for yearly fluctuations in residential and commercial building[62]. The definitive index was derived

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60 The sources are Tafunell (1989a) and Carreras (1983). There are residential construction indices for several cities, including Madrid and Barcelona for the late 19th and early 20th century, i.e., Tafunell (1989b); Gómez Mendoza (1986). Demolitions and improvements (i.e., increases in the size of houses) have to be added to the increase in the stock of houses to represent construction activity (Cf. Tafunell (1989a)). The percentage for annual increases (0.5%) is taken from Cairncross (1953) who used it to allow for increases in the size of new houses in the U.K. and was accepted by Lewis (1978). In the case of Spain, Bonhome & Bustinza (1969) estimated that in the period 1861-1960, demolitions evolved at an annual rate ranging between 0.21 and 0.31 per cent.

61 I am indebted to Albert Carreras for providing me with information on the apparent consumption of timber and cement in the construction industry, 1849-1958. Cement production for 1959-1964 (Carreras (1989)) was spliced with the inputs consumption series using their ratio for 1956-58. Prices derive from Ministerio de Trabajo (1942).

62 The three-year centered moving average is an attempt to allow for inventories of cement and timber.

multiplying the long-run trend series by the annual fluctuations indicator.

For road and public works (excluding railways) construction Government expenditure on roads and harbours deflated by a wholesale price index was adopted[63].

For railway building new annual construction was represented by a weighted average of the kilometres of lines finished each year and those ended in the next five years[64]. For maintenance, the length of the track in use annually was accepted as a proxy[65]. In order to derive a single index, a weighted average of the two indices obtained for new construction (2/3) and maintenance (1/3) was built up.

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[63] Data for Government expenditure is from Comín (1985b). The wholesale price index, from Ojeda (1988).

[64] This procedure is adapted from Fenoaltea (1984) who allocates the following weights: railways (major), 0.23_i, 03_{i+1}, 0.23_{i+2}, 0.16_{i+3}, 0.08_{i+4}; railways (minor), 0.35_i, 0.5_{i+1}, 0.15_{i+2} (construction of electric railways' tracks are assumed to follow the pattern for minor railways); tramways, 0.25_i, 0.75_{i+1}, where i represents the year in which the new line is finished. Fenoaltea's weights have been adopted assuming that Spain's and Italy's railways took for their construction roughly the same amount of time given the fact that they were built during approximately the same years and both countries present analogous geographical barriers (Cf. Fenoaltea (1992)). The resulting lenghts for tracks built were added up. For Spain, cf. Artola, ed. (1978) and Gómez Mendoza (1982).

[65] Again, I rely on Fenoaltea (1984) although his methods are more detailed and careful, i.e., he weights different kinds of tracks by their widths. Also, Fenoaltea includes the improvements that unfortunately were not incorporated into the index.

Finally, residential and commercial, railways and road and other public works construction were combined into a single index with their 1958 shares in the sector's value added[66]. An overall index of secondary sector's output was derived by weighting the industrial production and construction indices with their contributions to 1958 secondary sector's gross value added[67].

SERVICES.

Services represent the main obstacle in the construction of historical national accounts, especially in the case of those for which no market prices exist[68]. In the estimate of the output of services the use of inputs data (i.e.,

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66 Since only aggregate information for value added in the construction industry was available, actual sub-sectoral shares to build up a single construction index were derived using government expenditure on railways and roads and harbours and value added in residential and commercial building was obtained as a residual. The resulting weights for 1958 were: residential and commercial, 0.6823; railways, 0.0818; roads and other public works, 0.2359. For 1936-1940, data for Government expenditure on roads and harbours was missing, and an index was built up on the basis of residential and railways construction and spliced with the main index using 1935 as a basis for 1936-1938 and 1941 as a basis for 1939-1940.

67 Shares were 0.8689 for industry and 0.1311 for construction.

68 Actually, computing services output is the main difficulty to produce present day's national accounts and represents an unsurmountable obstacle for international comparisons (Cf. Maddison (1983)). For a critique of the measurement of services, see O'Brien (1983) who points out that historically "a high but unmensurable proportion of the output of the service sector was 'intermediate' in the sense that it was closely linked to and dependant upon the production of primary and industrial commodities" (p.81).

employment) was avoided as much as possible and, instead, output indicators and, when available, physical output were used[69]. Otherwise, I had to rely on deflated current price series. Eight major subsectors were considered: commerce, transport and communications, banking and insurance, government, education and health, rents of dwellings, domestic service and liberal professions.

To produce annual indices for different branches of the service sector the following steps were taken. To estimate commercial output, agricultural (including fishing), mining and manufacturing output plus imports of goods were combined with 1958 weights, and a three-year centered moving average was calculated to allow for inventories[70]. For banking services, Tortella's (1985) series of banking gross output, derived by applying a constant short-run interest rate to bank deposits for 1860-1935, was linked to an inter-banking compensations series for 1940-1964, with the help of an overlapping series for creditors of the banking system[71]. The

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[69] When services' output is derived using labour input data, productivity cannot be estimated since by construction it is implicitly assumed that no productivity growth occurs. This is a major shortcoming of Alcaide (1976) estimate for services' output (Cf. Tortella (1987)).

[70] The implicit assumption is that commerce is a linear function of physical output. It amounts to a 19 per cent trading mark-up over their value added in 1958. For imports the sources are Prados de la Escosura (1988) and Tena (1992). Vandellòs (1925) assumed that commerce value added can be represented by 20% of agricultural and mining plus 30% of manufacturing value added.

[71] Linking was done with ratios for 1931/35 and 1941/45. The sources are Tortella (1985) for banking output up to 1935, Almarcha *et alia* (1975), p. 318, for creditors of the banking

resulting series was deflated with a wholesale price index. For education, Government expenditure on primary education deflated by a wholesale price index was combined with the log-linear interpolation of the number of secondary and university students in census years[72]. For public administration, wages and salaries paid by the government were deflated by an consumer price index[73]. For the rent of dwellings it was assumed that it grew at the same rate as the stock of urban houses available at census dates. Annual data was log-linearly interpolated between census dates for which the urban housing stock is known[74]. For domestic service and liberal professions, it was assumed that output evolved as

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system, 1931-1945, and Schwartz (1977), p. 556, for inter-banking compensations, 1940-1964. A critical assessment of the procedures and sources used can be consulted in Tortella (1985).

72 Scanty data on primary education enrollment led me to use Government expenditure. 3:1 and 2:1 ratios to primary enrollment were arbitrarily adopted for secondary and university education in an attempt to allow for the differentials in the value added of education services. Finally, allocated weights were 0.755 for primary, 0.1965, for secondary, and 0.0484 for higher education. I assumed that education services are a plausible proxy for health services.

73 No allowance for government's rents from buildings (and depreciation) was made. Wages and salaries paid by the government are taken from Comín (1985b). The consumer price index comes from Reher and Ballesteros (1993). Alternatively, an index of wages could have been used to deflate the amount of wages and salaries. This procedure would imply that no labour productivity change occurs at all since total wages and salaries paid by the Government, that is, employment numbers times wages, are deflated by a wage index (always under the assumption that wages in the public sector and in the economy as a whole evolve the same). For data on wages, cf. Maluquer de Motes (1989) and Reher & Ballesteros (1993).

74 The source is Tafunell (1989a).

labour force employed in each sector log-linearly interpolated between census years[75].

Transportation and communication services include maritime (coastal and international), road and rail transport plus postal, telegraph and telephone services. For communication services, an unweighted average was derived from indices for the number of parcels sent by post, telegrams and telephone calls[76]. For maritime transport an unweighted average of two indices (with 1913 as the base year) for tons transported in coastal and international trade was adopted[77]. For land transport output data, expressed in ton/km. is only available since 1950 and an index was built for 1950-1964[78]. For the earlier period the road length was available back to 1858, and from 1911 onwards a stock of register motor vehicles was calculated assuming an average life of 12 years[79]. An index was obtained for 1911-1950 employing the geometric mean of index numbers (1913=100) for the stock of vehicles and the road length, which was, then,

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[75] The sources are population census. I am not following here Lewis (1978), p. 264, who assumed a steady labour productivity improvement over time "having regard to the introduction of the typewriter and other economies in administration" for late 19th Century U.K..

[76] Only figures for mail services go back to 1850: telegraph services are recorded from 1860, and telephone services from 1926. Separate indices on the basis of different coverage were built and spliced into a single index number. The sources are Gómez Mendoza (1989) and Mitchell (1992).

[77] Sources are Frax (1981), Gómez Mendoza (1989) and Valdaliso (1991).

[78] The sources is Instituto de Estudios de Transportes y Comunicaciones (1984).

[79] The source is Gómez Mendoza (1989).

spliced with the series for 1950-1964[80]. The resulting index was extended back to 1858 with the series for road length. For transportation services by rail, a series of output measured in metric tons/Km. from 1868 to 1913 was employed and projected backwards to 1850 with the growth of railway tracks[81]. For the period 1913-1964 series of output (ton/Km.) both merchandise and passengers are available, and three indices were derived, weighted by passenger and merchandise rates per kilometer for 1913, 1929 and 1960. A final index was obtained from the geometric means of those with 1913 and 1929 weights for 1913-1935 and those with 1929 and 1960 for 1940-1964. Finally, a single index for transport services was derived by weighting road, sea and rail indices by their contribution to gross value added in 1958[82]. Later, a joint index for transport and communications was calculated[83].

Finally, index numbers for the different branches of the services sector were merged into an aggregate index, with 1870, 1890, 1913, 1929, and 1958 weights, which correspond

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80 I am indebted to Albert Carreras for the idea of building up a stock of motor vehicles.

81 The source is Gómez Mendoza (1989).

82 Weights were 0.5124 for road, 0.1864 for sea, and 0.3012 for rail, and are derived from Contabilidad Nacional de España (1969). For years in which information was incomplete indices were built on partial evidence and spliced with the main index. That was the case for 1936-1939, when only a road transport index was available, and for 1850-1856 when only international transport by sea and rail transport indices existed.

83 Weights were 0.9169 for transport and 0.0831 for communication services and were derived from Contabilidad Nacional de España (1969).

to their contributions to total gross value added in services[84].

GROSS DOMESTIC PRODUCT

Indices for agriculture, industry and services now have to be aggregated in order to obtain an annual series of real gross domestic product. Indirect estimates through index numbers suffer, however, from a well known disease: their economic significance declines as one gets away from the base year. In an attempt to reduce this problem aggregate indices have been constructed weighting output series for agriculture, manufacturing and services using sectoral value added estimates for 1913, 1929, and 1958[85]. Differences between a chain index derived from splicing the three fixed-benchmark indices and the 1958-weighted series resulted to be negligible and I have preferred the latter that maintains the index's additive properties.

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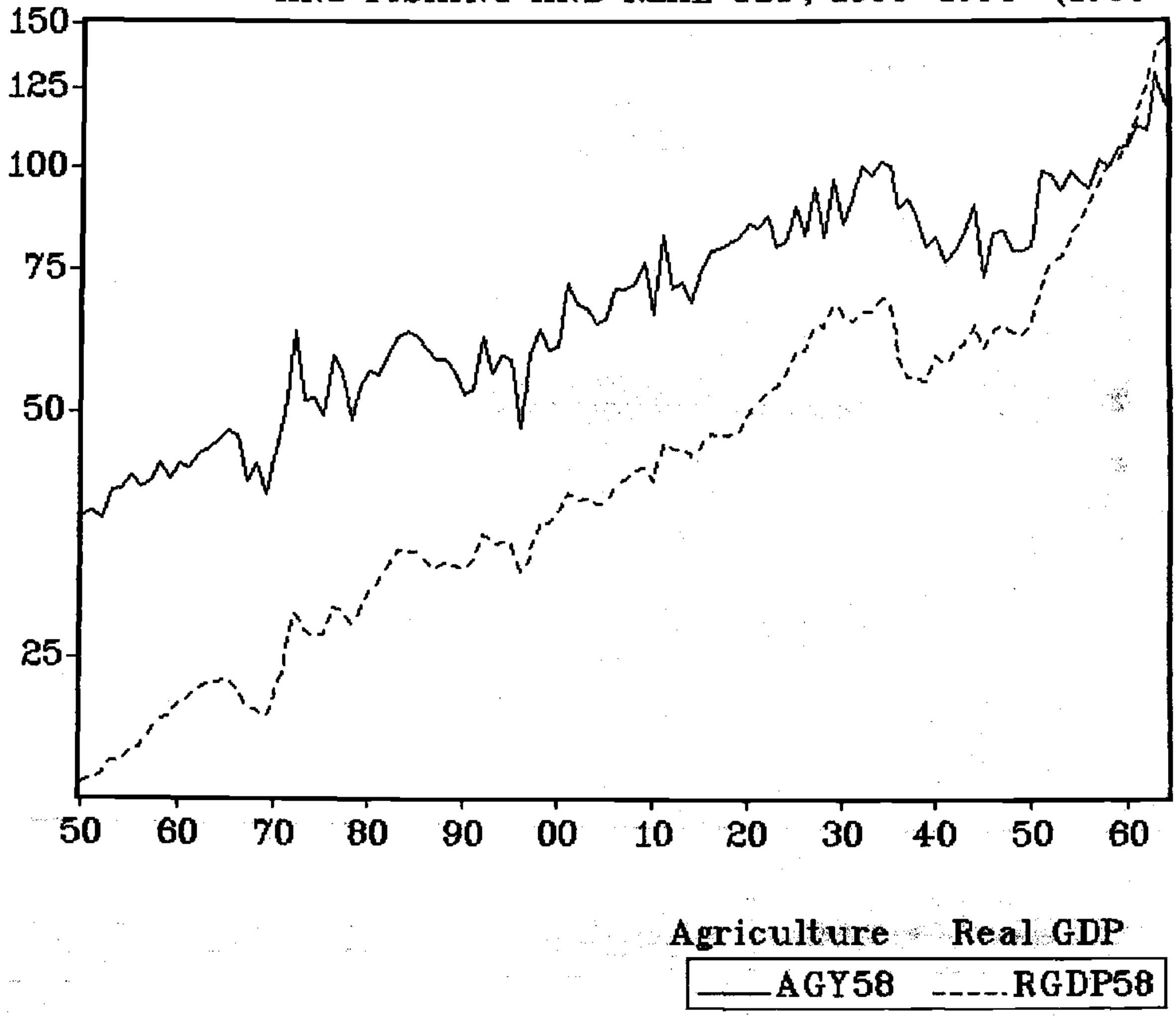
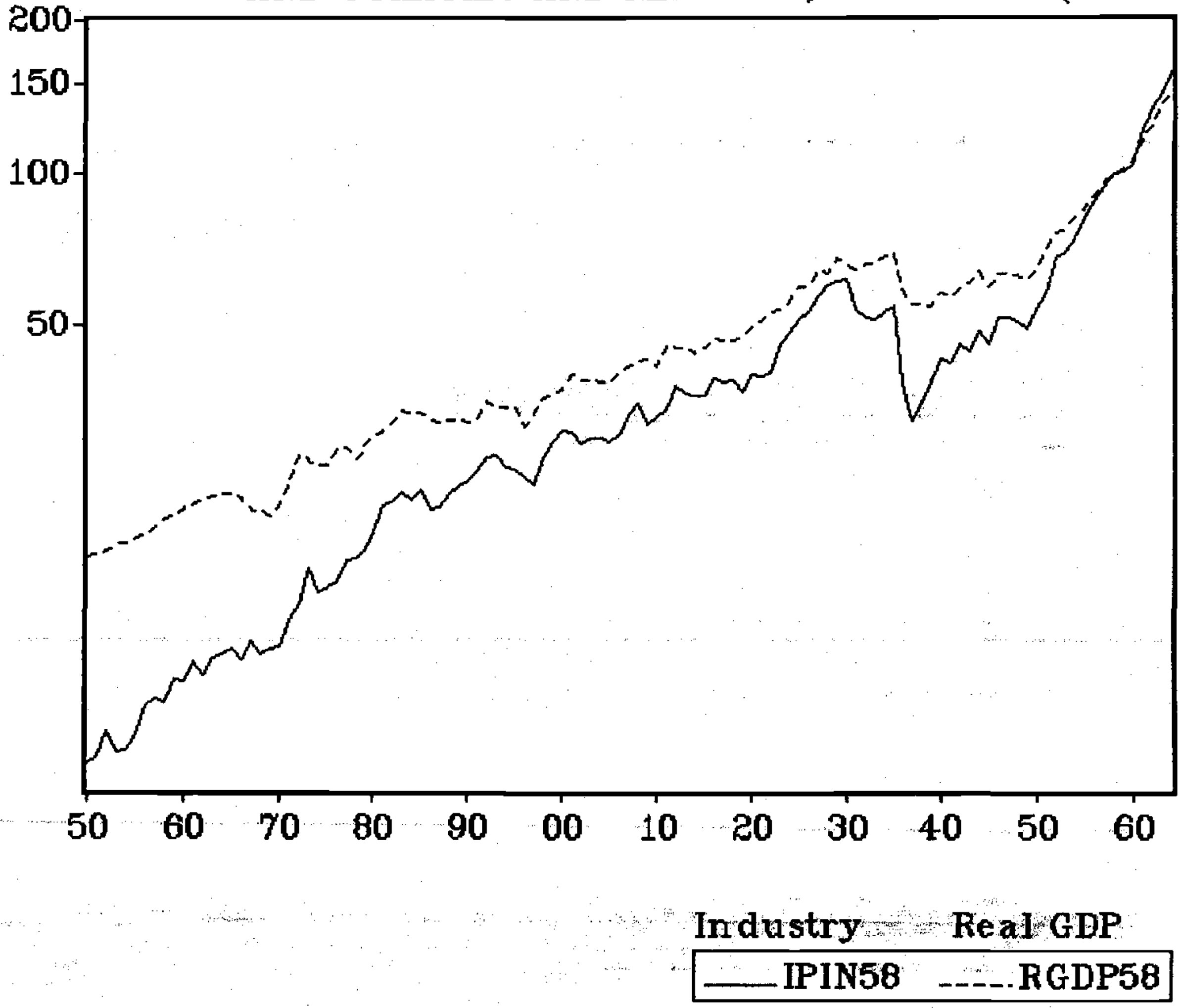
[84] A similar procedure to the one adopted for manufacturing was followed and sectoral shares in current value used. Weights used were derived by reflating sectoral output values at 1958 prices (derived from extrapolating backwards 1958 levels with their *quantum* indices) and obtaining shares in current value added in total services. Sectoral contributions appear in Table A.6.

[85] As for manufacturing and services, weights at current prices were derived from current price estimates of GDP and its sectoral components obtained by linking 1958 gross value added for agriculture, industry and services to real output indices and reflating the resulting value added series at 1958 prices with sectoral deflators (see Table C.6).

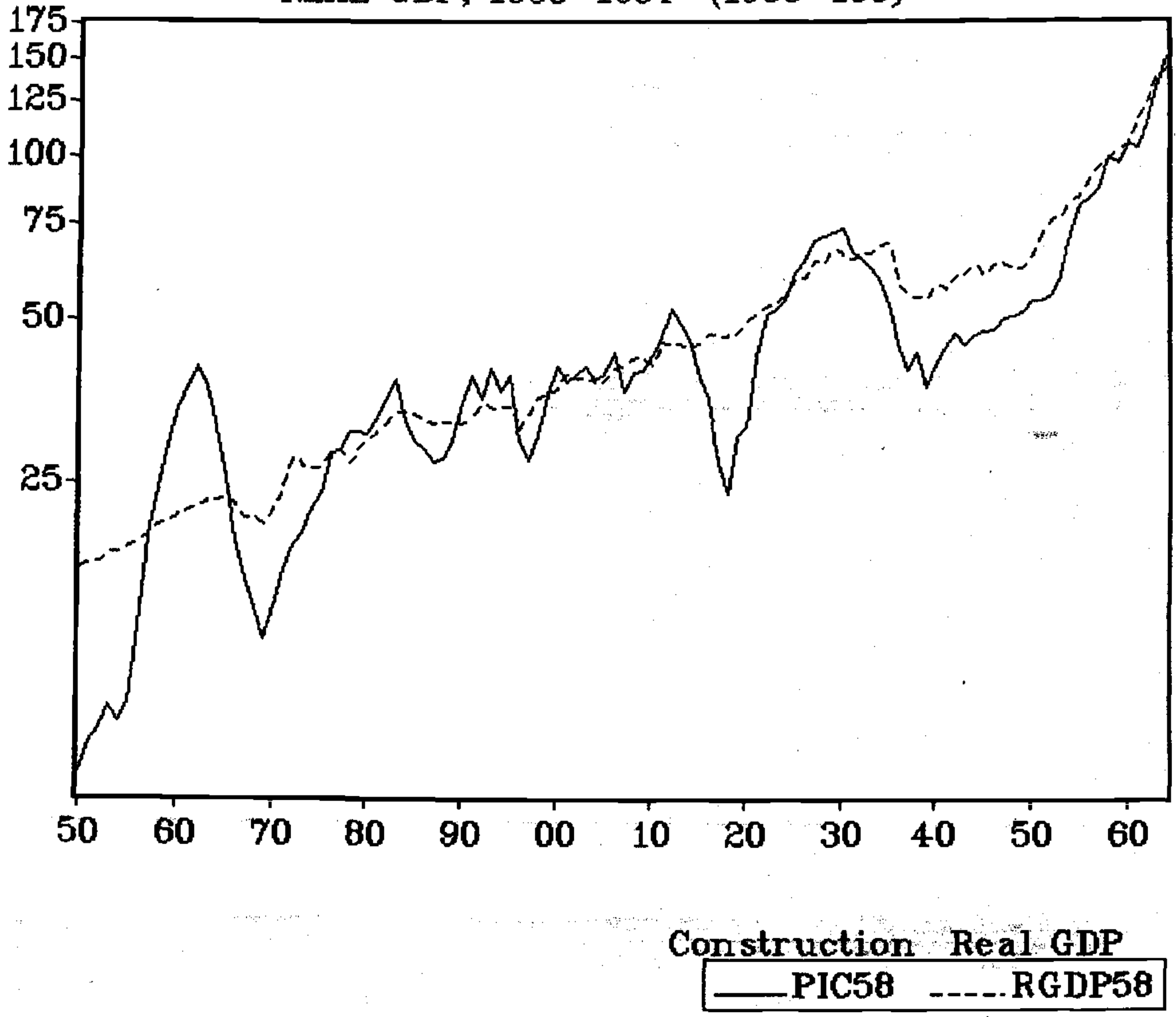
GRAPH 2. GROSS VALUE ADDED IN AGRICULTURE, FORESTRY, AND FISHING AND REAL GDP, 1850–1964 (1958=100)



GRAPH 3. GROSS VALUE ADDED IN MANUFACTURING, MINING, AND UTILITIES AND REAL GDP, 1850–1964 (1958=100)



GRAPH 4. GROSS VALUE ADDED IN CONSTRUCTION AND REAL GDP, 1850–1964 (1958=100)



GRAPH 5. GROSS VALUE ADDED IN SERVICES AND REAL GDP, 1850-1964 (1958=100)

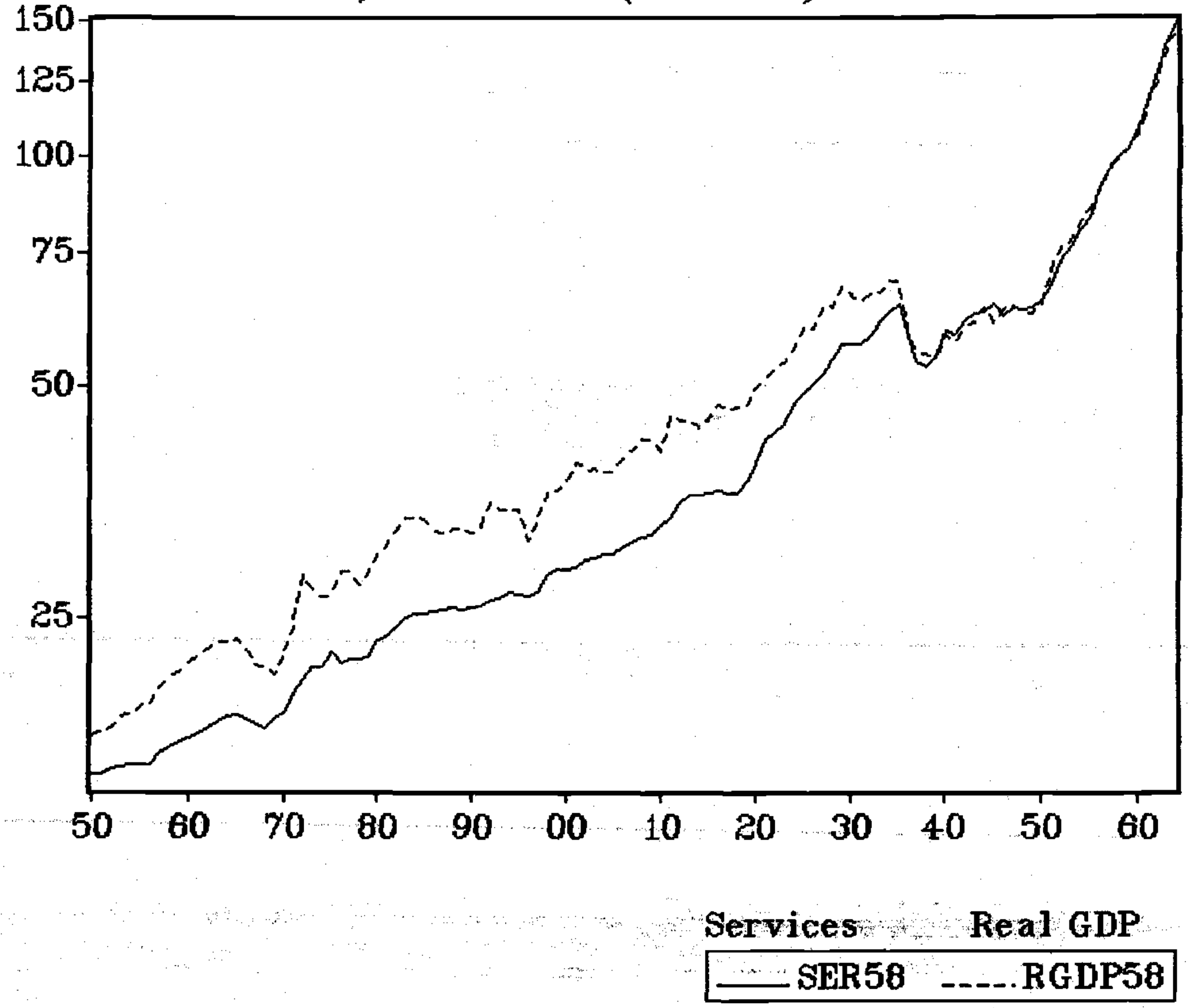


TABLE 6
Spain's GDP: Sectoral Weights in 1958 (%)

Agriculture, forestry & fishing	23.3
Industry & construction	36.0
services	40.7

Sources: Contabilidad Nacional de España (1969).

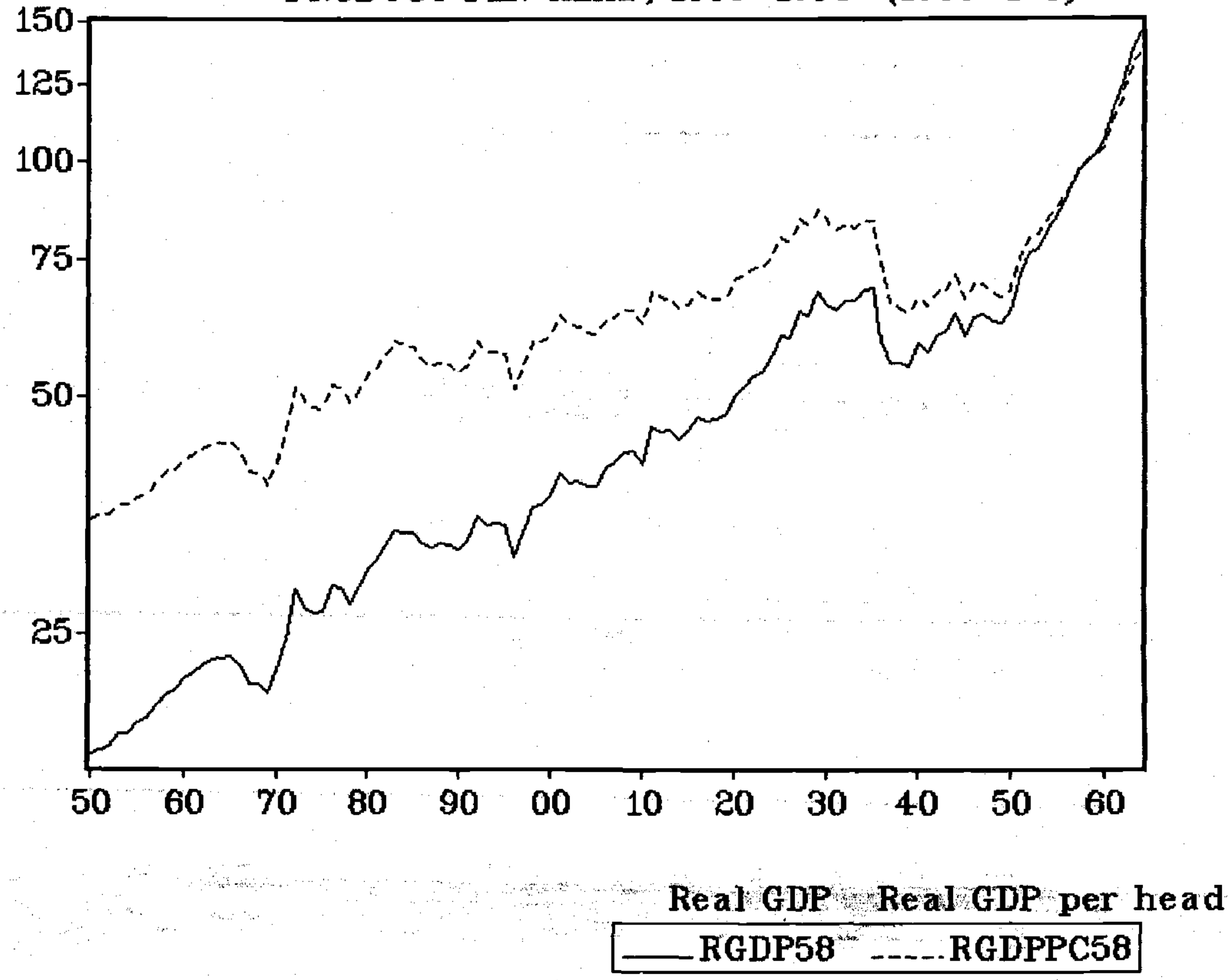
IV.NEW EVIDENCE ON SPANISH ECONOMIC GROWTH

Table 7 presents growth rates for the new series over significant periods in the pre-national accounts era and compare the results to those derived from earlier estimates. Graphs 9-14 illustrate the differences between the alternatives estimates on Spanish Real GDP.

The new series improves the picture of Spanish economic performance in the previous century up to 1960, in particular for the early twentieth century. There is a significant agreement between Carreras (1985) and the new estimates about the Spanish GDP rate of growth over the late 19th and early 20th century, despite discrepances for shorter periods. The new series emphasizes the intensive growth in the moderately free-trading years up to 1890 against the deceleration that followed the closure of the economy brought by the return to high tariff barriers in 1891 and the delayed effects of giving up the peseta's gold convertibility while Carreras' index suggests steady growth[86]. From 1913 to 1960, the new

[86] For Spain and the Gold Standard, cf. Martín Aceña (1992).

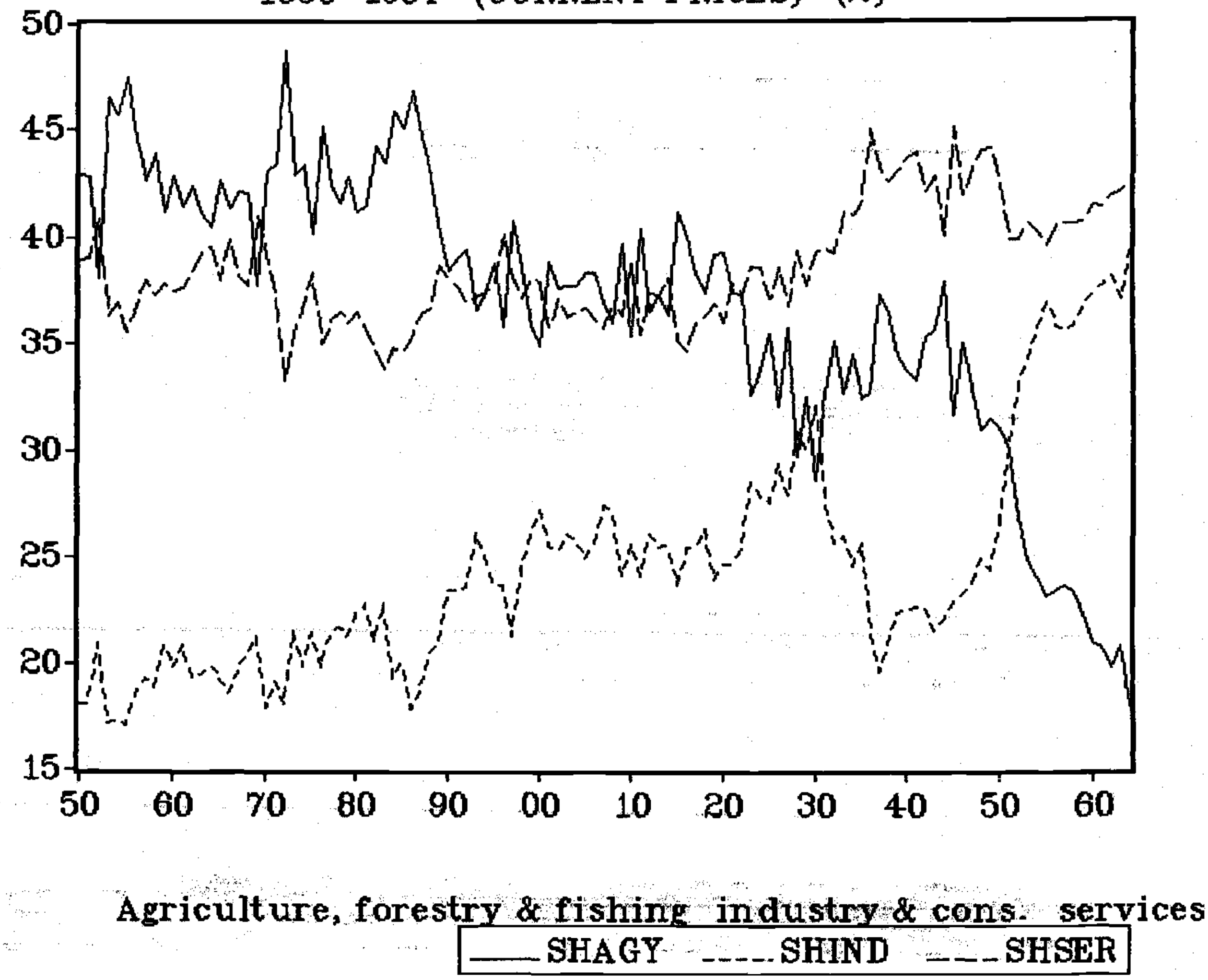
GRAPH 6. REAL GROSS DOMESTIC PRODUCT AND REAL PRODUCT PER HEAD, 1850–1964 (1958=100)



index clearly diverges from earlier estimates. An acceleration in the growth of real product per head took place over 1913-1929 (stronger than pointed out by CEN (1965) and Alcaide (1976)) against Carreras' suggestion of a slowing down during these years. Again, a discrepancy emerges for 1929-1935 in which the new index detects (as CEN and Naredo (1991)) a much milder period of recession than Carreras' estimates. The Civil War (1936-39) represents a heavy blow for the Spanish economy, but in the new index the fall in output is somewhat less dramatic than it has been assumed, as but not as much as has been suggested by Naredo. Finally, the slow recovery after the Civil War, stresses the views about the 1940's by Carreras and Schwartz (1977), against the over-optimistic story propose by Alcaide and Naredo.

A more gradual and more optimistic picture, in general, emerges from the new real GDP series that depicts early 20th century Spain as an accelerating economy up to the Great Depression, then abruptly interrupted by the Civil War, from which it recovered only slowly under the Dictatorship's economic autarchy that lasted until the late 1950's.

GRAPH 7. SECTORAL SHARES IN GROSS DOMESTIC PRODUCT, 1850–1964 (CURRENT PRICES) (%)



GRAPH 8. SECTORAL SHARES IN REAL GROSS DOMESTIC PRODUCT, 1850–1964 (1958 prices) (%)

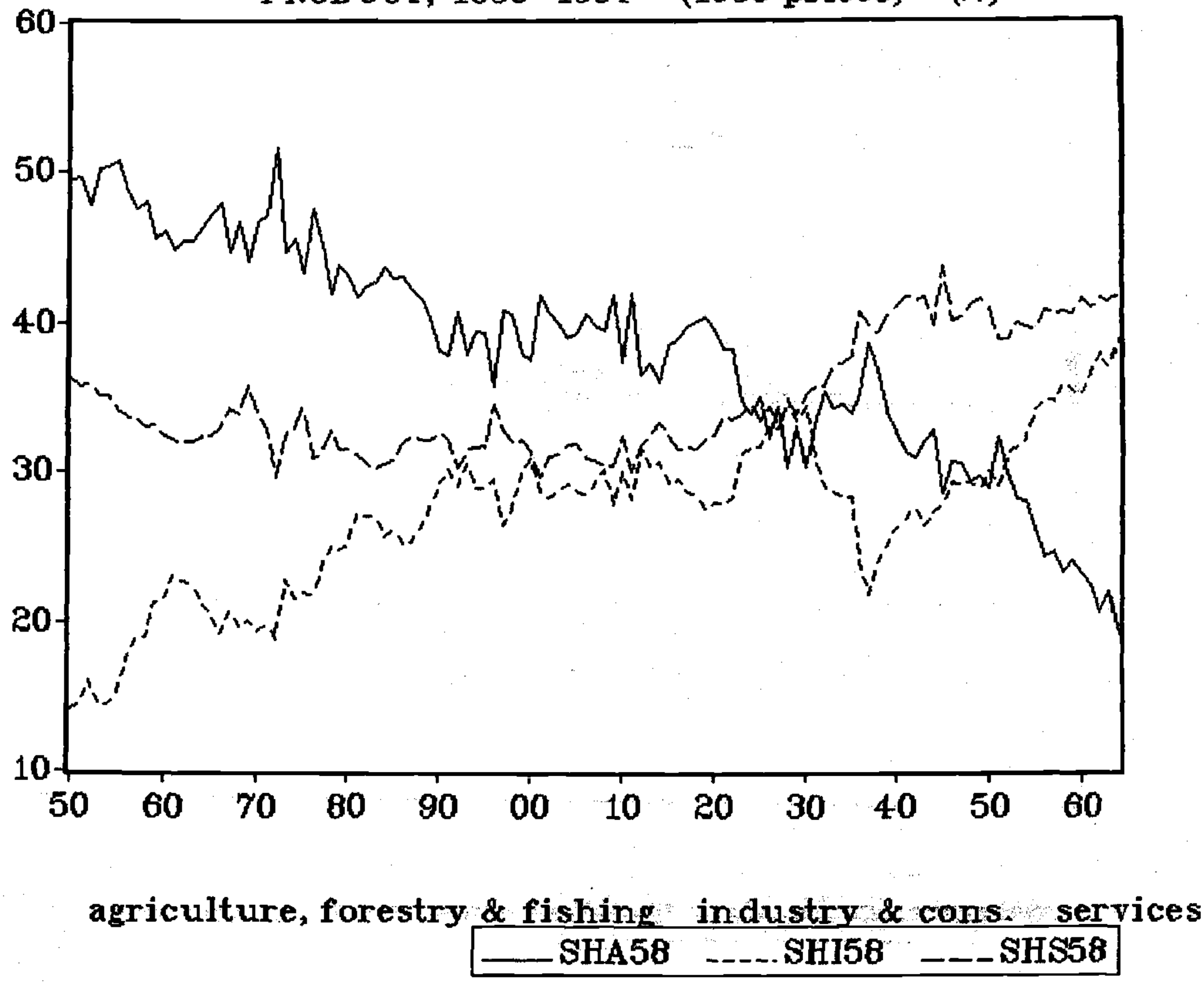


TABLE 7

Growth in Spain's Real GDP per Head since 1850 (%)
(annual growth rates by exponential fitting)

	Prados	Carreras	CEN	Alcaide	Schwartz	Naredo
1850-1890	1.3	1.1	-	-	-	-
1890-1913	0.9	1.0	-	-	-	-
1913-1929	1.8	0.8	1.1	1.2	-	-
1929-1935	-0.4	-1.4	-0.5	0.5	-	-0.5
1935-1940	-4.3	-6.8	-7.6	-6.9	-	-3.0
1940-1950	0.2	0.4	0.8	1.7	0.4	2.7
1950-1964	4.5	3.6	4.2	4.3	5.0	4.4
1850-1913	1.0	0.8	-	-	-	-
1913-1935	1.4	0.3	0.8	1.2	-	-
1940-1964	3.0	2.6	3.8	3.5	3.4	4.0
1850-1964	0.8	0.5				
1890-1964	0.7	0.2				
1900-1990	1.8	1.2	1.7	1.8	-	-
1850-1990	1.3	0.9	-	-	-	-

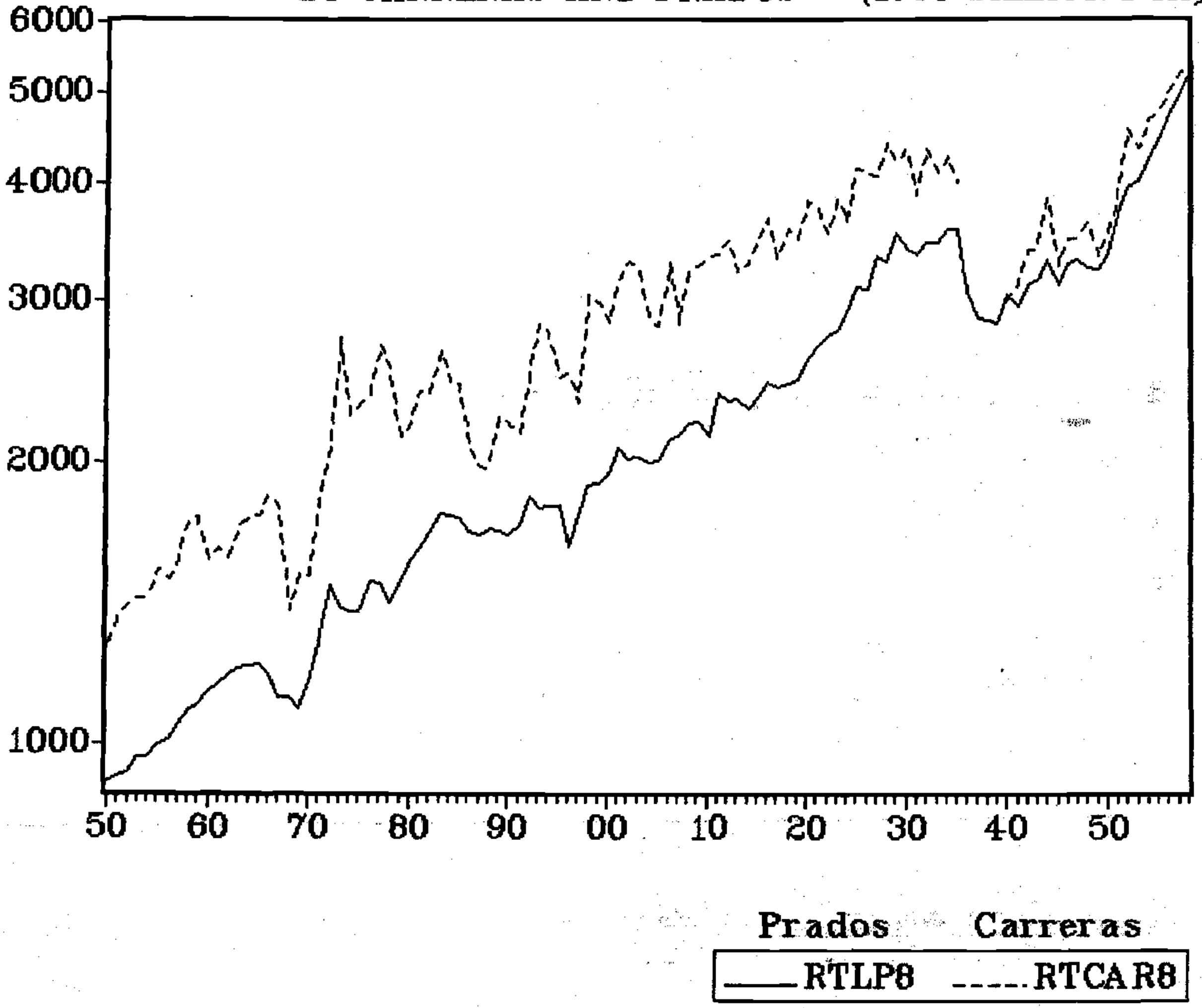
Sources: Appendix, Table D.2.

V. SPAIN'S INTERNATIONAL ECONOMIC PERFORMANCE

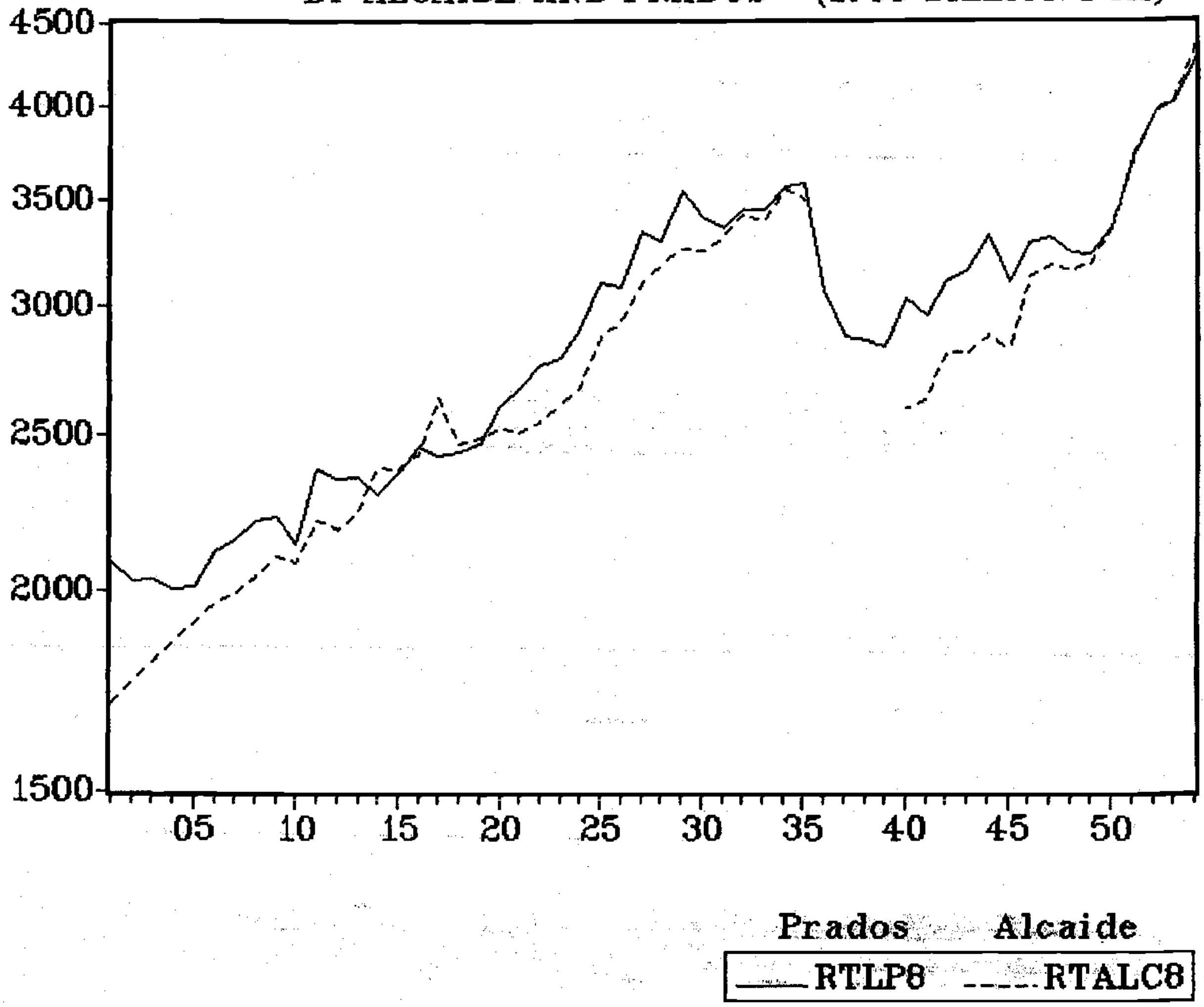
A sensitivity test for the the old and new series can be performed by comparing real product per head between Spain and other countries. Graphs 15-16 and Table 8 present evidence for Spain's comparative performance with real GDP per head expressed in 1960 dollars and adjusted for the peseta's purchasing power parity[87]. Levels of real product per person for 1960 US dollars expressed in purchasing power parity terms were projected backwards with the alternative

[87] 1960 US$ GDP levels from Teresa Dabán and Rafael Domenech (1993) who kindly allowed me to use their unpublished data. Backward extrapolations of 1960 levels seem to reconcile well with sectoral output PPP estimates (Cf. O'Brien & Prados de la Escosura (1992) for European agriculture). Besides, backward projections of 1960 PPP results are more plausible than OECD's (1992) 1990 PPP dollars (EKS).

GRAPH 9. REAL GDP, 1850-1958: ALTERNATIVE ESTIMATES BY CARRERAS AND PRADOS (1980 BILLION PTA)

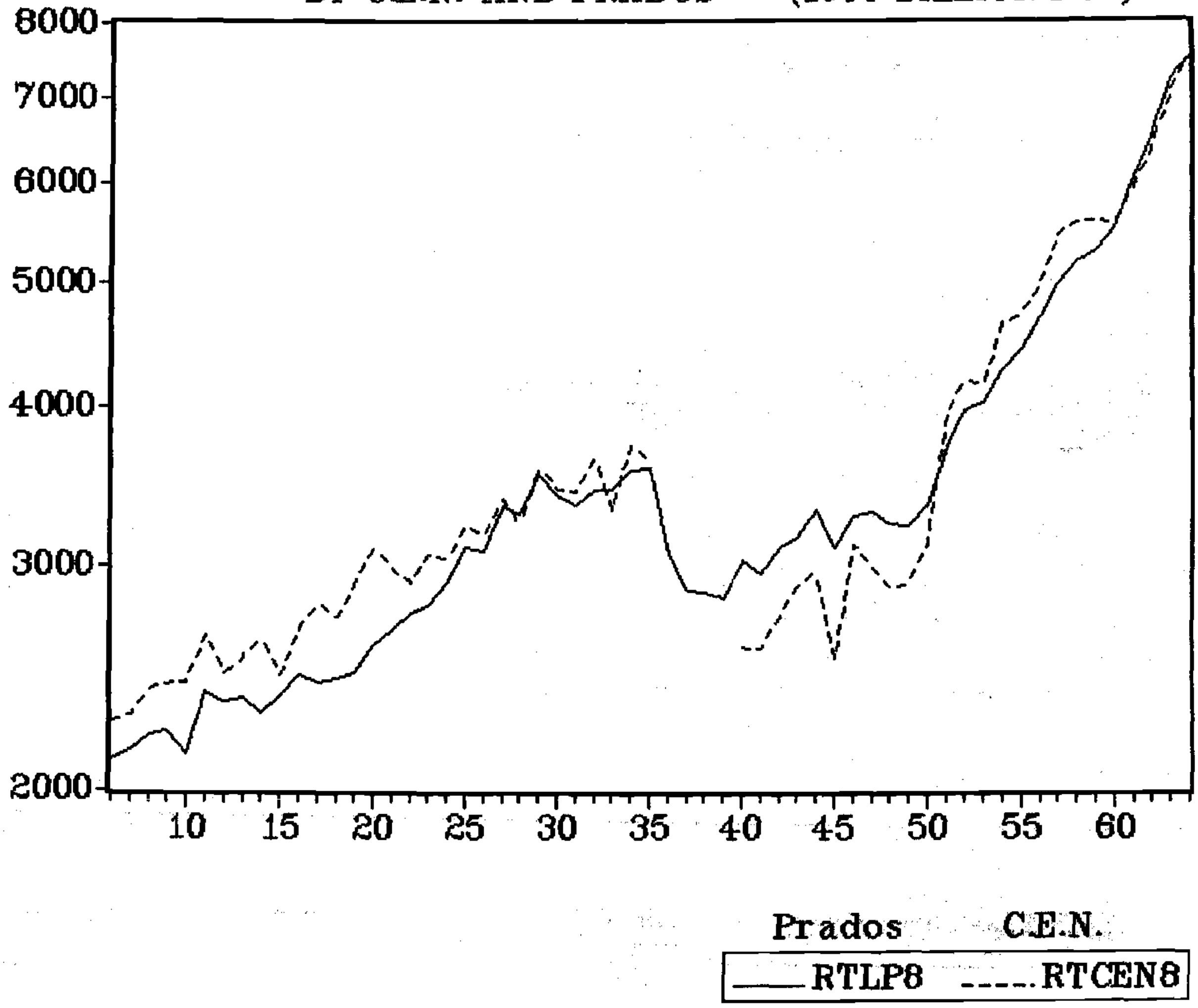


GRAPH 10. REAL GDP, 1901-1954: ALTERNATIVE ESTIMATES
BY ALCAIDE AND PRADOS (1980 BILLION PTA)

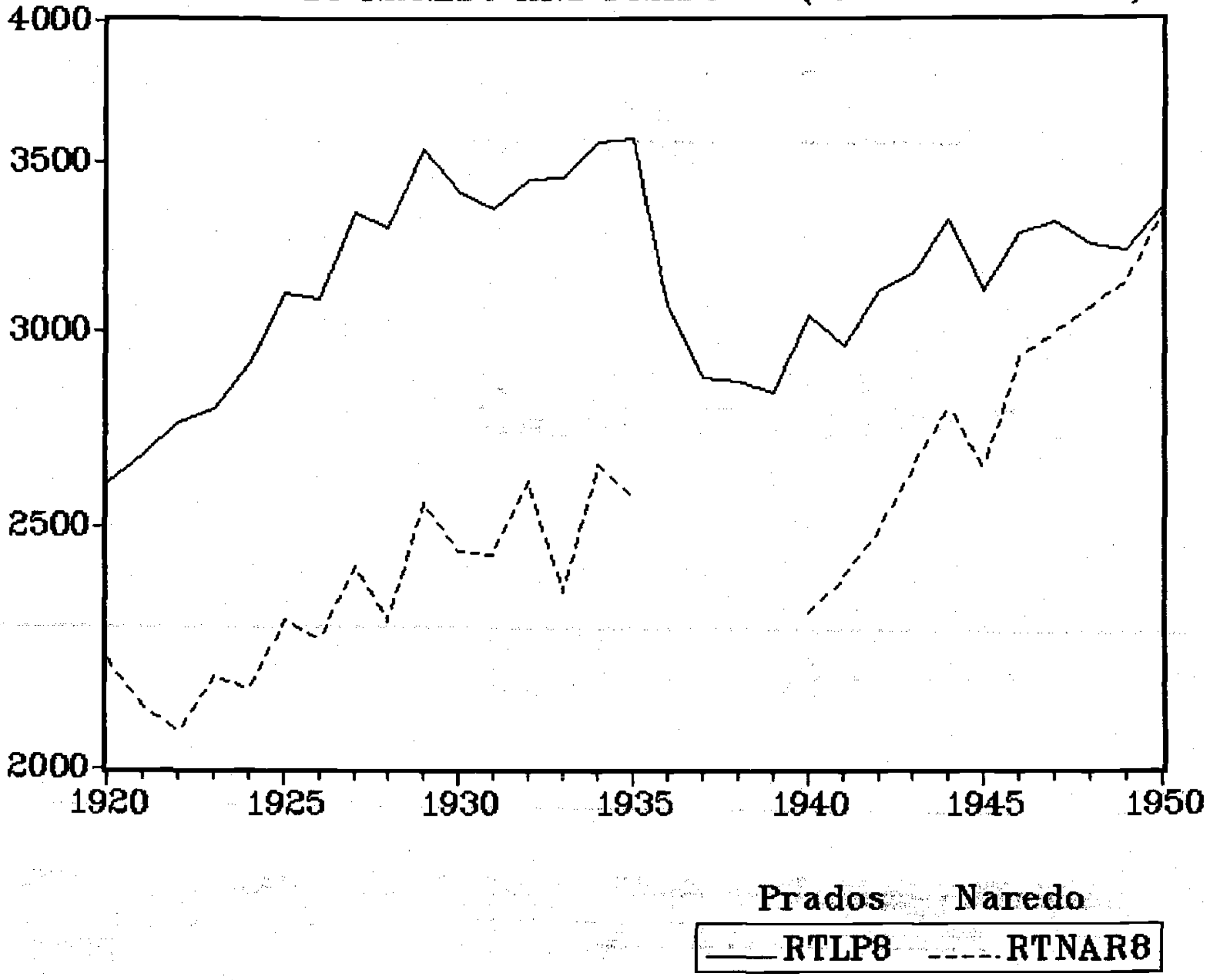


GRAPH 11. REAL GDP, 1906–1964: ALTERNATIVE ESTIMATES

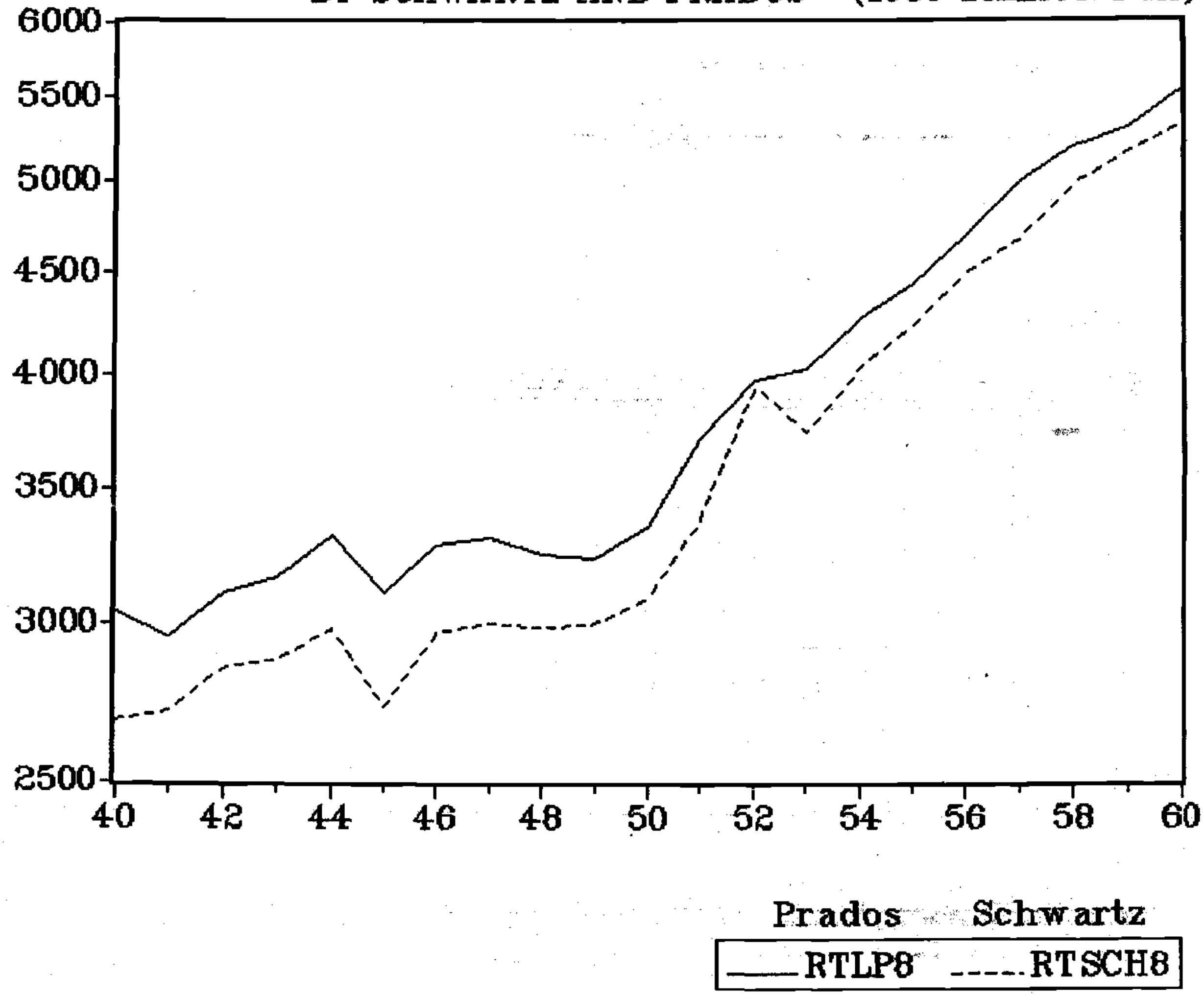
BY C.E.N. AND PRADOS (1980 BILLION PTA)



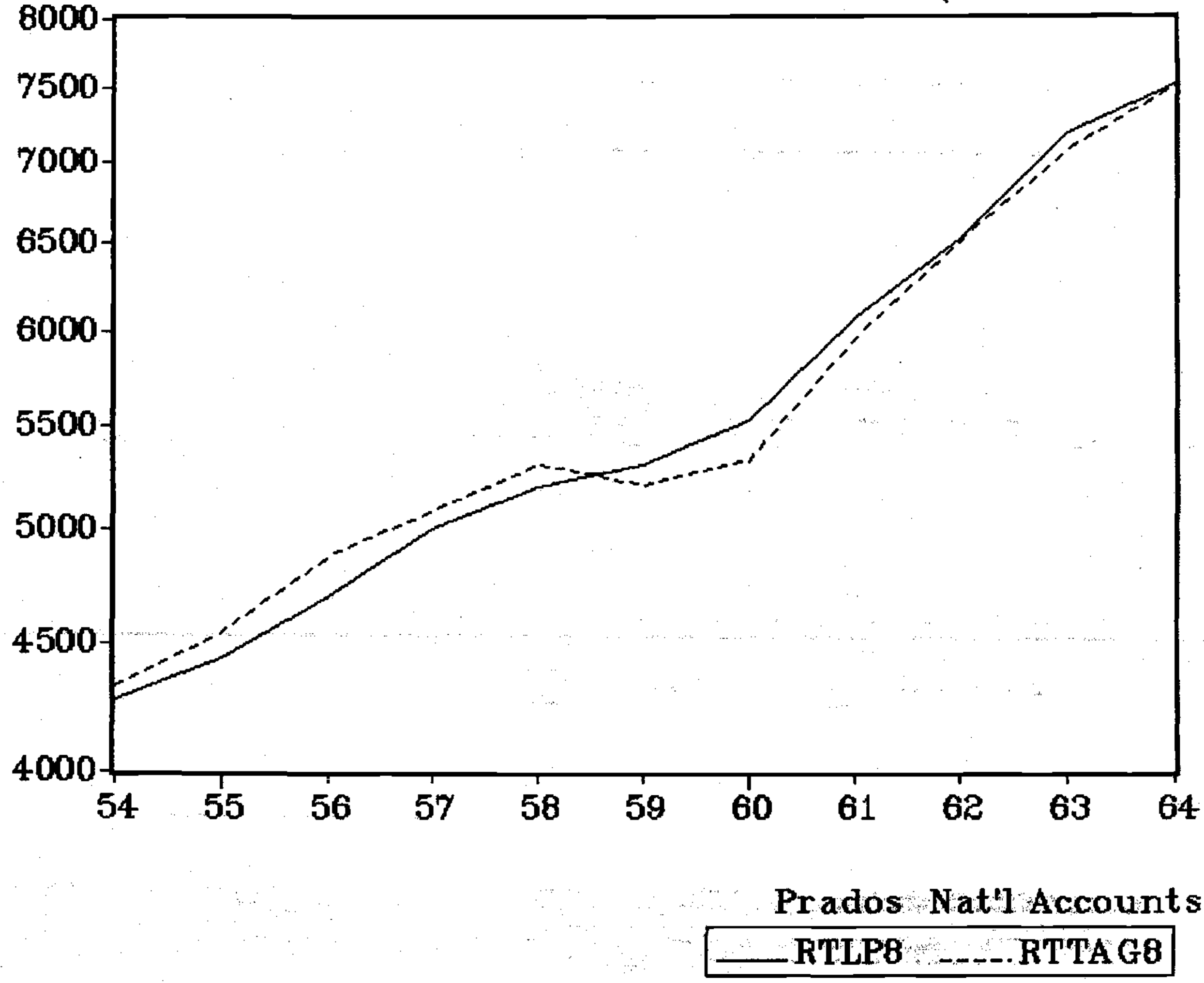
GRAPH 12. REAL GDP, 1920–1950: ALTERNATIVE ESTIMATES BY NAREDO AND PRADOS (1980 BILLION PTA)



GRAPH 13. REAL GDP, 1940–1960: ALTERNATIVE ESTIMATES BY SCHWARTZ AND PRADOS (1980 BILLION PTA)



GRAPH 14. REAL GDP, 1954–1964: NATIONAL ACCOUNTS' SERIES AND PRADOS ESTIMATES (1980 BILLION PTA)

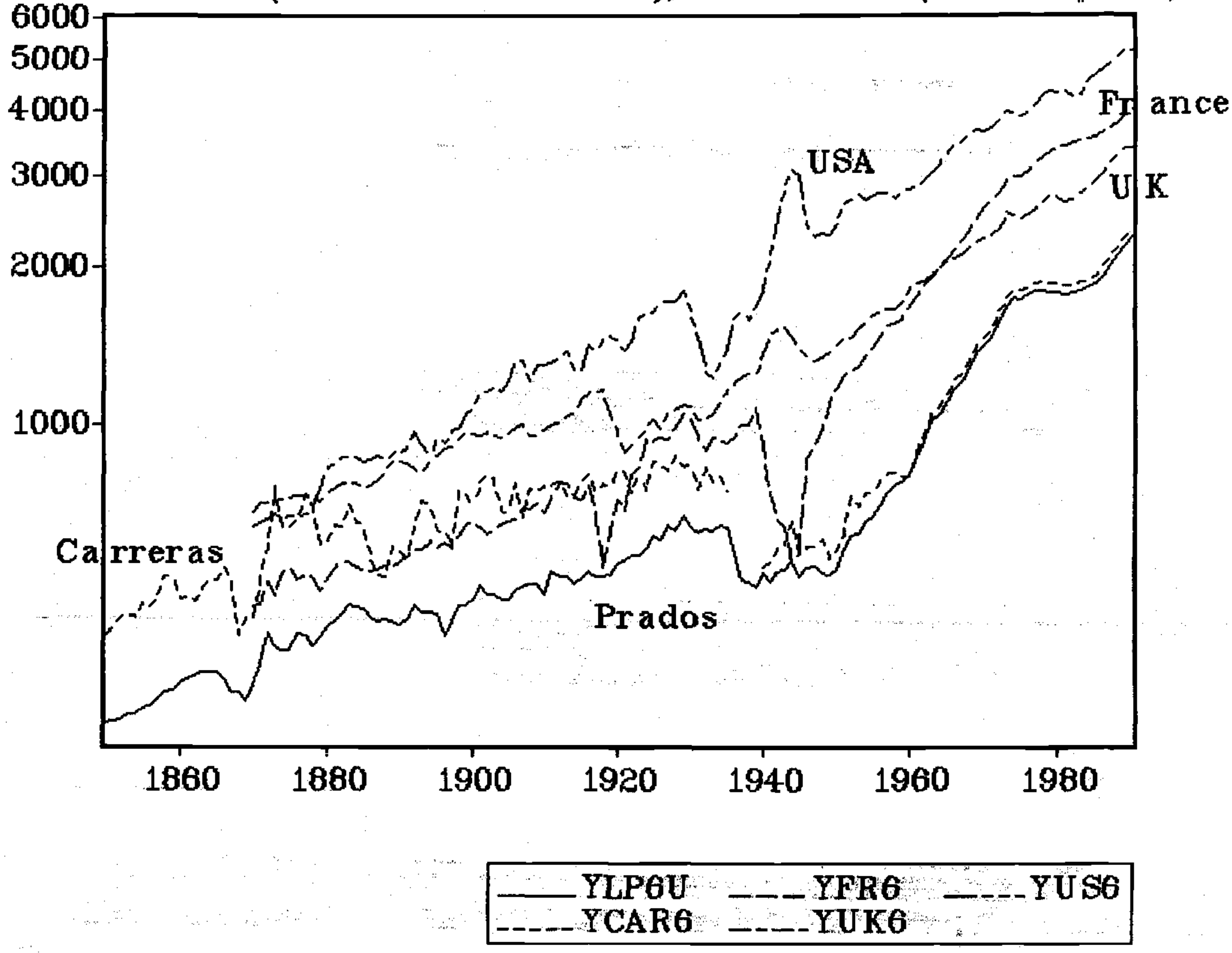


series (Carreras' and my new index) for Spain's real product per head and a similar procedure was used to derive comparable series for other countries[88]. Unfortunately, index number problems arise as one moves away from the present and as economies experienced the changes in relative prices and in the composition of output that are associated to structural change[89]. Therefore, the evidence offered here only allows to provide rough orders of magnitude for Spanish economic performance within the international context. However, the contrast between the performance of the new index and Carreras' series is strong enough to allows the suggestion of a higher degree of confidence for the new series. A glance at graphs 15-16 supports such a contention since it seems highly implausible that Spain reached a higher product per head than France prior to World War I, or that Spain equalled British or US product per head by the late 1870's.

[88] OECD (1992) 1960 levels of product per head converted into 1960 dollars (PPP) by Dabán and Domenech (1993) were projected backwards with annual indices of national real output head derived from Maddison (1991, 1992), for all countries, and Carreras' (1985) and my own estimates for Spain.

[89] Cf. Eichengreen (1986) for a critique of the procedure followed.

GRAPH 15. REAL GDP PER HEAD IN FRANCE, U.K., U.S.A. AND SPAIN (CARRERAS & PRADOS), 1850–1990 (1960 US$ PPP)



GRAPH 16. RELATIVE GDP PER HEAD IN FRANCE, U.K. AND SPAIN (CARRERAS & PRADOS), 1870–1990 1960 US$ PPP (US=100)

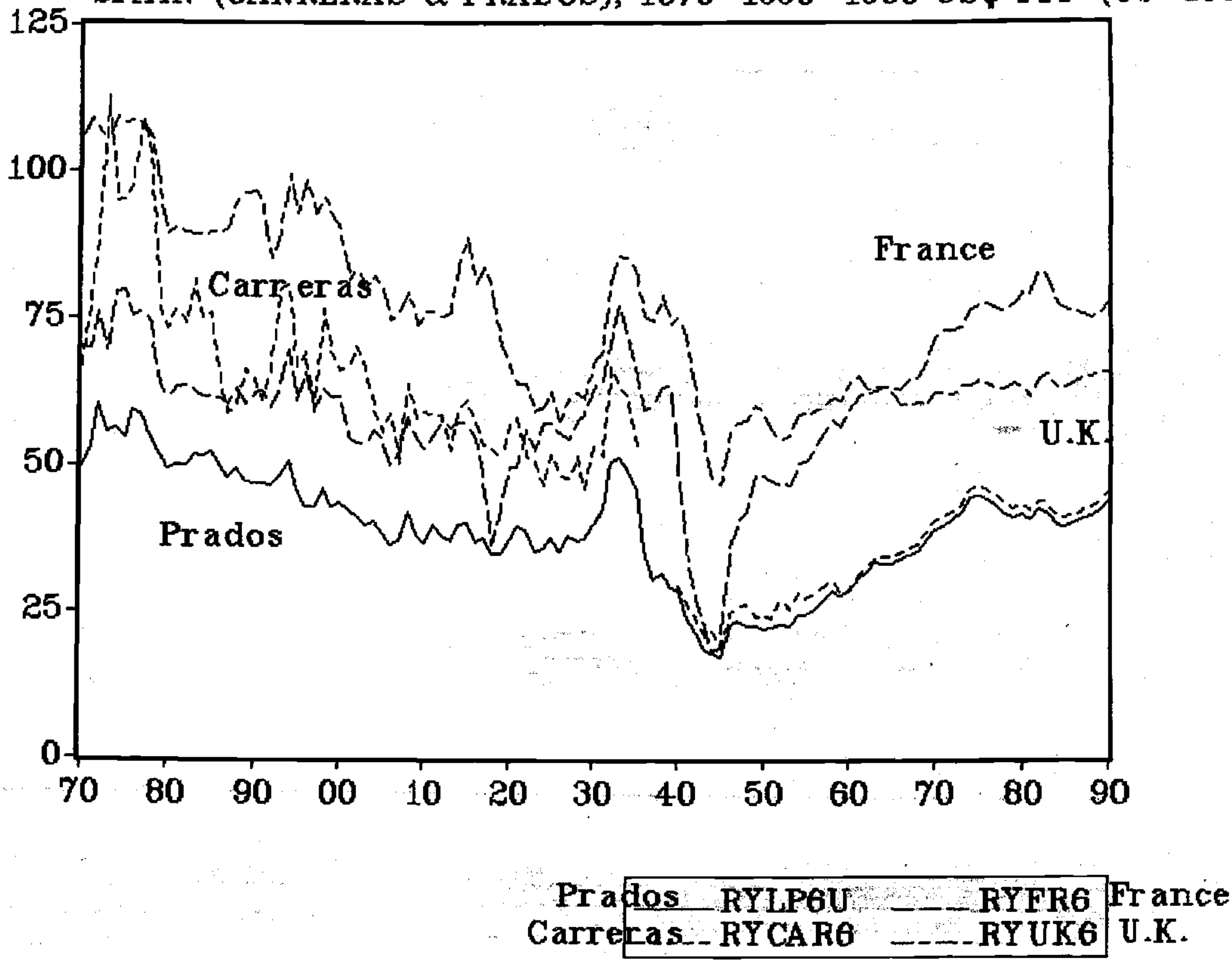


TABLE 8

Real GDP Per Capita Growth in European Countries, 1860-1990
(annual growth rates by exponential fitting)

	Spain	Italy	France	Germany	U.K.
1860-1890	1.3	0.4	1.1	1.4	1.1
1890-1913	0.9	2.4	1.3	1.7	0.9
1919-1938	1.4*	1.0	1.7	2.7	1.3
1950-1960	3.9	5.1	3.6	6.5	2.4
1960-1973	5.3	4.1	4.6	3.5	2.4
1950-1973	4.9	4.8	4.2	4.5	2.4
1973-1990	1.4	2.8	1.5	2.0	2.0
1860-1913	0.9	0.9	1.1	1.6	1.0
1860-1938	0.9**	1.2	1.1	1.3	0.8
1950-1990	3.6	3.9	3.3	3.3	2.2
1860-1990	1.3	1.9	1.7	1.8	1.2

Notes: t co-efficients are highly significant
** For Spain, 1860-1935; * For Spain, 1914-1935.

Sources: Table D.3.

VI. GROSS DOMESTIC PRODUCT AT CURRENT PRICES

This section presents yearly series for GDP and its main components at current prices. As the outcome of a highly temptative exploration nominal GDP figures must be judged as preliminary and, therefore, cautiously used[90].

An effort to construct price indices was carried out from a wide range of price series of uneven quality[91]. The

90 For the sources, a detailed description of the method for the construction of annual indices plus a discussion of the results, cf. Prados de la Escosura (forthcoming).

91 Actually, the dearth of data on 19th century prices have prevented economic historians from building price indices and Sardá (1948) wholesale price index remains to be widely used despite general complaints about its low and biased coverage.

results have been chain Laspeyres price indices for agriculture, manufacturing, mining and construction (1913 and 1958 weighted price indices were spliced) and an implicit deflator for services[92]. In the construction of price indices for agriculture and manufacturing a similar two-stage calculation procedure as the one applied for quantum indices was followed: the aggregate price index was obtained as a weighted average of sub-sectoral price indices.

Gross value added at current prices for agriculture, industry and services have been obtained through reflating the gross value series at 1958 prices, that is, the result of linking the 1958 level to real output indices, by price indices. Nominal GDP was estimated from estimates of sectoral gross value added. An implicit deflator for GDP has resulted from dividing current and constant price series.

Available indices for consumer and wholesale prices in the early 20th century have not been challenged (as is the case of the price index built by the Comisión del Patrón Oro in 1929).

92 In the case of services, the implicit deflator resulted from dividing nominal and real output series. For commerce, a price index was derived from combining agricultural, manufacturing and mining prices with import prices, while wholesale and consumer price indices for other services. Weights for computing the trading price index derived from shares in gross value added (except for imports where total value was accepted) were: 0.3953, agriculture; 0.4575, manufacturing; 0.0339; 0.1133, imports. A wholesale price index was used for education and health, rent of dwellings, and liberal professions (cf. Ojeda (1988)). Reher & Ballesteros (1993) consumer price index was applied to domestic service. Both banking and public administration series were available at current prices. Transport and communications price index was derived as an unweighted average of railway and commerce price indices.