

# **THE CAPITAL STOCK OF THE SPANISH ECONOMY, 1900-1958\***

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**WP-EC 97-17**

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Editor: Instituto Valenciano de Investigaciones Económicas, S.A.  
First Edition December 1997  
ISBN: 84-482-1640-7  
Depósito Legal: V-4798-1997

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\* The estimate forms part of a broader research project on Spanish economic growth in the 20th century. Research support from an IVIE internal grant is gratefully acknowledged. Comments and criticisms are welcome.

\*\* A. Cubel y J. Palafox: Universitat de València.

# **THE CAPITAL STOCK OF THE SPANISH ECONOMY 1900-1958**

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## **ABSTRACT**

This paper provides an estimate of the Spanish stock of physical capital between 1900 and 1958 in 1990 constant pesetas. The series is directly based on the progress made by the quantitative economic history in Spain during the last decade. An additional contribution of the paper is to present the capital/product and capital/labor ratio trends during the period considered.

**KEY WORDS:** Capital stock, capital accumulation, perpetual inventory.

## **RESUMEN**

El documento ofrece una estimación del *stock* de capital físico español durante el periodo 1900-1958 en pesetas constantes de 1990. La serie se basa directamente en el progreso en España de la historia económica cuantitativa durante la última década. Una contribución adicional del trabajo es la presentación de las tendencias de los ratios capital/producto y capital/trabajo del periodo considerado.

**PALABRAS CLAVE:** Stock de capital, acumulación de capital, inventario perpetuo.

## INTRODUCTION

During recent decades, eminent historians of the Spanish economy have dedicated much effort to the precise description of the evolution of the principal macro-economic variables during the last two centuries. One of the fields in which efforts have been most intense is in the estimation of quantitative series which, even with the limitations deriving from the deficiencies in historical statistics, should permit to achieve two objectives: on the one hand, to define the principal characteristics of Spain's economic growth in the 19th and 20th centuries; and on the other, to further test the hypotheses established by the literature on its successes and limitations.

Thus, the fundamental pioneering work of Albert Carreras on industrial production<sup>1</sup> and Gross National Expenditure<sup>2</sup> has been completed by a significant number of contributions, among which outstanding are those relating to the public sector carried out by Comín<sup>3</sup> (continuing the work started by the *Instituto de Estudios Fiscales*<sup>4</sup> (Taxation Studies Institute) or Leandro Prados on foreign trade<sup>5</sup>. At the present time, others projects no less important are at an advanced stage of publication, such as those relating to protection trade levels by Antonio Tena, the evolution of prices from the mid-19th century completed by Jordi Maluquer de Motes, or the successive estimations of the GDP made during recent years by Leandro Prados de la Escosura<sup>6</sup>.

In this framework of quantitative stock-taking for the economic analysis of Spanish history, the publication of a series of public investment and capital by researchers of the *Instituto Valenciano de Investigaciones Económicas* (IVIE) [Valencian Institute for Economic

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<sup>1</sup> A. Carreras, (1984).

<sup>2</sup> A. Carreras, (1985).

<sup>3</sup> F. Comín, (1985).

<sup>4</sup> Instituto de Estudios Fiscales, (1976).

<sup>5</sup> L. Prados de la Escosura, (1982).

<sup>6</sup> L. Prados de la Escosura (1995).

Research] for the BBV Foundation<sup>7</sup> constitute a good opportunity to estimate, combined with other macro-magnitudes, a series in pesetas of one of the key variables within any process of structural change and economic expansion as the one experienced by Spain in the first half of this century: the accumulation of physical capital. This paper, consequently, has a modest aim: to present, together with some very general remarks on its evolution, an estimation of the capital stock of the economy during the first half of the 20th century, directly usable for the testing of hypotheses, very closely based on two of the contributions mentioned above: Albert Carreras' estimation of GNB and the public investment series calculated by the IVIE. Its starting point is, therefore, as with much of the historical research work carried out by researchers trained in the Department of Economics of the University of Valencia in recent years<sup>8</sup>, the impressive research done years ago by Albert Carreras<sup>9</sup>. Paraphrasing Mankiw, Romer and Weil in their influential contribution on convergence in the OECD countries regarding the Solow model, it could be affirmed that this text takes very seriously the results obtained by this Catalan economic historian. On the other hand, we wish to make it clear that the purpose of this paper is just to present the estimation to all those interested in the economic growth of Spain during the 20th century. The testing of the various hypotheses linked to the evolution of the series are outside the scope of this paper, and some of them are the subject of studies in progress.

The paper is divided into five sections. The first makes a synthetic overview of the estimations of national wealth drawn up during the first third of the century which, though of little utility, are a necessary point of reference of the series calculated. In fact, the main aim of this first section is to show that, due to their defects, these estimations are not suitable for estimating the capital stock of the economy. Therefore the similarities and differences between the series obtained here and those obtained in the first half of the century have not been detailed, even when both are evident from the information supplied. In the second section, we explain the method used to calculate the evolution of the net stock of private capital, which is presented in the third section. The fourth is devoted to the presentation of the results obtained. The fifth and last section contains some considerations (voluntarily of a very

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<sup>7</sup> F. Pérez, M. Mas y E. Uriel, (1995).

<sup>8</sup> For example, C. Betrán, (1995), A. Cubel, (1993) and E. Morella (1992), (1997).

<sup>9</sup> A. Carreras, (1983).

general nature given the aims of this paper) on the trends that can be deduced in the capital-product and capital-labor ratios. Finally the appendix contains the yearly series.

## 1. ESTIMATIONS OF NATIONAL WEALTH

The estimations of wealth made in Spain in the first half of the century are numerous. Until the publication of *La Riqueza Comercial de España* [The Commercial Wealth of Spain]<sup>10</sup> by the University of Deusto, however, it cannot be said we have had a minimally reliable calculation. Those made before the Civil War suffer from serious methodological and conceptual problems. The former are a result of calculating by a process of capitalization, attributing an *ad hoc* capital-product ratio to the different sectors, and of the confusion between the components that form wealth and those that form capital. The conceptual problems derive from the confusion between flows and stocks, which leads to adding together income items and capital components. For this reason, these estimations, even acknowledging the effort made by their authors, are a heterogeneous mixture of elements with limited analytical value. Seven estimations were made during the first third of the century. Two by Vandellós, for 1914 and 1923; and those by the Viscount of Eza (1915), Barthe (1917), Ceballos (1919), Banco Urquijo (1924) and De Miguel (1933). After the Civil War the Consejo de Economía Nacional<sup>11</sup> [National Economic Council] made a new calculation for the period 1913-1935 with a different methodology from that used for the earlier ones.

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<sup>10</sup> Universidad de Deusto, (1968).

<sup>11</sup> Consejo de Economía Nacional, (1945).

**TABLE 1**  
**NATIONAL WEALTH ESTIMATIONS**  
Millions current pesetas

	<b>VANDELLÓS</b>	<b>EZA</b>	<b>BARTHE</b>	<b>CEBALLOS</b>	<b>VANDELLÓS</b>	<b>BCO. URQUIJO</b>	<b>DE MIGUEL</b>
	<b>1914</b>	<b>1915</b>	<b>1917</b>	<b>1919</b>	<b>1923</b>	<b>1924</b>	<b>1933</b>
Agriculture and cattle	32.500.000	30.000.000	31.500.000	123.526.110	67.000.000	86.794.000	107.217.000
Fishery, navigation and commerce				1.000.000			
Industry		13.000.000		5.000.000		48.247.000	74.824.000
Buildings	14.500.000	15.000.000	12.500.000	32.794.640	25.000.000	35.700.000	52.883.500
Public Debt	8.300.000	9.809.275	9.000.000	13.359.300	13.000.000	12.623.000	20.964.700
Mines	2.000.000	2.300.000		5.000.000	3.000.000	7.093.000	9.078.830
Railways		2.000.000				7.000.000	6.087.674
Navigation		500.000				300.000	203.100
Tramways		100.000	215.029.050				
Public Utilities		150.000					
Savings		419.000					
Bank Deposits	500.000	1.500.000	200.000	3.881.000	1.600.000	6.179.000	
Annual Savings		700.000					
Insurances		300.000					
Forestry and hunting				500.000			
Trade				10.500.000			
Corporation Securities	6.000.000		6.000.000	12.500.000	12.500.000	9.500.000	
Gold and Silver (coins)	1.600.000		2.000.000	3.548.000	3.900.000	3.214.000	
Capitals invested abroad				2.500.000			
Loan to France				420.000			
Jewlery and work arts				500.000			
Inventories			1.500.000			1.500.000	
Tools			1.800.000				
Household furniture	5.600.000		9.000.000		13.000.000		
Diverse assets	7.000.000				16.000.000		
Spanish assets abroad minus foreing assets in Spain	- 1.000.000						
<b>TOTAL</b>	<b>77.000.000</b>	<b>75.778.275</b>	<b>73.500.000</b>	<b>215.029.050</b>	<b>155.000.000</b>	<b>218.150.000</b>	<b>271.258.804</b>

The first estimation was by the Viscount of Eza and was published in his book *El problema económico de España*<sup>12</sup> [The Economic Problem of Spain]. His calculation gives a figure for national wealth in 1915 of 75.000 million pesetas. As can be seen in Table 1, the result is a mixture of items without any clear economic sense, which makes it difficult to evaluate its reliability. Furthermore, the author makes no comment on the method used to quantify each of his headings. However, it is useful in summarizing the type of confusions incurred by the pioneers of the calculation of aggregated values. As can be seen in the table, the national debt is included as an estimate of public capital, without taking into account the possibility of financing public services by ordinary revenue. Also, the aggregate includes items that really belong to income, such as annual national savings, or incurs in dual accounting by calculating urban, agrarian or industrial wealth in services and including at the same time the credits, loans or savings capital that are but a counterpart of the wealth figures.

In 1917, Andrés Barthe<sup>13</sup> attempted a new estimation with very similar results to those of the Viscount of Eza's calculations. Against the latter's 75.770 million pesetas, Barthe estimated a wealth of 73.500 million. Here end the similarities, however. His method was to capitalize annual income from production. Urban wealth was capitalized at 4% and rural at 3,5%, while livestock was calculated by multiplying the number of heads by an average value. The rest was estimated by direct valuation, in some cases by mere intuition, with no basis to support its rigor. To these objections must be added the inclusion of such heterogeneous items as gold and silver or accounts in the Bank of Spain.

Ceballos Teresí<sup>14</sup> attempted a new estimation for 1919. As was then usual, the calculation is a combination of capitalizations of the annual income from various productions and of subjective estimations of items which in some cases are income and in others wealth. He also counted some items twice, by including the physical assets of industrial wealth and their equivalent on the balance sheet, the shares of the corporations. The valuation reaches 215.000 million pesetas, and is difficult to compare with the others as it is formed by different items.

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<sup>12</sup> Vizconde de Eza, (1916).

<sup>13</sup> A. Barthe, (1971).

<sup>14</sup> Ceballos Teresí, (1931).

Of all the estimations of the first third of the century, the best known is that of Vandellós<sup>15</sup>, which offers figures for two years: 1914 and 1923. His method is closer to current methodological concerns, and indeed his paper begins with a criticism of the estimations by the Viscount of Eza and Barthe, in which he points out the heterogeneity of the items included in their calculations and their lack of clarity. Vandellós's method is to capitalize mining and agricultural wealth, at 4 and 5 per cent respectively. The remaining items are estimated directly by inventory, either by finding and average price and multiplying it by the stock, as in the case of urban wealth or securities, or by computing directly the accounting value of inventories. He thus obtained a value of 77.000 million pesetas of wealth in 1914, which would increase to 155.000 million after the war. Vandellós's estimations are, without a doubt, more reliable than the previous ones. However, they continue to present conceptual problems with the inclusion of savings deposits or debentures as part of the securities value of firms.

In 1924 the Banco Urquijo<sup>16</sup> made an estimation of wealth using the results of its previous sector studies. We will not repeat the problems of this estimation, which can be deduced from the observation of the items included in the table. We should just mention the persistence of the problems with the meaning of the concept of wealth and that the figure obtained was 218.000 million pesetas.

The calculations by Antonio de Miguel in his work *El potencial económico de España*<sup>17</sup> [The Economic Potential of Spain] offer greater reliability. Most of his items are estimated by capitalizing annual income. Thus, agricultural and livestock production are capitalized at 12 per cent to obtain the 86.790 million pesetas for the first and 20.427 million for the second. Mining and industry are capitalized at 15 per cent; property computed from an estimation of the value of existing buildings; the merchant navy is valued by inventory and the railways by capitalizing them at 10 per cent. Finally, the Treasury Debt is included for the value of the bonds issued. The sum of all these items gives a wealth of 271.000 million pesetas in 1933.

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<sup>15</sup> J.A. Vandellós, (1955).

<sup>16</sup> Banco Urquijo, (1924).

<sup>17</sup> A. de Miguel, (1935).



From this brief summary it is easy to deduce that the main features of the estimations by contemporaries all present notable defects from a modern methodological point of view. Without denying their merits, the problems mentioned made it advisable to undertake the calculation of a capital stock series in pesetas that, being based on more rigorous criteria, would correct most of the problems just mentioned. The synthesis of these results is contained in the following sections.

## 2. METHODOLOGY

By private capital stock we understand those durable, tangible, reproducible assets owned by the private sector of the economy and situated in Spanish territory, regardless of the owner's nationality. The concept corresponds to that of gross fixed capital formation in terms of the National Accounts, and does not include non-reproducible assets such as land, mineral and forest wealth, intangible assets like patents, inventories or consumer durable. The calculations are based on the perpetual inventory method, the stock being derived from the investment series. The gross capital stock in a particular year is obtained by accumulating past investment flows and deducting from these the cumulative value of the investment already retired. The net capital stock represents the cumulative value, less depreciation, of the existing gross stock.

According to the foregoing definitions, the gross capital stock at the end of year  $t$  of asset  $i$  is the sum of the past acquisitions of that asset less the retirements that have taken place since its acquisition.

$$KB_t^i = KB_t^i + IB_t^i - R_t^i \quad (1)$$

$$R_t^i = \sum_{j=0}^{M_i} r_j^i IB_{t-j}^i \quad (2)$$

where  $KB_t^i$  is the gross capital stock of asset  $i$  in the period  $t$ ;  $IB$  the gross investment in  $i$  during period  $t$ ;  $R_t^i$  the retirements of asset  $i$  occurring during period  $t$ ; and  $M_i$  the maximum

lifetime of the asset. From (1) and (2) the following expression can be deduced, in which the gross capital stock depends only on investments made in previous periods.

$$KB_t^i = \sum_{j=0}^{M_i} (1 - r_j^i) IB_{t-j} \quad (3)$$

where  $r_j^i$  is the retirement rate of asset  $i$  after  $j-1$  periods of having made the investment.

The assumption that assets disappear after a period of time allows us to ignore the addends after  $t-M_i$  and to obtain the gross capital stock series as an accumulation of past investments without the need to know the initial stock. To determine the date of retirement of the assets, in this estimation we have used the method known as "sudden death" or "simultaneous exit" which considers that fixed assets acquired in the same period of time disappear simultaneously from the stock after  $t$  periods, there being no retirement until that moment.

The net capital stock is the depreciated value of the gross stock generated by use and obsolescence. It is calculated in a similar way to the gross stock but taking depreciation into account.

$$KN_t^i = \sum_{j=0}^{M_i} (1 - r_j^i) IB_{t-j} d_j^i \quad (4)$$

where  $d_j^i$  is the proportion of fixed assets acquired in  $t-j$  which have not been amortized in  $t$ . The method used was linear depreciation, which applies a constant depreciation rate over the whole life of the asset.

One problem to be solved is the value of the stock of assets at the end of year  $t$ , estimated by the perpetual inventory method. The stock is the result of the accumulation of fixed assets acquired in the period from  $t-M_i$  until moment  $t$ , so the estimate of the investment series, and therefore of the stock itself, can be done on the basis of three criteria: historical (or original) cost; constant replacement cost; and current replacement cost. In this paper we

use constant cost valuing derived from an investment series valued in constant pesetas of a benchmark year.

With the perpetual inventory methodology two alternative procedures can be followed for calculating the capital stock. The first consists of obtaining an investment series of such length that it is possible to accumulate investment flows in order to obtain a capital series. The second starts by using an initial capital in a benchmark year for which an estimation already exists, and proceed towards the past by subtracting the investment flows. This second method is the one used by Feinstein<sup>18</sup> in his estimation of the gross capital stock of Great Britain in the period 1855-1920, but when applied to the case of Spain, it poses the problem of lack of knowledge of retirements if there is not a sufficiently long investment series, which forces to adopt the assumption that retirements are a percentage of the gross stock.

In the estimation presented here, the first procedure has been adopted, i.e. the calculation of an investment series at constant cost, leading by aggregation to a capital value for an initial year, 1900, on the basis of which subsequent years can be calculated by adding gross capital formation and subtracting retirements. There are no series for gross capital formation before 1954, so the National Accounts figure for 1954 has been taken as benchmark and, by using the growth rates derived from the gross capital formation series by Carreras, we have estimated the investment values in pesetas of 1958 for the period 1850-1958.

Gross private fixed capital formation has been obtained as the difference between the GFKF estimated by the method indicated above and the IVIE's Public GFKF series at current prices and subsequently deflated. This private investment series has been split into two components, "Buildings and other constructions" and "Machinery, capital goods and transport material", using the data offered by Carreras who gives the percentage of the total of two of its components, "Domestic production of metal articles" and "Imports of machinery and transport material". We have assumed that these two formed, jointly, the heading "Machinery, capital goods and transport material". The rest, which would be composed of apparent consumption of wood and cement, would form the heading "Buildings and other constructions". The percentages thus obtained have been applied to the GFKF series.

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<sup>18</sup> Ch. Feinstein, (1977).

The application of the perpetual inventory method requires assumptions to be made regarding the working life of the physical assets that make up the stock of private capital. In line with the estimation of public capital made by the IVIE, the following average lives have been assumed: "Buildings and other constructions", 50 years; "Machinery, capital goods and transport material", 25 years<sup>19</sup>. These assumptions have two consequences. Firstly, as a result of the use of the "sudden death" method to calculate retirements, an asset is maintained, on average, in the capital stock from when the investment is made until the end of its working life. Secondly, the annual loss of value of the asset, its depreciation, is of 1/working life, i.e. 2 per cent in the case of buildings and 4 per cent in the case of capital goods.

In spite of the enormous difficulties in reaching robust results, the destruction caused by the Civil War has been included in the estimation, and consequently subtracted from the series. For this purpose the starting point has been the different estimations of destruction of physical capital<sup>20</sup>, transformed into monetary values by various methods. These values have been distributed proportionately over the four years in which there was war, (July 1936- April 1939) and have been assigned to each year as a function of the capital structure existing at each moment. In other words, we have calculated the percentage of net capital for year  $i$  in year  $t$ , where  $t$  is from 1936 to 1939, and the destruction has been assigned to the capital of each year in terms of this value.

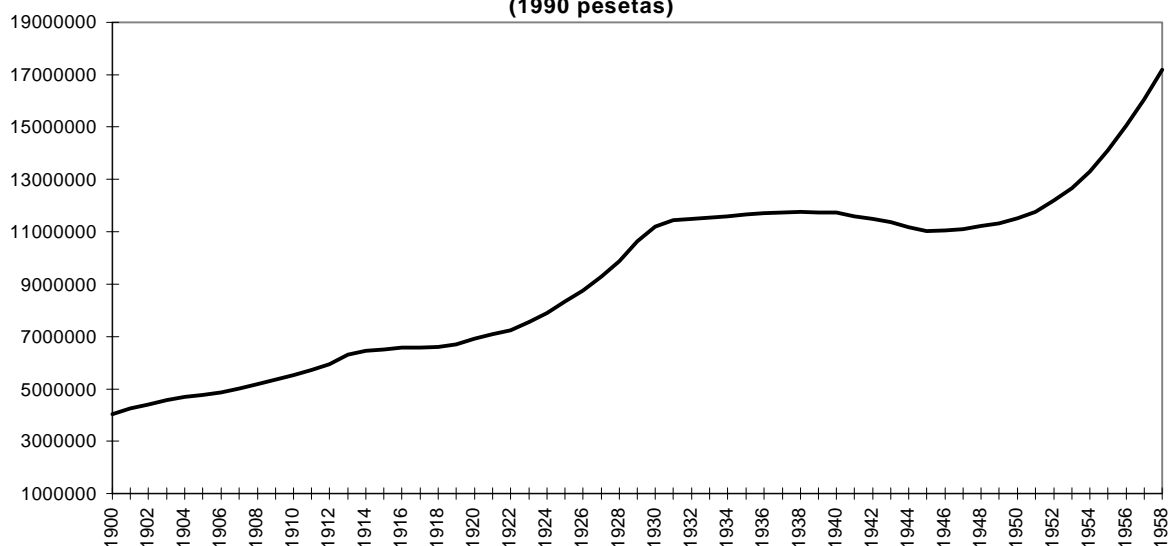
The estimation of the stock of private capital is presented in Graph 1 and the annual figures in the appendix, as indicated.

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<sup>19</sup> As it is well known, the average lives of assets are quite different in each estimation. Cfr. M. O'Mahony (1996), p. 169, table 4.1.

<sup>20</sup> Information has been obtained from P. Schwartz (1977), J. Catalán (1995) and the bibliography cited therein.

**GRAPH 1**  
**NET STOCK OF PRIVATE CAPITAL**  
**(1990 pesetas)**



### **3. THE EVOLUTION OF THE NET PRIVATE CAPITAL STOCK OF THE SPANISH ECONOMY**

Graph 1 shows the behavior of the net physical private capital stock variable from 1900 to 1958. It can be observed that in the first two decades of the century it tends to grow slightly, while in the 1920s there is a vigorous expansion. In the 1930s and 1940s it stagnates and retracts slightly, recovering the expansive trend in the 1950s. Nevertheless its evolution should be analyzed in greater detail, given its strategic importance in economic growth, to establish more rigorously the different phases in the accumulation of capital of the Spanish economy. Table 2 shows the mean annual rates of variation of the variables Net Capital Stock and GFKF .

From this evolution, four periods emerge quite clearly. In the first two decades of the century, the growth of the stock is slightly below its long-term trend. This stability around the trend shows differential behavior in three sub-periods characterized by an upward or downward evolution of the growth rates, corresponding to phases in the evolution of the investment rate well identified by the literature. The stage from 1900 to 1905 is of a slowing-

down of the growth of the capital stock, linked to the downturn of the investment cycle at the end of the century, the distinctive feature of which was the birth of the principal shipping companies, the expansion of the sugar companies, and the beginning of investment in public services (tramways, water supplies, street lighting). From 1906 until 1913, the trend changes and there is a steady increase in the inter-annual variation rates due to the new investment cycle dominated by the first phase of electrification. From that date until 1917, there is a period when growth rates fall sharply until stagnation is reached in the last year, an evolution which is linked to the serious investment crisis caused by the First World War.

**TABLE 2. Mean annual variation rates of net private capital stock and of investment in constant pesetas of 1990 for the Spanish economy: 1900-1958 (in percentages)**

Years	Net Stock of private capital	Private GFKF
1900-1909	2,84	-0,91
1910-1919	1,92	-0,31
1920-1929	4,41	8,13
1930-1939	0,48	-4,42
1940-1949	-0,34	2,39
1950-1958	4,56	8,19
1900-1935	2,98	1,06
1940-1958	2,03	6,12
1900-1958	2,48	2,43

After the end of the conflict, there begins the most intense process of capitalization of the Spanish economy of the first third of the century. Although hesitant from 1920 to 1922, year after year, the growth rates of the stock of capital become higher, reaching an annual rate of 7,5 per cent in 1929. The strong investment drive is without doubt not only connected with the increasing productive capacity of the heavy industries and the development of public works, but also with the diversification of industry characteristic of the period<sup>21</sup>.

The conjunction of the consequences of the crisis of 1929, the internal troubles during the Second Republic, proclaimed in April 1931, and the Civil War caused a steady reduction

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<sup>21</sup> C. Betrán (1997).

in the capital growth rates, within which two sub-stages can be differentiated. In the 1930s, the stagnation of investment caused the growth of capital stock to slow down, with variation rates lower than 1 per cent per year from 1932 to 1939. From that date onwards, the series begins to reflect the direct economic effects of the Civil War and presents a process of de-capitalization extending from 1940 to 1946.

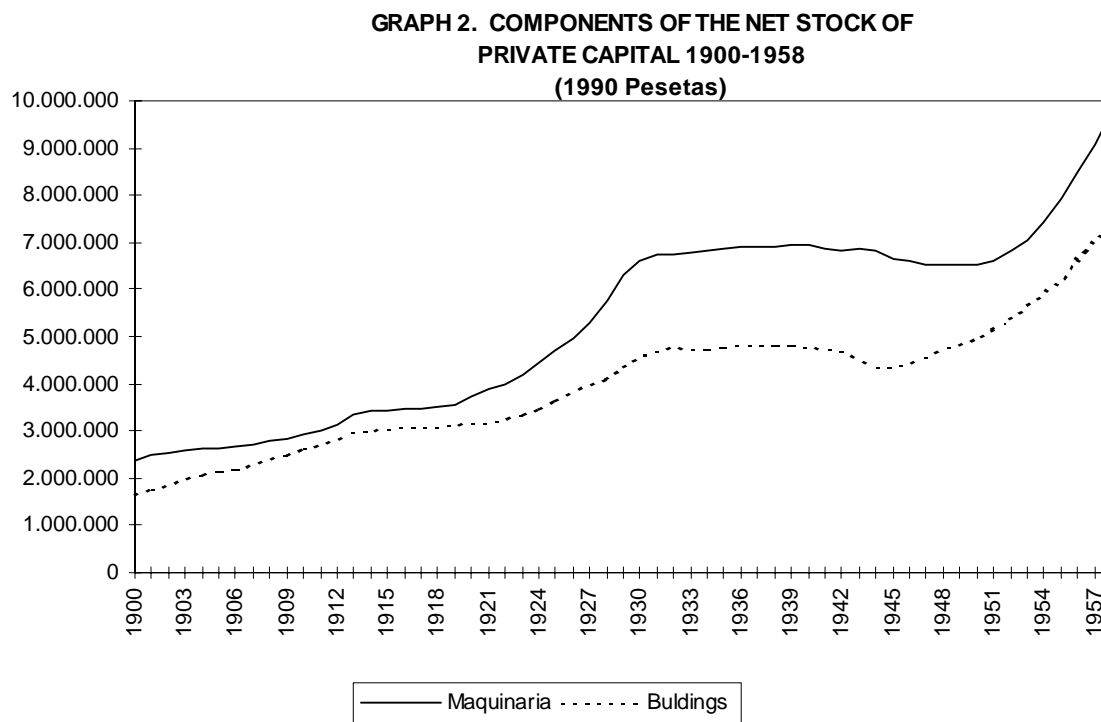
The last interval extends from 1945 to 1958 and reflects the slow recovery of the postwar period and the accelerated growth of the second half of the 1950s. The growth of the stock of capital in the second half of the 1940s presents negative rates overall, an effect of the series' delay in showing the effects of the stop of investment during the war and early postwar years, when an autarchic process of industrialization was implemented by the Dictatorship of Franco. On the other hand, in the first half of the 1950s, once the main regulatory measures were abolished, the rate of growth recovered but still remained below the long-term trend, while in the second half the capital stock began an exponential growth with an average rate for the whole period of 7 per cent per year.

It is therefore clear that the net private capital stock series reflects the capitalization effort made by the Spanish economy during the first half of the century, especially in two periods: the 1920s and the second half of the 1950s. The effects of the Civil War and the early postwar period are also present in the form of de-capitalization.

Graph 2 presents the evolution of the two components into which it has been possible to divide the capital stock series: "Machinery and capital goods" and "Buildings and other constructions". As can be observed from it, the expansion of the two components is very similar and in the period considered there, physical assets in both items quadruplicate. The share of each in the stock of capital remains constant, "Buildings and other constructions" accounting for 55 per cent and "Machinery and capital goods" for 45 per cent.

The long-term evolution of the two types of assets should not lead to exaggerate the similarities. The feature is simultaneous to the existence of appreciable differences when we consider shorter periods. The volatility of productive assets, within the heavy inertia present in all capital series, is greater than that of buildings. In the latter the longer stagnation in the 1910s is notable, as already pointed out by the literature, and its sharp fall during the Civil

War years. In productive capital there is a notable fall in the growth rates in the first decade of the century, a recovery in the years before the First World War and strong expansion in the 1920s.

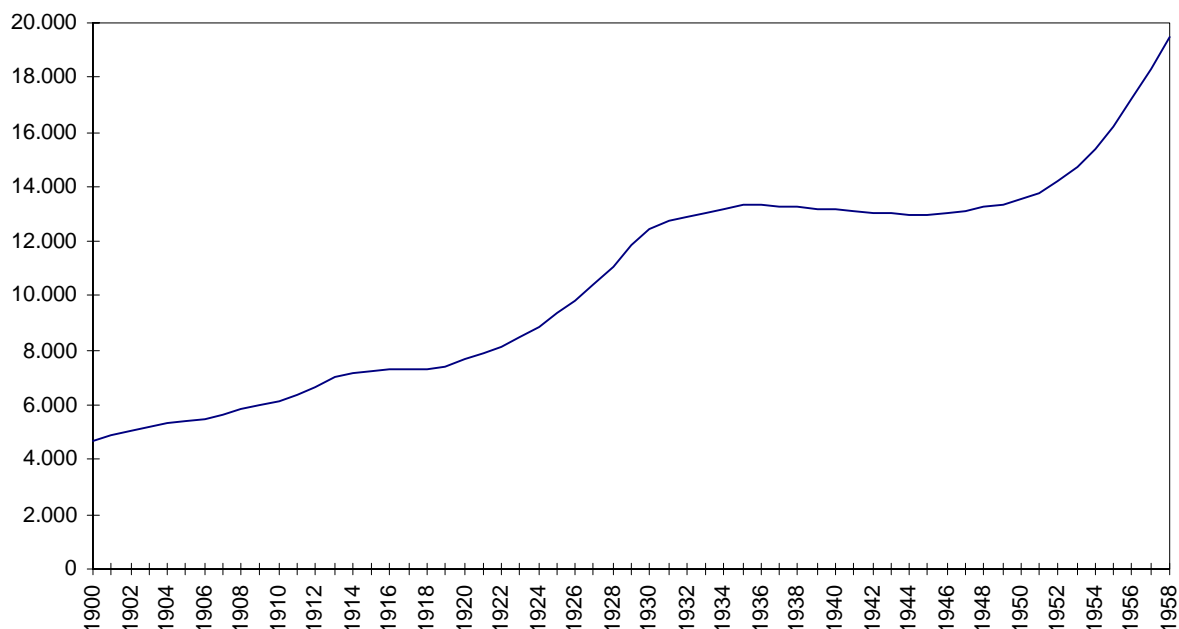


#### 4. THE CAPITAL SERIES OF THE SPANISH ECONOMY

The existence of an estimation of public capital and one of private capital enables us to construct a total physical capital series for the Spanish economy for the period 1900-1958. The series is represented in Graph 3 and shows, as the most outstanding features, a slight growth in the first two decades of the century, an acceleration after the end of the world war, a fall during and after the Civil War and a strong subsequent recovery.



**GRAPH 3**  
**NET STOCK OF PHYSICAL CAPITAL**  
**(1990 Pesetas)**



The composition of the capital figuring in the table of the Appendix permits us to observe that, as expected, private capital is the main component, representing nearly 90 per cent of total capital, so that the remarks made about the different stages in its evolution are valid for the whole. The stagnation of public capital in the first decade causes a reduction in its share, although in later periods it recovers and reaches its highest values in the 1930s. In the postwar years, the greater growth of private capital caused the share of public capital to be reduced once again.

## **5. THE EVOLUTION OF THE CAPITAL-PRODUCT AND CAPITAL-LABOR RATIOS**

On the basis of the estimation, it is possible to make an approximation of the capital-product and capital-labor ratios of the Spanish economy during the period considered throughout this paper. However, it is essential to mention three caveats on the plausibility of

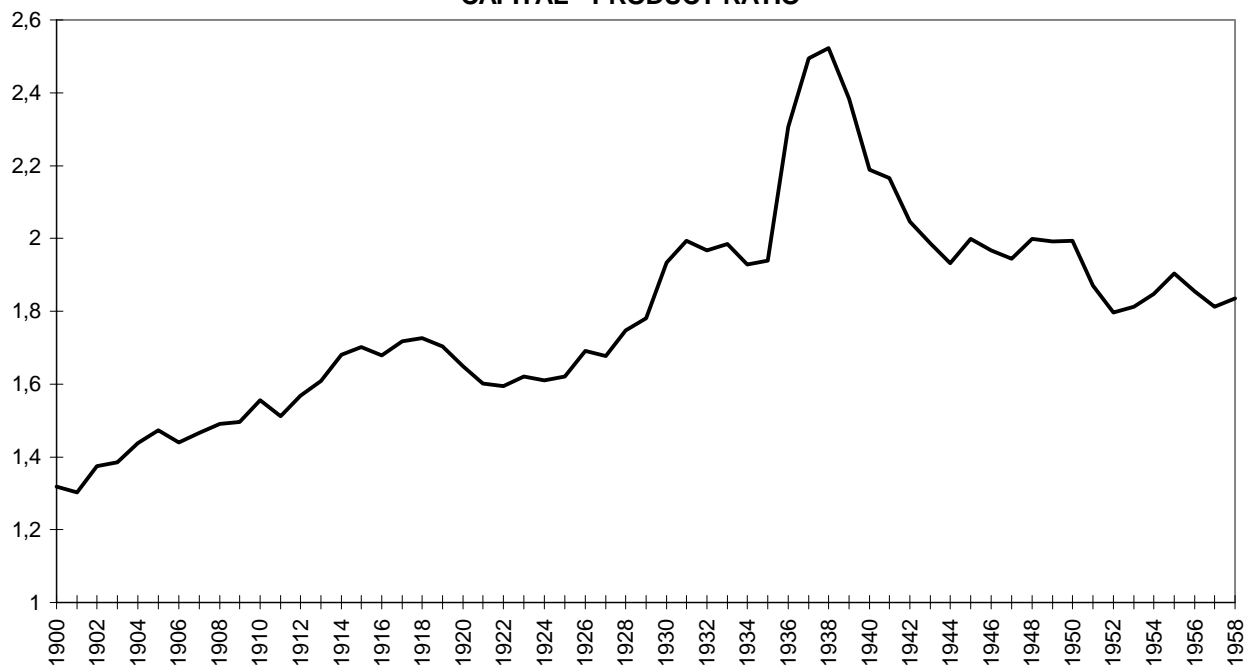
the capital-labor ratio. Firstly, the non-existence of data on the employed population compels us to use the active population as the denominator, with the obvious risk that variations in the employment rate mask the real evolution of the ratio. And this quite apart from the fact that, in second place, it would be more accurate to use the hours worked instead of the employed population, as the variation in the time of work affects the utilization of the productive capacity. Third and last, for the years prior to the Civil War there exist serious problems in accounting for women in the active population in agriculture due to the defects of the census. All these remarks make it necessary to treat with caution the estimate of the capital-labor ratio.

As Graph 4 shows and with regard to the evolution of the capital-product ratio, it is possible to identify two major periods. Before the Civil War, there was a steady increase in the need for this factor of production, with special intensity in the period 1924-1930. In the second period, the 1940s and 1950s, there is a slight trend towards the reduction of the use of capital in obtaining the product. In the first of these two stages, the series shows continuous growth from the beginning of the century to the start of the First World War, when a slight stagnation occurs. The long process of capitalization indicated in the previous section involved, then, a movement towards more capital-intensive production methods, especially clear in the investment boom of the 1920s.

**TABLE 3: Average annual variation rates of the capital/product and capital/labor ratios, 1900-1958 (Percentages based on 1990 pesetas).**

Years	K/Y	K/L
1900-1909	1,28	2,41
1910-1919	0,91	1,61
1920-1929	0,77	3,56
1930-1939	2,12	-0,05
1940-1949	-0,93	-1,17
1950-1958	-0,92	2,50
1900-1935	1,08	2,01
1940-1958	-0,93	0,68
1900-1958	0,56	1,59

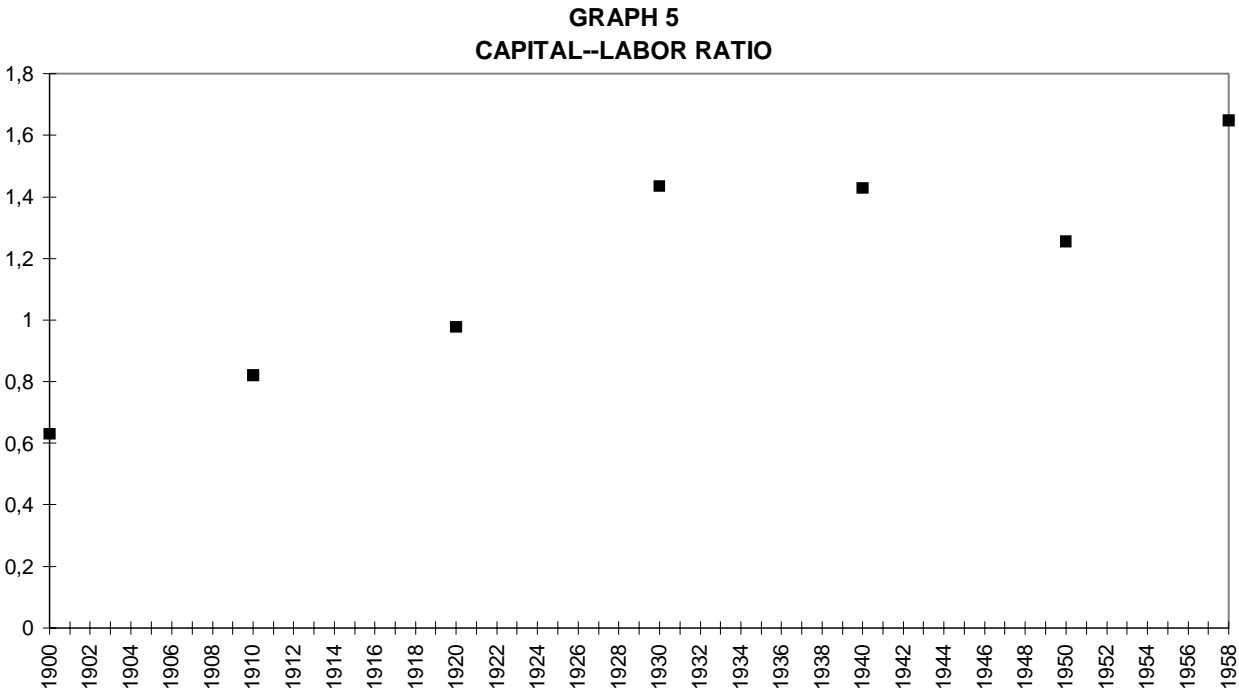
**GRAPH 4**  
**CAPITAL-- PRODUCT RATIO**



However, it is worth pointing out that, whereas in the first two decades, the growth of the stock was moderate but steady and in the years of the Dictatorship of Primo de Rivera, the increase in the ratio takes place with a strong increase in productive assets. The first half of the 1940s are dominated by the effect of the Civil War on production and capital stock. Hence, the increase in the ratio was due to the substantial disturbance of productive activities and the appearance of idle\* capacities with more intense effects on production than the destructions or the investment crisis. This effect makes it difficult to indicate when the capital-product ratio returns to normal. But if we take 1945 as the year in which the direct effects of the conflict disappear and the values of 1935 reappear, the ratio shows an unequivocal downward trend until the last year of the series. It is perceptible how, as well as this reducing trend, its greatest intensity occurs precisely when growth of the capital stock and of the GFKF was more intense, i.e. in the second half of the 1950s. The literature has pointed out that this element characterized the boom period of the 1960s in industry. This therefore places in relief the modification of the growth rate of the economy during the 1950s compared to the first third of the century. It was then, when the use of capital was intensified, reducing the need for it in obtaining the product, as against the situation prevailing in the first thirty years of the century.

It is more difficult, for the reasons of reliability already referred to, to find a clear line of behavior in the capital-labor ratio. On the basis of Graph 5, it seems possible to detect an increase in the mechanization of productive activity in the first third of the century more intense in the 1920s than in the two preceding decades. Consequently, according to the elements analyzed, the 1920s would be the period of greatest capitalization of the economy with clear repercussions in the increase in capital endowment per worker and in a greater use of capital-intensive techniques.

The series shows a fall in the ratio during the 1940s and a sharp increase in the following decade, demonstrative of the relationship between the higher growth rate of capital and of GFKF and the greater intensity of the replacement of labor by capital. It could therefore be concluded that the growth rate of the GFKF is linked to that of the replacement of labor by capital and that the latter resulted in a decrease in the capital needed per unit produced, at the same time as an expansion in production levels.



## APPENDIX

YEARS	PRIVATE NET STOCK	PUBLIC NET STOCK	TOTAL STOCK
	Millions pesetas of 1990	Millions pesetas of 1990	Millions pesetas of 1990
1900	4.056.770,74	634.284,25	4.691.054,98
1901	4.269.053,32	630.684,23	4.899.737,55
1902	4.402.186,40	631.400,30	5.033.586,71
1903	4.564.998,24	633.016,12	5.198.014,36
1904	4.695.951,44	632.694,03	5.328.645,47
1905	4.774.223,44	635.186,71	5.409.410,15
1906	4.883.911,58	636.862,39	5.520.773,97
1907	5.020.647,58	640.053,15	5.660.700,72
1908	5.203.991,94	643.606,09	5.847.598,03
1909	5.369.116,34	649.885,01	6.019.001,35
1910	5.529.867,06	657.842,74	6.187.709,81
1911	5.718.456,11	666.607,76	6.385.063,87
1912	5.955.866,57	675.909,48	6.631.776,05
1913	6.307.733,25	689.935,30	6.997.668,55
1914	6.460.987,19	704.896,43	7.165.883,62
1915	6.519.082,22	719.737,00	7.238.819,22
1916	6.573.649,69	727.803,66	7.301.453,35
1917	6.575.437,72	730.789,28	7.306.227,01
1918	6.611.635,34	729.303,49	7.340.938,83
1919	6.689.960,03	735.216,98	7.425.177,01
1920	6.907.491,80	755.129,88	7.662.621,69
1921	7.107.167,50	809.189,51	7.916.357,00
1922	7.247.531,25	873.609,70	8.121.140,95
1923	7.557.078,01	928.399,01	8.485.477,02
1924	7.902.713,64	967.624,49	8.870.338,13
1925	8.345.187,21	1.011.367,68	9.356.554,90
1926	8.758.548,77	1.071.458,36	9.830.007,13
1927	9.284.979,73	1.107.826,71	10.392.806,45
1928	9.887.604,82	1.153.488,81	11.041.093,63
1929	10.633.718,98	1.201.050,55	11.834.769,53
1930	11.195.626,55	1.255.789,06	12.451.415,62
1931	11.448.436,54	1.305.054,36	12.753.490,89
1932	11.506.968,69	1.406.831,86	12.913.800,55
1933	11.528.446,48	1.488.816,84	13.017.263,32
1934	11.576.756,24	1.579.081,25	13.155.837,49
1935	11.665.617,30	1.658.471,10	13.324.088,40
1936	11.715.737,35	1.604.876,21	13.320.613,56
1937	11.743.153,03	1.551.838,87	13.294.991,90
1938	11.750.848,63	1.499.371,43	13.250.220,06
1939	11.743.020,34	1.447.476,13	13.190.496,47
1940	11.728.088,47	1.437.588,92	13.165.677,39
1941	11.599.086,38	1.486.743,53	13.085.829,91
1942	11.502.034,83	1.534.216,15	13.036.250,97
1943	11.367.829,49	1.680.567,19	13.048.396,68
1944	11.159.849,34	1.843.763,33	13.003.612,67
1945	11.022.119,76	1.920.232,79	12.942.352,55
1946	11.051.912,14	1.956.554,86	13.008.467,00
1947	11.116.099,61	1.976.144,46	13.092.244,08
1948	11.237.126,45	1.992.863,79	13.229.990,24
1949	11.330.232,31	2.018.110,35	13.348.342,65
1950	11.509.543,23	2.037.592,98	13.547.136,21
1951	11.767.206,85	2.034.869,86	13.802.076,71
1952	12.197.241,14	2.029.755,05	14.226.996,19
1953	12.664.997,81	2.026.806,23	14.691.804,03
1954	13.307.602,83	2.057.440,21	15.365.043,04
1955	14.096.058,01	2.129.988,24	16.226.046,25
1956	15.051.686,09	2.179.919,30	17.231.605,39
1957	16.059.342,39	2.229.086,54	18.288.428,93
1958	17.194.846,08	2.272.339,59	19.467.185,67

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