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The Spanish Great Depression. 1929-1935

(Very Preliminary and Incomplete)

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Abstract: One of the most striking economic events in the 20th century was the Great Depression: it shocks Western economies along a decade. The effects on the Spanish economy remains uncertain between two explanations. The first explanation deals with an international source: the external sector was strongly affected and, consequently, this affected severely the Spanish economy. The second explanation deals with an internal source: the fact that simultaneously to the international depression there was a change of Spanish political regime, from a monarchy to a republican state, it generated uncertainties that pushed Spain into a recession. In this paper, we will assess on the preeminence of which of these explanations accounts better for explaining the behavior of the Spanish economy along 1929 to 1935.
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1 Introduction

One of the most intriguing economic events in the 20th century was the Great Depression, which strikes Western economies along the decade of 30s. The idea that Spain was apparently isolated due its sectorial structure –mainly agricultural– with low external trade activities is contradicted by the data.[1]

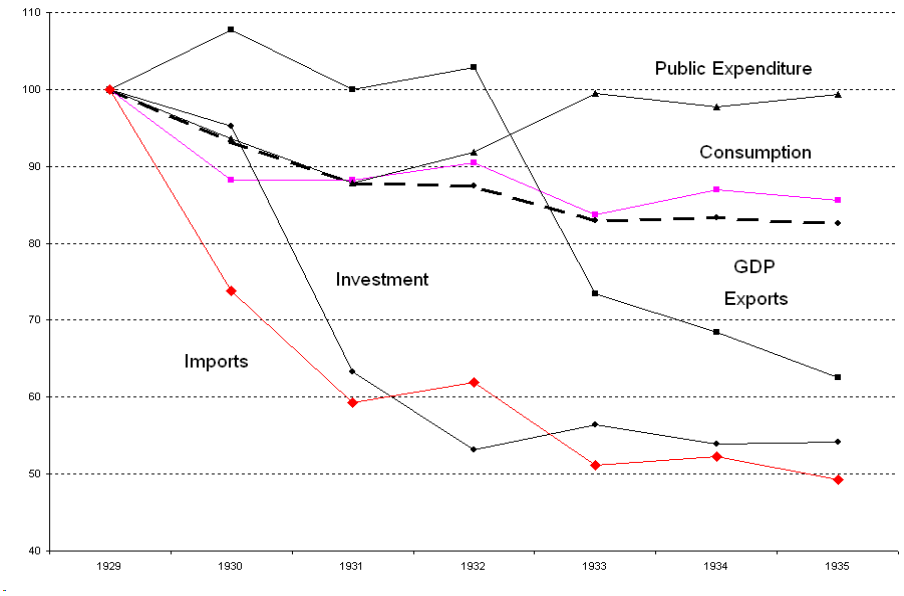

Figure 1: GDP and its Demand Components (1929=100). All series are per capita of population between 15 to 65, and were detrended by the average long-run growth rate of the Spanish economy 2,28% for the period 1850-2000, excluded the decade of 30s.

Figure 1 sharply contradicts this version. The 20% drop of the Spanish GDP falls into the definition of a great depression given by Kehoe and

[1]Taking data from Prados-de-la-Escosura (2003) the average sectorial distribution of GDP at cost of factors among agriculture, industry, construction and services in the 20s was 26,9%, 28%, 36,5% and 41,5%, while the distribution of employment was 50%, 20,3%, 4,7% and 25% respectively.

Prescott (2002).[2] Spanish economy, as well as in other Developed Countries, was harmed with a strong decrease in GDP, investment and imports, and later exports, as well as some decrease in consumption. However, the permanence in time is difficult to analyze, since two successive shocks strike hard the Spanish economy: first, the international scenario after the Great Depression which also coincides in time with the eve of the Spanish Republican Period; and then the Spanish Civil War magnified the economic decline as lower as 50% of its level at 1929, precluding the expected recovery as in other economies. Spanish economy could not overcome both shocks for twenty years.

The understanding of the source and events involving the Spanish economic decline at the end of 20s and along 30s is not clear at all. At present there are two main explanations of the Spanish Great Depression (if it really existed). Palafox (1980, 1991) explains the crisis due to the domestic factors, in particular the developments from the born of the Second Spanish Republic on 1931 until the beginning of the Spanish Civil War on 1936. Some of these factors are the uncertainty under the new political situation that precluded entrepreneurs to undertake investment projects, or the unrealistic government budgets at the end of the dictadure which led to a decrease of construction and public investment in the new regime and that affected the industrial sector around this activity. However, he also considers that a more favorable international economic situation could help for the young Spanish republican regime, so that the Great Depression could impact negatively on the modernization and liberalization of the Spanish economy. Some point remains unclear in Palafox argument: why the Spanish economy begins its decline on 1929, before the fall of Primo de Rivera dictadure.

The other explanation is due to Hernández-Andreu (1981).[3] He supports the thesis that the Spanish economy suffered a Great Depression analogous to other Western Economies, and the connecting point was the External Sector trade. However, he does not dismiss that internal situation in the Spanish economy could play a role. He reports a number of quantitative

[2]Kehoe and Prescott consider a great depression as a negative deviation from trend that must satisfy two conditions: (i) it must be a a sufficiently large depression, namely, a deviation at least 20% below trend and (ii) the deviation must occur rapidly. They works with the definition that detrented output per working-age person must fall at least 15% within the first decade of the depression.

[3]This book is a compilation of Hernández-Andreu's works on this issue along the 70s.

research making use data from the League of Nations to find similarities of the Spanish recession and those reported to other economies. Despite the evidence displayed, some point remains unclear in Hernández-Andreu argument: how Spanish economy might be so harm stroken if only a small percentage of the GDP (7% imports and exports on 1929, respectively) were affected by the international events.

Some authors have defied this approach arguing that the Spanish economy was completely isolated from the international Great Depression and domestic events played a key role in explaining the Spanish crises. Some arguments on the isolated state of the Spanish economy are due to Cambó, Ventosa, Marfil or Fábregas (1933), and to support it that prices were not even affected (e.g., Paris-Eguilaz, 1944), were rebated by Fernández-Baños, Olariaga (1933) and Perpiñá (1945). More elaborated arguments are due to Palafox (1991, Chap.3), who supports that the international slump scenario impacted few on the Spanish economy. Given that the international transmission of the Great Depression would be through international trade, this author recognizes that the Spanish foreign trade decreased, but despite imports immediately drop after the crises, the exports increased on 1930 and were high before 1933 where main buyers of export goods (mainly, oranges and wine) established tariffs on them. Palafox argument concludes that a high level of exports and a drop in imports should not have a negative effect on output, so that a decrease in output must be explained by domestic factors instead. However, Palafox does not consider that a decrease in the amount of imports may have a negative consequences on domestic production. The Spanish imports where mainly on raw materials and produced goods. Some of produced goods were industrial, which could be needed to undertake investment projects and difficult to domestically substitute; and raw materials, such as cotton -the main imported good-, were used as input for industrial sector (e.g., textile production).

In studying the Spanish depression of the 1930s, our objective is to help build a better general understanding of the depression era. We use the modern tools of macroeconomics to analyze the Spanish experience. In doing so, we use a methodology similar to that pioneered in the work of Cole and Ohanian (199a,b) and Prescott (1999).

This paper assesses on the preeminence of which of the two explanations above described accounts better for explaining the events reported in the Spanish economy from 1929 to 1935. We suggest that any explanation for the Spanish Great Depression has to account for supply shock source. In doing

so, we assume that the Spanish economy were growing along its balance growth path on the 20s, and we modelize each explanation as a shock: a international negative shock on external trade, and a domestic negative shock on the productivity of all sectors of the economy.

2 An historical review: Spain 1914-1935

Spain remained neutral at the Great War (1914-1918), which boosted the Spanish economy due to the export sector, even to the extreme case of suffering domestic scarcity of some raw materials. The massive exportations to both adversary sides resulted in a huge superavit in the balance of trade, so that Spanish firms increased their holdings on foreign money. However, entrepreneurs could not make use this foreign money: the possibilities of machinery imports were difficult because of the destruction of the foreign industrial sector, as well as the Spanish legislation did not allow for international movements of capital, so that the Banco de Espaa (the Spanish central bank) sterilized this money and exchanged abroad into gold. Consequently, at the beginning of the 20's Spain became the fourth largest country in gold reserves, and Spain need not to borrow money from abroad as other European countries involved in the conflagration.

The end of the Great War also marked a decline in the foreign exchanges: more competitive markets than Spanish were then opened again after the war. The dictatorship of Primo de Rivera evolve during the 20's, where many public infrastructure was build, keeping however an orthodox governmental budget constraint balanced.

The international Great Depression (1929 to 1939) coincides in time with several dramatic events in Spain that makes blurred its analysis. First, on 29 of January of 1930, two months after the crack of the stock market in New York, the dictator Primo de Rivera resigns, opening a period of uncertainty in Spain, where the monarchy tumbled as long as king Alfonso XII personally supported the Primo de Rivera's coup. Second, on 14 of April of 1931 Alfonso XII resigns and Spain became a republic, which lasted until the end of the civil war. Finally, from 1936 to 1939, the Civil War divided the country politically and economically.

The economic consequences of this period are the result of the overlapping of an internal period of political unrest and the adverse external economic conditions. After 1929, we are witness of a first period of political uncer-

tainty from 1930 to the end of the dictatorship where output and investment declined. Then, there was three periods for the Spanish republic. First, from 1931 to 1933, the left parties won the elections and, among several reforms, treated to undertake reforms in the agricultural sector, where expropiations were taken place. This frightened entrepreneurs, expectant on the political evolution of the new regime. All of this results in a decline in output and a strong decrease on investment, which coincides with the worsening of the foreign exchanges. On 1933 the right party CEDA won the elections, stopping the expropiations and returning confidence to the entrepreneurs. Investment and output raised slightly. Finally, on February 1936 the left party Frente Popular won the elections and on July the Civil War started.

At the light of the evidence provided, and the coincidence with domestic events, we can understand the dispute on the effects of the international Great Depression on the Spanish economy. It was argued that the isolation of the Spanish economy avoid the propagation of the foreign shocks, both by contemporaneous authors such as Balaguer (193?), or in recent academic works, e.g., Palafox (1991). However, the Spanish foreign trade during the Great War (1914-1917) was important, about 20% of the GDP, and, despite its subsequent reduction it kept its path around 14% along the 20's. This argument is the basement for other authors, such as Carreras and Tafurel (2004), to support the existence of a Spanish Great Depression, although milder than other European countries. The reasons of the soft impact on the Spanish economy was due to this economy had a particular features that distinguished from other European economies, and the events that surrounding the crash of New York Stock Market.

We have to go back to the end of the Great War, where many European economies ask for loans to reconstruct their countries, mainly to US banks, which were renewed along the 20's. At the end of this decade, the US banks were involved in a massive loans that were used to invest in the Stock Market. The crash on November 1929 put in difficulties several US banks that decided not to renewed loans to European countries. This put in trouble some European economies. In addition, the closure of US firms and the increase of the unemployment, led US government to set a foreign tariff to protect US production. This reduced the income of the countries that export to US, consequently reducing their US imports affecting negatively the US economy. In addition, new tariffs were set as retaliation worsening even more international trade, and then affecting economies. These two sources of international transmissions of the Great Depression, the financial and the

international trade transmission, hit differently to European economies. In the case of the Spanish economy, we have been indicated that the Great War turned Spain into a excess of savings country. So the negative financial shock due to the cut on loans did hit Spanish economy, being restricted the negative shock to the foreign trade. In this sense, the Spanish economy do suffered a Great Depression.

3 Some features of the Spanish Depression

In this study, we mainly use Prados-de-la-Escosura (2004)'s data base that we considered the most homogeneus data for the interwar period. The feature of Spanish Great Depression are shared with which was reported by other economies in the 30's.[4]

The depth of the depression should be evaluated in relation to the normal growth rate of the economy. The choice of the growth rate will greatly influence the evaluation of the depth and persistence of the depression. Table 1 presents average growth rates of Spanish per capita, per 15-65 and per worker GDP for different subperiods. Following Cole and Ohanian,we use the entire available sample except for depression years to compute the average growth rate of output, so that we skip the Great Depression period (1930-1935), the Spanish Civil War (1936-1939) and the first period of autarky of Franco regime (1940-1949). This growth rate is 2.28%. Note that this is a conservative value compared to what economic agents would have thought in 1929 if they extrapolated the 1919-1929 trend (2,99%) or after the autarky period trend 1950-2000 (4,05%).

3.1 Output and Components

Let us first inspect levels of output per capita and its components. In the following we use the expenditure-based data for GDP. Series are all normalized to 100 in 1929.

The undetrended measures presented in Table 2 show the collapse of exports and imports,the relative mildness of the depression from 1930 to 1932 and the long period of output stagnation from 1932 to 1935,the trough

[4]See Cole and Ohanian (1999, 2002), Amaral and MacGee (2002), Beaudry and Portier (2002), Fisher and Hornstein (2002) and Perri and Quadrini (2002).

	per capita	per 15-64	per worker
By subperiods			
1850-1929	1,28	1,27	1,25
1850-1913	1,13	1,14	1,09
1919-1929	2,99	2,88	2,90
1930-1935	-0,97	-1,17	-1,38
1940-1949	0,77	0,31	0,09
1950-2000	4,05	4,00	3,69
Average			
All sample (1850-2000)	1,94	1,87	1,77
Excluding 1930-1940	2,27	2,21	2,07
Excluding 1930-1950	2,28	2,34	2,21

Table 1: Average Yearly Growth Rate of GDP per capita, per 15-65 and per worker. Source: Own computations from Prados-de-la-Escosura (2002)

in 1936,and then the recovery at the steady growth rate. Table 3 presents detrended measures of output components. One can observe the large decline in investment,the level of which from 1932 to 1935 is below 60below trend. Also,note the increase in public expenditures. Table 4 shows that both the share of imports and exports in output stayed constant over the period. Excluding 1939,the consumption share increased while the investment share decreased. Compared to 1929, it seems that the economy had reached a new balanced growth path with a lower capitaloutput ratio and a larger consumptionoutput ratio in the late 1930s.

3.2 Input Measures

Table VIII shows the effect of the 1936 accords on the workweek length and the drop in hours worked. Note that employment did not vary significantly after 1932. Again,it seems that in 19361939 the economy is on a new steady growth path where hours are about 25% lower than before the depression. Capacity utilization collapsed in 1930 and 1931 and then stayed relatively constant.

Year	GDP	C	G	I	X	IM
1929	100,00	100,00	100,00	100,00	100,00	100,00
1930	95,08	89,93	95,48	97,07	109,85	75,34
1931	91,43	91,82	91,34	65,88	104,02	61,70
1932	92,79	96,02	97,40	56,36	109,19	65,75
1933	89,85	90,59	107,74	61,04	79,54	55,39
1934	91,99	96,01	107,88	59,51	75,48	57,70
1935	92,94	96,34	111,95	60,97	70,40	55,50

Table 2: Undetrended GDP and its Demand Components. All series are per capita of population between 15 to 65, in millions of pesetas 1995.

Year	GDP	C	G	I	X	IM
1929	100,00	100,00	100,00	100,00	100,00	100,00
1930	92,90	87,88	93,30	94,85	107,34	73,61
1931	87,30	87,67	87,21	62,90	99,32	58,91
1932	86,58	89,59	90,88	52,58	101,88	61,34
1933	81,92	82,59	98,22	55,65	72,52	50,49
1934	81,95	85,53	96,10	53,01	67,24	51,40
1935	80,91	83,86	97,46	53,07	61,28	48,31

Table 3: GDP and its Demand Components. All series are per capita of population between 15 to 65, and were detrended by the average long-run growth rate of the Spanish economy 2,34% for the period 1850-2000, excluded the decades of 30s and 40s (1929=100), except Inventories in millions of pesetas 1995.

Year	Private consump.	Private inv.	Govt. purch.	Exports	Imports
1929	70,61	14,28	4,37	7,02	7,11
1930	66,79	14,34	4,24	8,11	5,63
1931	70,91	14,26	2,87	7,99	4,80
1932	73,06	14,99	2,46	8,26	5,04
1933	71,19	17,12	2,66	6,21	4,38
1934	73,69	16,75	2,59	5,76	4,46
1935	73,19	17,20	2,65	5,32	4,25

Table 4: Shares of Output (in Percent).

3.3 Summary of main facts

1. In the 30s there exists a drop of GDP per 15-64 about 20% lower than its *normal* trend. (A "Great Depression" under Kehoe and Prescott terminology.)

2. The Depression was milder than other countries. (However, the Civil War began without any sign of recovery.)

3. Investment and Imports were the most affected components (a quick drop towards 50%), followed by Exports.

1. About 20% decrease in GDP and consumption below its trend;

2. Dramatic drop of investment in almost 50%, mainly after 1931;

3. Decrease in Imports just before the Great Depression started in other economies, and delay in the decrease of exports until 1933;

4. Stability at the 1929 level of Inventories from 1930 to 1933 (see Table 3);

5. No sign of recovery of the Spanish GDP in 1935, just before the Spanish Civil War (see Figure 1). This contrast with the quick recovery of other economies, like US, or with some delay as Canada;

6. Decrease in productivity in all sectors while real wages increase (see Table 5 for total and the industrial sector);

	Productivity		Real wages	
	Industrial	Total	Industrial	Total
1929	100,00	100,00	100,00	100,00
1930	91,89	95,41	115,74	113,68
1931	80,52	91,77	110,24	109,75
1932	79,24	92,50	115,75	115,80
1933	77,76	89,44	118,90	118,63
1934	74,01	91,52		
1935	74,32	92,01		

Table 5: Productivity of Labor and Real Wages (1929=100). Source: Productivity, own computations from Prados-de-la-Escosura (2004); Real Wages, Estadísticas Históricas de España, p. 507 (This series originally was set (1913=100)).

7. Sharp increase of terms of trade just before 1929, followed by a sharp drop afterwards.

3.4 Some explanations for the Great Depression and the Spanish recession of the 30s

Next we are going to present some explanations on the Great Depression for other countries, that seems not to explain the Spanish recession.

3.4.1 Monetary Shocks

Monetary shocks can be identified by several ways. On the one hand, monetary shocks are identified as either the decline in the money stock or the decline in the price level. There are a conventional wisdom that deflationary monetary/exchange rate policy are below the Western economies depressions.

In another hand, as in Keynes (1932)'s story, monetary shock is identified as high real wages.

3.4.2 Money supply and Price levels

The decrease in output seems to be not related with the evolution in money supply and the wholesale prices: output fell about 10% between 1913 and

	Workers	Hours		Productivity	Capital
		(legal)	(microdata)	(GDPfc/worker)	Growth rate (%)
1929	100,00	100,00	100,00	100,00	7,19
1930	101,29	101,45	93,98	95,41	5,21
1931	102,62	102,96	92,38	91,77	2,43
1932	104,02	98,75	91,95	92,50	1,26
1933	105,46	100,20	87,87	89,44	0,80
1934	106,97	101,71	97,30	91,52	1,06
1935	108,53	103,28	100,37	92,01	1,28

Table 6: Input measures. 1929=100 except for Capital in growth rates. Source: own computations from Prados-de-la-Escosura (2002), Escudero (1998), and Cubel and Palafox (1997).

1920, while the money supply and the wholesale price rose about 14.8% and 12.5%, respectively. Afterwards, between 1921-1929, output was growing while the money supply remain roughly constant and the price level was decreasing. After 1929, GDP fell dramatically while money supply and prices practically remain constant (see Figure 2). These suggest that unanticipated monetary shocks are not the key factor that depressed the Spanish economy.

3.4.3 Real wages

Figure 3 reports undetrented real wages for the industrial sector. For the industrial workers the undetrented real wage remain roughly flat between 1930-1933 while the GDP was falling about a 11% . This wage is practically unchanged between the 1920's and the prewar period (+4.4% in the period)

3.4.4 Relative Prices of Spanish Exports

Another drawback to the monetary story is that the relative price of Spanish export rise during the 1929-1935 period. (buscar datos para elaborar este ratio: indice de prezo das exportacions en España, e deflactor de US ou GB ou Francia polo tipo de cambio correspondente. Problema o deflactor do pais extranxeiro debe estar necesariamente en base 1995)

The real Exchange rate is an alternative measure of this relative price.

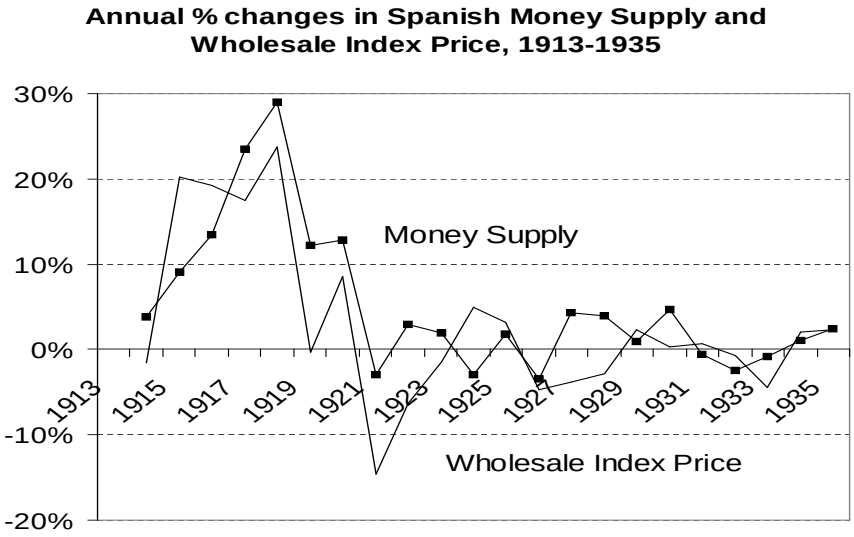

Figure 2: Changes in Money and the Price Level.

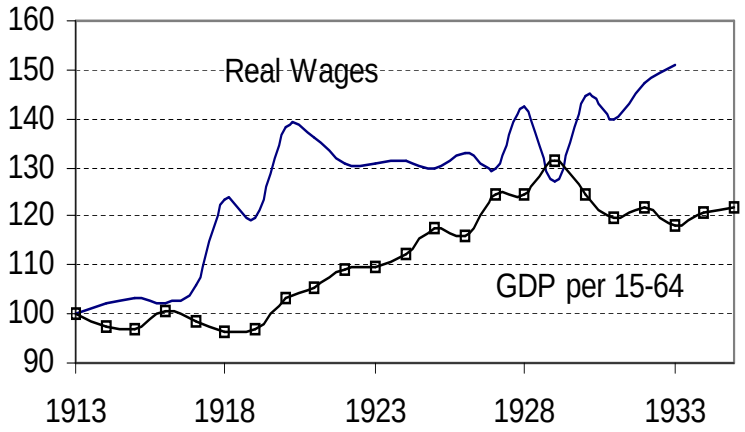

Figure 3: Real wages and output index (1913=100).

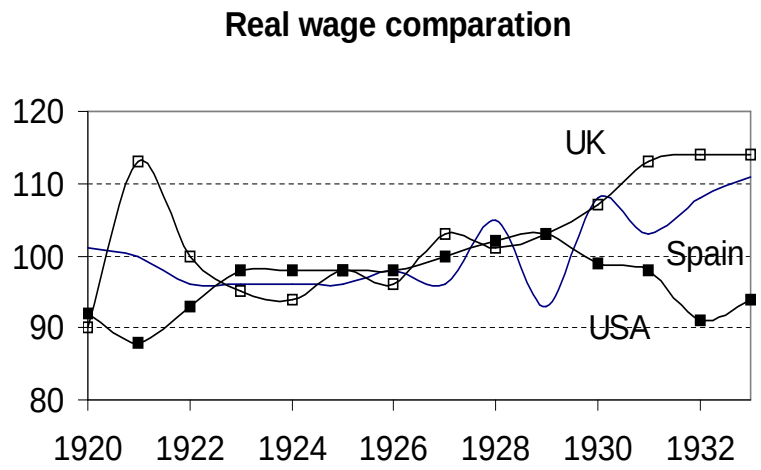

Figure 4: International comparation of Real wages index (Average 1925-29=100).

This is the ratio of the price of Spain domestic goods to the price of U.K. goods multiplied by the exchange rate. After 1929 this measure growth considerably (30 porcentual points).

Figure 6 shows that the onset of the Great Depression was associated with an adverse movement in Spanish's terms of trade. This can be attributed to several factors. First, Spain was a net exporter, but really, the surplus was small.

We can do a simple computations like Amaral and Macgee (2002) that suggests that trade cannot explain more than 8% of the Great Depression in Spain. Suppose that a reduction in Imports lead one-for one reduction in output. Imports were 7% of the Spanish GNP in 1929. By 1933 they had fallen by slightly more than 42% their 1929 level. If inputs cannot be substituted by national factors, then this could account for a decline of 3% in output at most. This is roughly 8% of the actual decline in real GNP per capita.

This calculation casts doubt on the common wisdom that Spain was affected via trade.

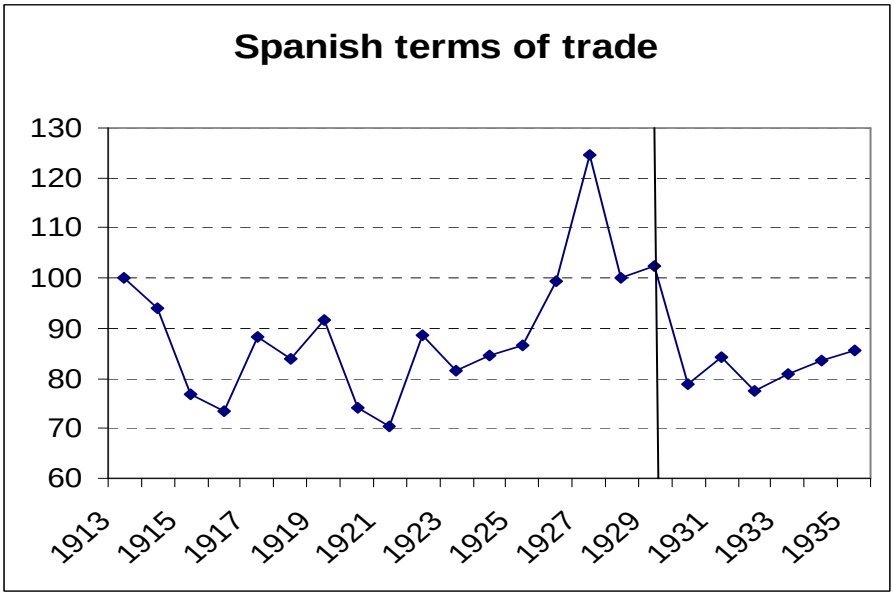

Figure 5: Spanish terms of trade (price deflactor of exports over imports). Source: Own computations from Prados-de-la-Escosura (2003).

3.5 The external trade goods

Hernández-Andreu (1981) reports the main goods traded from 1930 to 1934. The most imported goods are Cotton in branch [Algodn en rama], followed by Machinery, Cars and its components, Electric materials and fresh eggs. The most exported goods was Oranges, followed by Olive oil. Finally followed by almonds, wine and potatoes. This suggest that agriculture sector exported while the industrial sector imported.

Palafox (1991, Chap.3) supports that the international slump scenario impacted few on the Spanish economy. Given that the international transmission of the Great Depression would be through international trade, this author recognizes that the Spanish foreign trade decreased, but despite imports immediately drop after the crises, the exports increased on 1930 and were high before 1933 where main buyers of export goods (mainly, oranges and wine) established tariffs on them. Palafox argument concludes that a high level of exports and a drop in imports should not have a negative effect

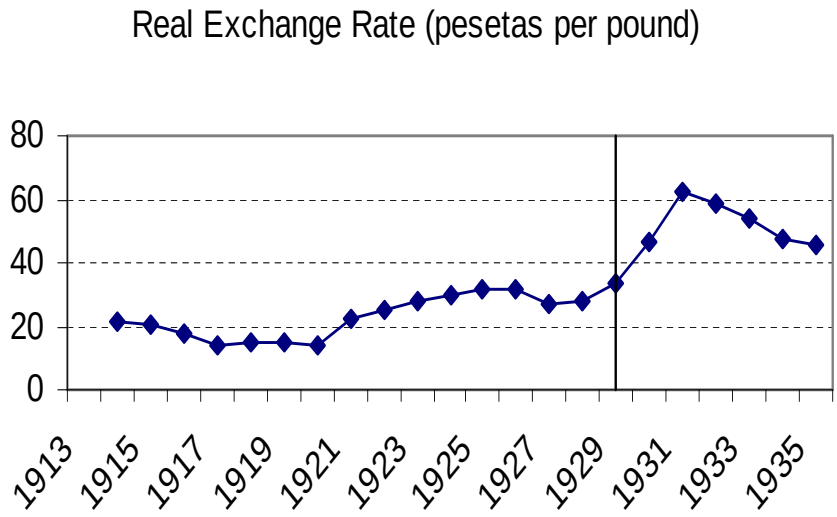

Figure 6: Real exchange rate (pesetas per pound). Source: Own computations from Estadístias Históricas de España, p. 390).

on output, so that a decrease in output must be explained by domestic factors instead. However, Palafox does not consider that a decrease in the amount of imports may have a negative consequences on domestic production. The Spanish imports where mainly on raw materials and produced goods. Some of produced goods were industrial, which could be needed to undertake investment projects and difficult to domestically substitute; and raw materials, such as cotton -the main imported good-, were used as input for industrial sector (e.g., textile production). (See figure 7.)

3.6 The external trade partners

Hernández-Andreu (1981) also reports which was the main Spanish trade partners on 1932. On what respects imports the United States, followed by Great Britain, Germany and at some distance France. On what respects exports Great Britain was the main partner followed by France .

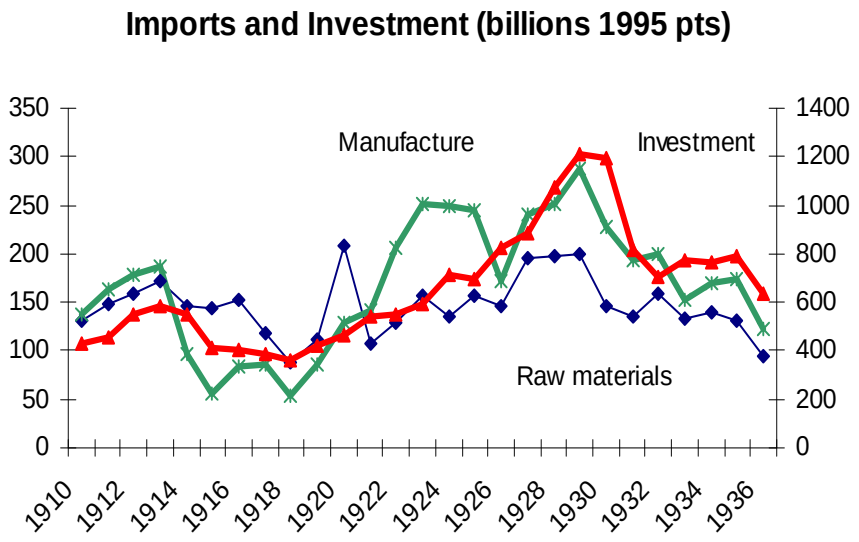

Figure 7: Real Imports (manufacture and raw materials) -left scale- and Real Investment -right scale- (billions of 1995 pesetas).

4 Growth Accounting exercise

To identify the sources of growth we made a growth accounting exercise. We assume the following production function for the economy

$Y_t = A_t K_t^{\theta} L_t^{1-\theta}$

where Y is the aggregate output, A is TPF, K is aggregate capital stock and L is total employment. Given this production function, we can write

$A_t = \frac{Y_t}{K_t^{\theta} L_t^{1-\theta}}$

So, given the series of Y, K and L, as well as a value for the share of labor compesation in GDP valued at factor prices, to obtain $1-\theta$ in our exercise, we can obtain the serie of the TPF.

According with the data from Escudero () the labor share was 0.54 taken the average in the 1900-1936 period. However we choose a higher value of the labor share for our growth accounting and numerical experiments for several reason ¿¿??. We choose a value of 0.69 that is equivalent to a value of 0.31 for the parameter θ.

The capital stock serie was taken from Cubel and Palafox (1997). As a check we observe the capital/GDP ratio, which in the model is measured by K/Y.In period 1929-1936 gives a value around 2.

Since there is no annual series of aggregate hours in Spain we have to constructed an annual measure. We have used data from individual firms taking from Escudero (1998). The procedure was the following. Given the definitions:

$$Labor\ Income = Wage * Total\ Worked\ Hours$$
$$Labor\ Income = Labor\ Share * GDP$$

Then,

$$Total\ Worked\ Hours = Labor\ Share * GDP/Wage$$

The salaries correspond to mining sector of Bilbao. To check this calculated hours, we computed the number of worked hours taking the number of people employed by economic sector (agriculture, industry, services and construction) and then applying the labor legislation about the length of the workweek in each year. Figure 8 compares the two series showing that the first series (namely the series constructed with microdata) is more realistic than the another one series.

Given the choice of θ and the generated series for capital and hours worked, we can calculated the TPF series. The Figure 9 shows the TPF and GDP detrented series. To detrend the GDP we use a 2.28% growth rate so we have to detrend the TPF by 1.62%.

We can observe how closely the TPF data match the GDP per working-age data. This can suggest that TPF can account for the fall in the GDP.

We follow Hayashi and Prescott (2001) to decompose the contribution to growth of TPF changes, the capital output ratio changes and hours worked per working-age person changes. Taking natural logarithms of the production funtion we obtain

$$log\left(\frac{Y_t}{N_t}\right) = \frac{1}{1-\theta}\log A_t + \frac{\theta}{1-\theta}\log\left(\frac{K_t}{N_t}\right) + \log\left(\frac{L_t}{N_t}\right),$$

where N_t is the number of hours available for work. As in Bergoeing et al (2002), we use this expression to decompose the change in real GDP per capita over the period t to $t+1$ as

$$\left[log\left(\frac{Y_{t+s}}{N_{t+s}}\right) - log\left(\frac{Y_t}{N_t}\right)\right]/s \;=\; \frac{1}{1-\theta}\left[\log A_{t+s} - \log A_t\right]/s$$

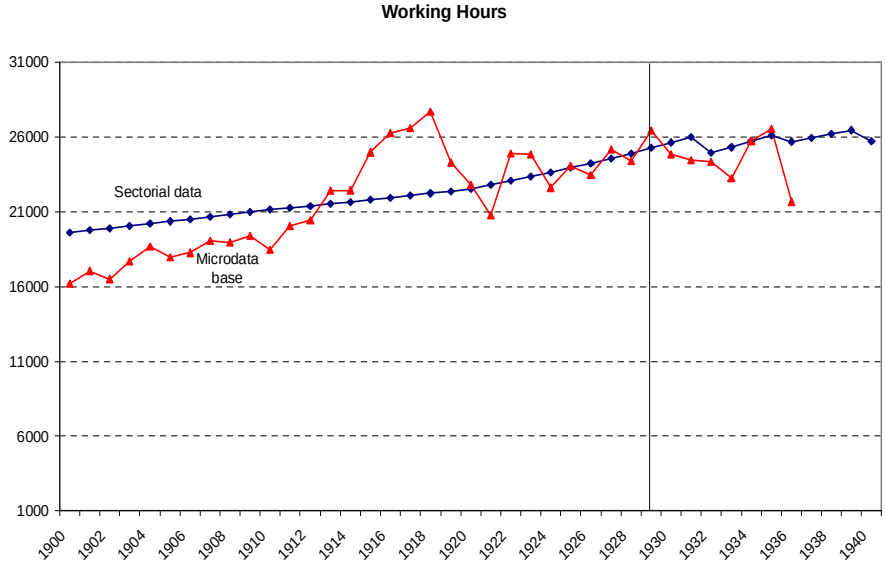

Figure 8: Working hours. Source: Own computations from ???.

$$+\frac{\theta}{1-\theta}\left[\log\left(\frac{K_{t+s}}{N_{t+s}}\right)-\log\left(\frac{K_t}{N_t}\right)\right]/s$$
$$+\left[\log\left(\frac{L_{t+s}}{N_{t+s}}\right)-\log\left(\frac{L_t}{N_t}\right)\right]/s$$

This equation shows the contribution to the growth of the GDP per working age person of the TPF changes, the contribution of changes in the capital-output ratio, and finally the contribution of changes in hours worked per working age person.

Table 7 shows the growth accounting for Spain during the period 1900-1936. Most of the economic fluctuations in output per working-age person $\frac{Y_t}{N_t}$ during the 1914-1929 period were due to changes in total factor productivity A_t, while in the period 1929-1935 changes in output can be explained by changes in total factor productivity A_t as well as changes in the hours per working-age person $\frac{L_t}{N_t}$.

In the period 1914-1929, TPF accounted for an increase of 0.24 compared with an increase of 0.29 in the data. In the next period, 1929-1935, TPF

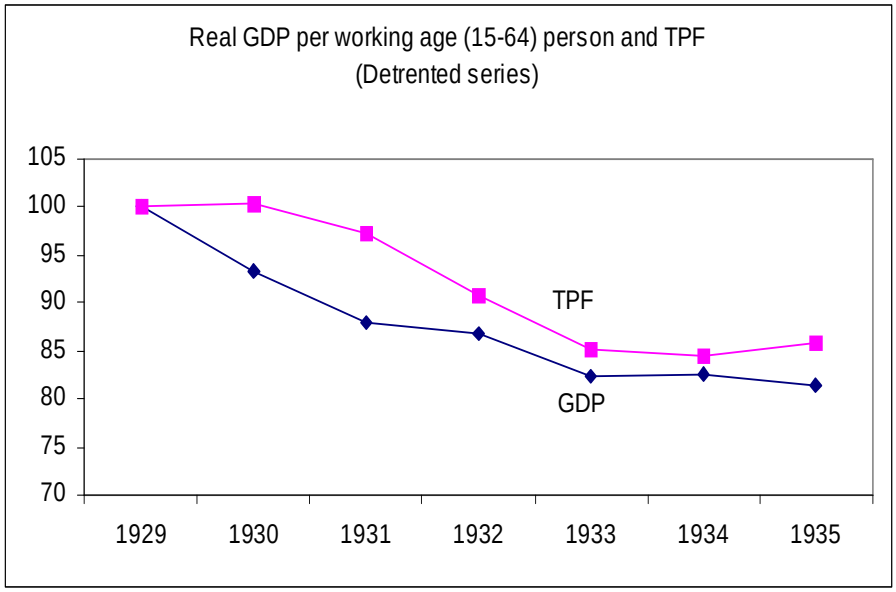

Figure 9: Real GDP per working age (15-64) person and TFP (detrended series). Source: Own computations from ???.

accounted for a fall of 0.21 and hours per working age person accounted for a fall of 0.28 compared with a fall of 0.33 in the data.

What happened with employment? As we can observe, Table 9 shows that while the activity rate (given by the number of worker per 15-64 person) was roughly constant for the 1929-1935 period, the hours worked by 15-64 person fell about a 9% in the same period. The average hours per worker fell from 3193 hours per year before 1929 to about 2906 in the following years. En 1929 se publica (Gaceta de Madrid 8 de marzo 1929) o proxecto de convenio para limitar as horas de traballo nos establecementos industriais a 8 horas diarias e a 48 horas semanais. O 2 de xullo de 1931 decretase a xornada máxima de 8 horas/dia.

Conclusion.

We have that TPF and Worked Hours accounts for the GD in Spain.

If employment fell we have to find the shock that depresed employment. One candidate to this shock could be external shocks. If we have supossed that domestic and foreing intermediate inputs are imperfect substitutes then

Period	1900-1914	1914-1929	1929-1935
Change in **GDP (total)**	0.91 (12.79)	1.94 (29.03)	-4.77 (-33.42)
TPF (total)	-1.48 (-20.66)	1.62 (24.32)	-3.16 (-22.12)
Capital/GDP (total)	0.63 (8.81)	0.18 (2.73)	2.23 (15.62)
Worked hours/Employment (total)	1.72 (24.03)	0.12 (1.8)	-4.0 (-27.99)

Table 7: Growth Accounting (ELIMINAR no paper o periodo 1900-1914)

	GDP	TPF factor	Capital/GDP	Worked hours
1900-1914	0,91	-2,03	1,23	1,72
1914-1929	1,94	1,46	0,35	0,12
1929-1935	-1,18	-1,72	1,64	-1,09

Table 8: Growth Accounting for Spanish GDP per person aged 15-64

Years	Hours/worker	Worker/Adult	Hours/Adult
1914-1929	3193	0.58	100
1929-1935	2906	0.58	91.4

Table 9:

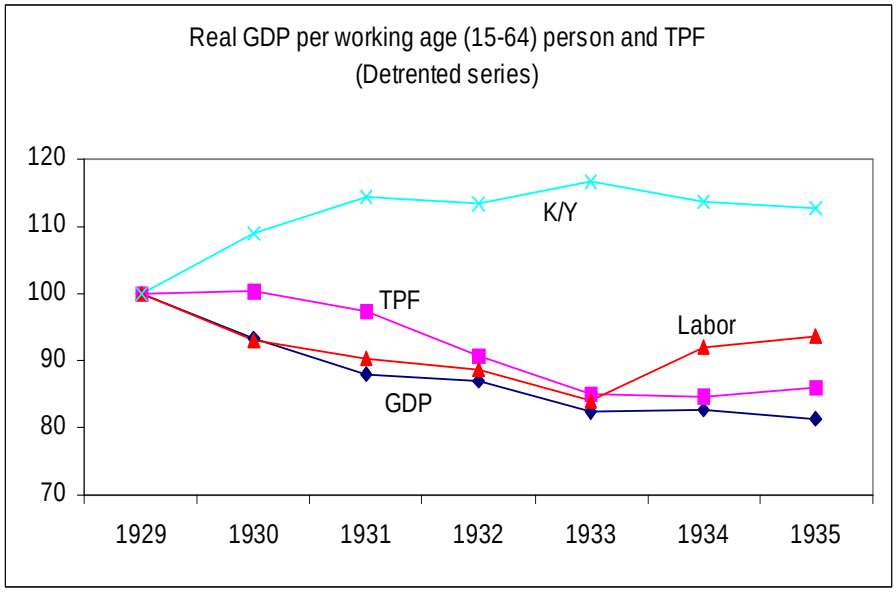

Figure 10: Real GDP per working age (15-64) person and TFP (detrended series). Source: Own computations from ???.

an increase in the relative price of the imported intermediated goods will affect capital acumulation and output. But we need a link between trade and the behavior of TPF (like Amaral- MacGee)

5 The Model

We present a model of the Spanish economy for the interwar years. The economy is a two-sector open-economy model. There are two domestic sector: agricultural and industrial sector.

Domestic households. The economy is populated by a continuum of households that maximize the lifetime utility

$$\sum_{t=0}^{\infty} \beta^t U(C_t, 1 - H_t), \tag{1}$$

where $\beta < 1$ is the intertemporal discount rate, H_t is working hours, and C_t is a composite consumption good resulting from the aggregation of consumption goods produced in the two domestic sectors, agriculture C_{at} and industrial C_{it}, and the consumption goods produced by the foreign sector, C_{ft}. The aggregation function is represented by

$$C = \Phi(C_a, C_i) = D\ C_a^{\gamma_a}\ C_i^{\gamma_i}\ C_f^{\gamma_f}, \tag{2}$$

with $\gamma_a + \gamma_i + \gamma_f = 1$, where this parameters will determine the shares of the consumption goods.

Domestic firms. There exists two domestic sectors that differs on the inputs required to undertake production, and their trade with abroad. The production of the agricultural sector takes place according to the constant return-to-scale technology where capital and labor are required inputs:

$$Y_a = AK_a^{\alpha} H_a^{1-\alpha}; \tag{3}$$

whereas the production of the domestic industrial sector takes place according to the constant return-to-scale technology where capital, labor and foreign raw materials are the required inputs:[5]

$$Y_i = A\ \left[K_i^{\gamma}\ RM^{1-\gamma}\right]^{\alpha}\ H_i^{1-\alpha}. \tag{4}$$

where K_j and H_j are, respectively, the input of capital and the input of labor in sector $j = a$, i, and RM are the raw materials making used by the

[5]Like in other production function specification, where intermediate inputs are considered, we assume some substitutability between capital and raw materials.

industrial sector. Observe that we are assuming that technology, both α and the total factor productivity, A, is the same in both sectors.[6][7]

Investments are given from goods produced in the domestic industrial sector and in the foreign sector. Investment in the two domestic sectors, agriculture and industrial, are produced according to the constant return to scale technologies

$$I_j = \phi(I_{ji}, I_{jm}) = B\ Ln\left[I_{ji}^{\sigma_i}\ I_{jf}^{\sigma_f}\right] \tag{5}$$

for $j = a,\ i$; with $\sigma_i + \sigma_f = 1$, and where I_{ji} is the intermediate input used to produce investment in sector $j = a,\ i$ and produced in the industrial sector, and I_{jm} is the intermediate input used to produce investment in sector $j = a,\ i$ and produced in the foreign sector. The parameters σ_i and σ_m will determine the share of the intermediate inputs. Hence, capital accumulation in each sector are:

$$K_{i,t+1} = (1 - \delta)K_{j,t} + I_{j,t} \tag{6}$$

for $j = a,\ i$. We assume that capital in both sectors depreciates at rate δ.

The foreign sector. We first assume that only trade exchanges are taking place, and there is no international mobility of capital (according with the political decisions taken by interwar Spanish economic authorities, see Carreras and Tafurel, 2004). In fact, according with data, imports M mainly correspond to investment goods (machinery, fertilizers, etc.), while exports X mainly correspond to agriculture outputs. The equilibrium of the foreign sector is then given by the balance in the trade account; that is,

$$P_{m,t}M_t \ = \ P_{a,t}X_t \tag{7}$$

where P_m is the price of the imported goods, and P_a is the price for the agriculture goods exported.

To close the model, we need to specify the demand of exports and the supply of imports. We will assume that imports are inelastically but stochastically supplied M_t, so exports will be found at (7); and, supporting from the data, we will assume that there is a fix ratio of the imports M

[6] See Mankiw (1995) for some arguments to support of this view, despite Romer (1995)'s critiques.

[7] **DEBERIAMOS SUPONHER** A **DIFERENTES?**

devoted to import foreign consumption goods, $C_m = \xi_c M$, investment goods $I_{am} + I_{im} = \xi_I M$, and raw materials $RM = \xi_{RM} M$.[8]

The government. There exists a government that may set tariffs on imports τ, and rebated back the tariff revenue to the households through lump-sum transfers. The transfers will be denoted by T_t and they are equal to

$$\tau P_m M = T. \tag{8}$$

The resource constraints. The resource constraints are given by

$$C_a + X_t = Y_a \tag{9}$$
$$C_i + I_{ai} + I_{ii} = Y_i \tag{10}$$
$$C_m + I_{am} + I_{im} + RM = M_t \tag{11}$$

5.1 Agents problem

The domestic household problem. Households choose sequences of hours worked, agriculture and industrial consumption goods, and investment to maximize (1), subject to the sequence of budget constraints

Households choose sequences of hours worked, intermediate inputs in the consumption function, and intermediate inputs in the investment functions, and the next period stock of capital to maximize (1), subject to the sequence of budget constraints

$$P_a C_a + P_i \left(C_i + I_{ai} + I_{ii}\right) + P_f(1+\tau_t)\left(C_f + I_{af} + I_{if}\right) = W\ H + R_a K_a + R_i K_i + T \tag{12}$$

and to the technological constraints (2), and (5) and (6) for both sectors. Given the sequence of prices $\{W_t, R_{a,t}, R_{i,t}, P_{a,t}, P_{i,t}, P_{f,t}, \tau_t\}$, it is straight-

[8]Perri and Quadrini (2002) have assumed that the real demand of exports is always equal to the real demand of imports; that is, $X = M$. They interpret this restriction assuming the existence of two symmetric countries that are both affected by the same shocks and implement the same policies. If we would take this assumption the equilibrium condition in the trade sector (condition (7)), the price of imports had been equal to the price of agriculture goods: $P_a = P_m$.

forward to write down the necessary first-order conditions:

$$P_{a,t}C_{a,t} = \frac{\gamma_a}{\gamma_i}P_{i,t}C_{i,t} \quad (13)$$

$$P_{f,t}(1+\tau_t)C_{f,t} = \frac{\gamma_f}{\gamma_i}P_{i,t}C_{i,t} \quad (14)$$

$$W_t H_t = W_t - \frac{1-\alpha}{\alpha}P_{i,t}C_{i,t} \quad (15)$$

$$P_{f,t}(1+\tau_t)I_{jf,t} = \frac{\sigma_f}{\sigma_i}P_{i,t}I_{ji,t} \quad \text{for } j=a,\, i \quad (16)$$

$$\beta\left[R_{j,t+1} + \frac{1-\delta}{B\sigma_i}P_{i,t+1}I_{ji,t+1}\right] = \frac{1}{B\sigma_i}P_{i,t}I_{ji,t}\frac{P_{i,t+1}C_{i,t+1}}{P_{i,t}C_{i,t}} \quad \text{for } j=a,i \quad (17)$$

and (12), and (5) and (6) for both sectors. Substitution (13)-(17) into the budget constraint (12) we find

$$\frac{1}{\alpha\gamma_i}P_iC_i + \frac{1}{\sigma_i}P_i[I_{ai}+I_{ii}] = W + R_aK_a + R_iK_i + T. \quad (18)$$

The domestic firms problem. The optimization problem of the firms in the two sectors is static and consists of the choice of capital and labor (and raw materials in the case of the industrial sector) to maximize profits. That is, in the case of the domestic agricultural firm,

$$\Pi(K_a,H_a) = \max_{K_a,H_a}\left\{P_aA_jK_a^{\alpha}H_a^{1-\alpha} - R_aK_a - W_aH_a\right\}$$

and for the domestic industrial sector

$$\Pi(K_i,H_i,RM) = \max_{K_i,H_i,RM}\left\{P_iA\left[K_i^{\gamma}RM^{1-\gamma}\right]^{\alpha}H_i^{1-\alpha} - R_iK_i - W_iH_i - P_m(1+\tau)RM\right\}$$

where W_j is the nominal wage rate, R_j the rental rate of capital in sector j, and P_j is the price of goods produced in each sector, for $j=a,\, i$.

The solution to the firm's problem satisfies

$$R_aK_a = \alpha P_a\, Y_a \quad (19)$$

$$WH_a = (1-\alpha)P_a\, Y_a \quad (20)$$

$$R_iK_i = \alpha\gamma P_iY_i \quad (21)$$

$$W\, H_i = (1-\alpha)P_iY_i \quad (22)$$

$$P_f(1+\tau)RM = \alpha(1-\gamma)P_iY_i \tag{23}$$

Observe that (3) and (20), and (4) and (22) find the labor demand for the agriculture and the industrial sector:

$$H_a^d = A^{1/\alpha}\left[\frac{(1-\alpha)}{\frac{W}{P_a}}\right]^{1/\alpha} K_a \tag{24}$$

$$H_i^d = A^{1/(\alpha\gamma)}\left[\frac{1-\alpha}{\frac{W}{P_i}}\right]^{[1-\alpha(1-\gamma)]/(\alpha\gamma)}\left[\frac{\alpha(1-\gamma)}{\frac{P_f(1+\tau)}{P_i}}\right]^{\alpha(1-\gamma)/(\alpha\gamma)} K_i, \tag{25}$$

and the demand for the foreign good raw material is

$$RM^d = A^{1/(\alpha\gamma)}\left[\frac{1-\alpha}{\frac{W}{P_i}}\right]^{[1-\alpha]/(\alpha\gamma)}\left[\frac{\alpha(1-\gamma)}{\frac{P_f(1+\tau)}{P_i}}\right]^{\alpha/(\alpha\gamma)} K_i. \tag{26}$$

Finally, we can find two relationships among parameters. Substitution of (19) and (20) into (3), as well as (21), (23) and (22) into (4), we find

$$\left(\frac{W}{P_a}\right)^{1-\alpha}\left(\frac{R_a}{P_a}\right)^{\alpha} = A\alpha^{\alpha}(1-\alpha)^{1-\alpha} \tag{27}$$

$$\left(\frac{W}{P_i}\right)^{1-\alpha}\left(\frac{R_i}{P_i}\right)^{\alpha\gamma}\left(\frac{P_f(1+\tau)}{P_i}\right)^{\alpha(1-\gamma)} = A(1-\alpha)^{1-\alpha}(\alpha\gamma)^{\alpha\gamma}(\alpha(1-\gamma))^{\alpha(1-\gamma)}, \tag{28}$$

The competitive equilibrium. We determine the equilibrium of the economy with the first-order conditions for households and firms, along with the proper transversality conditions, and the equilibrium aggregate conditions for agricultural, industrial and foreign goods (9)-(11), the equilibrium condition for labor markets $H_a^d + H_i^d = H^s$, the financial equilibrium condition $K_j^d = K_j^s$ for $j = a, i$, and the balance of trade exchanges (7) and government budget (8).

5.2 Steady state equilibrium

The domestic household conditions in the steady state. In the steady state (17) yields the investment demand on domestic industrial goods in the steady

state

$$P_i I_{ji} \;=\; \frac{\sigma_I B}{\eta} R_j \tag{29}$$

for $j = a,\ i$, and with $\eta = [1 - \beta(1-\delta)]/\beta$. Consequently, the investment demand on foreign goods in the steady state are found from (16), i.e., $P_f(1+\tau)I_{jf} = [\sigma_I B]/\eta R_j$ for $j = a,\ i$; and the aggregate investment in each sector $j = a,\ i$ is found from (5)

$$I_j = B \;\; Ln\left[[\sigma_I B]/\eta \left(\frac{\sigma_i}{P_i}\right)^{\sigma_i} \left(\frac{\sigma_f}{P_f(1+\tau)}\right)^{\sigma_f} R_j\right].$$

Finally, from (6), the stock of capital in the steady state is given by

$$K_j = (1/\delta) I_j \;\text{ for each sector } j = a,\ i. \tag{30}$$

The consumption demand for industrial goods in the steady state is found from (18):

$$P_i C_i^d = \alpha\gamma_i \left[W + R_a\Big(K_a - \frac{B}{\eta}\Big) + R_i\Big(K_i - \frac{B}{\eta}\Big) + T\right]. \tag{31}$$

Then we find the consumption demand for agricultural and foreign goods in the steady state

$$P_a C_a^d \;=\; \alpha\gamma_a \left[W + R_a\Big(K_a - \frac{B}{\eta}\Big) + R_i\Big(K_i - \frac{B}{\eta}\Big) + T\right] \tag{32}$$

$$P_f(1+\tau) C_f^d \;=\; \alpha\gamma_f \left[W + R_a\Big(K_a - \frac{B}{\eta}\Big) + R_i\Big(K_i - \frac{B}{\eta}\Big) + T\right] \tag{33}$$

Finally, the supply of labor in the steady state is found from (15):

$$H^s = \alpha - (1-\alpha)\left[\frac{R_a}{W}\Big(K_a - \frac{B}{\eta}\Big) + \frac{R_i}{W}\Big(K_i - \frac{B}{\eta}\Big) + \frac{T}{W}\right]. \tag{34}$$

The steady state equilibrium.

Labor market equilibrium. Given that $H_a^d + H_i^d = H^s$, from (34), (24), (25) and (30) for $j = a,\ i$, we find the clearance condition for the labor

market

$$A^{1/\alpha}\left[\frac{(1-\alpha)}{\frac{W}{P_a}}\right]^{1/\alpha} K_a + A^{1/(\alpha\gamma)}\left[\frac{1-\alpha}{\frac{W}{P_i}}\right]^{[1-\alpha(1-\gamma)]/(\alpha\gamma)}\left[\frac{\alpha(1-\gamma)}{\frac{P_f(1+\tau)}{P_i}}\right]^{\alpha(1-\gamma)/(\alpha\gamma)} K_i = \alpha - (1-\alpha)\left[\frac{R_a}{W}\Big(K_a - \frac{B}{\eta}\Big) + \frac{R_i}{W}\Big(K_i - \frac{B}{\eta}\Big) + \frac{T}{W}\right] \quad (35)$$

where K_a and K_i are found in (30).

Agricultural goods market equilibrium. Given (9), from (19)and (32), we find the clearance condition for the agricultural goods market

$$\alpha\gamma_a\left[\frac{W}{P_a} + \frac{R_a}{P_a}\Big(K_a - \frac{B}{\eta}\Big) + \frac{R_i}{P_a}\Big(K_i - \frac{B}{\eta}\Big) + \frac{T}{P_a}\right] + X = \frac{1}{\alpha}\frac{R_a}{P_a} K_a \quad (36)$$

where K_a and K_i are found in (30).

Industrial goods market equilibrium. Given (10), from (21), (31), and (29) for $j = a,\ i$, we find the clearance condition for the foreign goods market

$$\alpha\gamma_i\left[\frac{W}{P_i} + \frac{R_a}{P_i}\Big(K_a - \frac{B}{\eta}\Big) + \frac{R_i}{P_i}\Big(K_i - \frac{B}{\eta}\Big) + \frac{T}{P_i}\right] + \frac{\sigma_I B}{\eta}\frac{R_a + R_i}{P_i} = \frac{1}{\alpha\gamma}\frac{R_i}{P_i} K_i \quad (37)$$

where K_a and K_i are found in (30).

Foreign goods market equilibrium. Given (11), from (26), (33), and (29) for $j = a,\ i$, we find the clearance condition for the industrial goods market

$$\alpha\gamma_f\left[\frac{W}{P_f(1+\tau)} + \frac{R_a}{P_f(1+\tau)}\Big(K_a - \frac{B}{\eta}\Big) + \frac{R_i}{P_f(1+\tau)}\Big(K_i - \frac{B}{\eta}\Big) + \frac{T}{P_f(1+\tau)}\right] + + \frac{\sigma_f B}{\eta}\frac{R_a+R_i}{P_f(1+\tau)} + A^{1/(\alpha\gamma)}\left[\frac{1-\alpha}{\frac{W}{P_i}}\right]^{[1-\alpha]/(\alpha\gamma)}\left[\frac{\alpha(1-\gamma)}{\frac{P_f(1+\tau)}{P_i}}\right]^{\alpha/(\alpha\gamma)} K_i = M \quad (38)$$

where K_a and K_i are found in (30).

Balance of payments The value of the trade exchange is always balanced (7).

Government Budget The government budget is always balanced (8).

Solution Consequently, there are 6 constraints (35)-(38), (7) and (8), and

six unknowns: P_a, P_i, P_f, W, R_a, and R_i. By Walras' Law, one of the equations is redundant.

[However, there is a problem: how to define a foreign demand of exports, or a foreign supply of imports.]

In addition, there are two equilibrium relationships between prices (27) and (28).

5.3 Calibration

We will calibrate the model to represent the Spanish economy in the interwar period, making use annual data from the industrial and agriculture (available) data. The utility function is specified as $U(C_t, H_t) = \theta Ln[C_t] + (1 - \theta)Ln[H_t]$, with $\theta = 0.33$. The intertemporal discount rate is set to $\beta = 0.96$.

6 The Experiment and Future Research

Given the model described above two experiments are in order to assess the relevance of domestic and international shocks reported in the 20s and 30s. First, a negative international shock on imports M_t will decrease the investment on the industrial sector so that reduce income, aggregate output $Y_t = P_{at}Y_{at} + P_{it}Y_{it}$, and consumption. Second, a negative domestic shock in productivity of both sectors A_{jt} will reduce also aggregate output, investment and consumption. Which of the shocks become preeminent to explain the economic crises of the Spanish economy is about to be done in future research.

Appendix. The data

Before to analise the main factors that have been pointed as causes for the Spanish depression, we will make some considerations about the data.

6.0.1 Detrenting

We evaluate the depth of the depression in relation to the normal growth rate of the economy. To calculate this normal rate we use the average growth rate of per capita GDP over the sample 1850-1995 excluding the 1914-1918 and 1930-1945 periods (World War I, II and Civilian War). Table number presents average growth rates of Spanish per capita GDP for different subperiods. We use the growth rate 2.28%.

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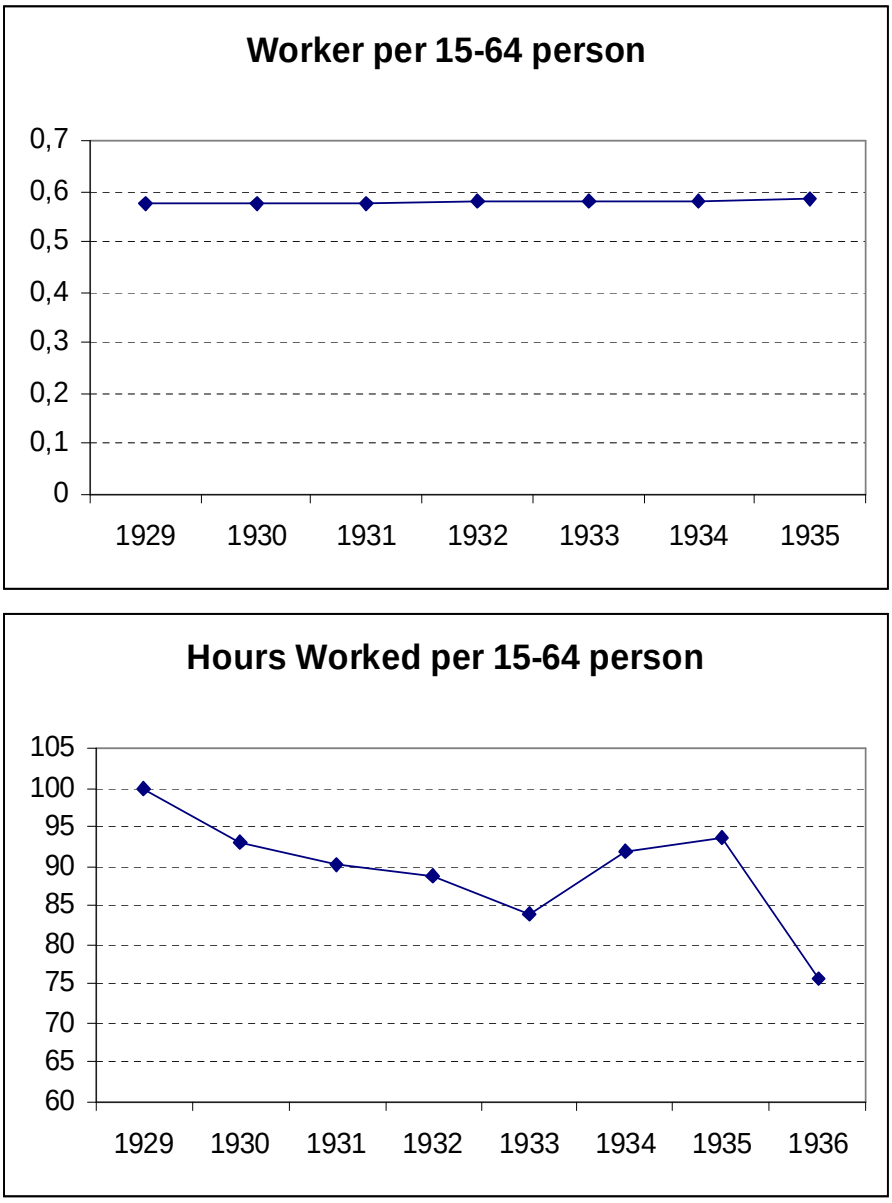

Figure 11: Worker per 15-64 person. Source: Own computations from ???.