

**‘The World Economy in Crisis – The Return of Keynesianism?’  
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**Household indebtedness, economic growth and the monetary circuit.**

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&

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ABSTRACT

Recently some countries have experienced a period of mild prosperity based on increasing household indebtedness and stagnant real and nominal wages. The former has made it easier to spend on durable consumer goods and residential investment above households' gross disposable income, keeping levels of activity and employment relatively high. Household indebtedness has been fuelled by low (even negative) real interest rates and, perhaps more relevantly, a process of financial liberalization which has led to an unprecedented era of easy credit. The latter, not unrelated to the former, has allowed for low inflation and increasing profitability of capital.

Notwithstanding, this pattern of growth is unsustainable: raising borrowing to fund consumer and residential investment today leads to rising debt service payment tomorrow. Therefore, in the future, larger portions of households' gross disposable income will have to be put aside for debt service settlement, weakening household demand. Two further problems should be added. (i) Building booms occur simultaneously with increasing real estate prices. Hence, the same nominal borrowing puts in motion less resources. (ii) Unlike the government or firms, households cannot roll over debt.

The aim of this paper is twofold: to provide a theoretical framework where the consequences of household indebtedness can be dealt with and to check that it fits the facts. For our first objective, we deal with household indebtedness in a monetary circuit framework. Taking our lead from Edward Nell, we set up a model integrating the linear theory of production framed in multisectoral models and the Classical theory of value and distribution, as revived by Sraffa, the Theory of the Monetary Circuit, as in Graziani, the Marxian distinction between production and circulation spheres, and the Keynesian principle of effective demand. In this model, not only do firms borrow for the funding of production, but also households borrow long term for the purchase of houses. This, we believe, makes the Circuit approach closer to the real world and, theoretically, more flexible. Further, we shift our model into a Stock–Flow Consistent Accounting *à la* Godley & Lavoie. And for the second objective, we study the dynamic interaction between household borrowing and debt service settlement and how these variables affect household demand and, hence, output and employment. Then we study what has happened in Spain during the last fourteen years.

The conclusion we reach for the Spanish economy is that it has fallen into recession because households' debt service payments have outstripped new indebtedness without any other institutional agent (neither non financial corporations, nor the government nor the rest of the world) having taken up the indebtedness baton. The banking crisis, because of rising default rates, may deepen the recession but it is not the ultimate cause.

## Introduction

According to the Post Keynesian view, capital accumulation rules the roost of (i) output and employment where the Keynesian principle of effective demand holds, (ii) distribution where the Cambridge equation holds (Kaldor, 1956, Pasinetti, 1974), and (iii) growth and fluctuations, as in multiplier-accelerator models (Samuelson, 1939).

In this view, although consumption can be considered to be the ultimate objective of economic activity, it is investment decisions, taken up by firms, which drive the level of output and employment in advanced market capitalist economies which are demand constrained. Hence, consumption is perceived as induced spending, made by households and funded with incomes chiefly coming from the sale of labour services.

The Theory of the Monetary Circuit (TMC onwards), a strand sympathetic to the Post Keynesian approach, conceives households in a rather similar manner (see for instance Graziani, 1989, 2003, Lavoie, 1992, Realfonzo, 1998, or Rochon, 1999, amongst others). This approach stresses the relation between firms and banks with a view to monetizing the production process. Here, households are viewed as relatively passive agents that sell their labour services in exchange for a wage which in turn is spent on consumer goods so that liquidity can return to initial borrowers who can then cancel bank debt. Workers may affect the level of nominal wages, but not the real wage, nor the amount of employment. The latter variables are determined by firms' decisions.

Nevertheless, in the last decade or so, household spending has played a key role in output, distribution and growth, in several countries. This has been the case, not only because the propensity to consume has risen but, also, because of the generalized increased access of households to bank lending. However, this pattern of growth has revealed itself to be unsustainable. Output growth has required increasing household indebtedness which, in turn, has led to a heavier debt service burden that has taken away resources which would, otherwise, have funded additional effective demand.

In the present paper, we deal with what has happened in Spain since 1997 to the present. We investigate the causes and consequences of household indebtedness which drove the economy during 10 years of prosperity, until mid 2007, and then to recession and crisis. Next, we deal with household indebtedness in a Monetary Circuit framework in which, following Edward Nell's lead, we integrate the linear theory of production and the Classical theory of value and distribution, as revived by Sraffa (1960), with the TMC, as developed by Graziani, *op.cit.*, taking into account further contributions of authors, such as Marx' distinction between production and circulation spheres, and Keynes' principle of effective demand. We proceed in two steps. First, we assume an economy growing *à la* von Neumann (1945). Next, we investigate the consequences of a fall in the interest rate relative to the rate of growth of output. Balanced growth should be interpreted as a benchmark equilibrium. That is, we do not state that such a situation works as a centre of gravity for the real world. It is just a methodological device, a starting point, which shall prove useful to understand how an economic system reacts to a particular shock.

This shock is analyzed with the help of Stock – Flow Coherent Accounting matrices and behavioural functions, following Godley and Lavoie (2007).

Our main conclusion is that the Spanish growth pattern based on increasing household indebtedness is unsustainable, because the factors which induced households to increase borrowing led to the rising inflation of the assets purchased provoking further indebtedness. And growing debt led to a heavier debt service burden, thus removing funds which would otherwise have gone to sustaining aggregate demand at a higher level.

### Spain's recent experience.

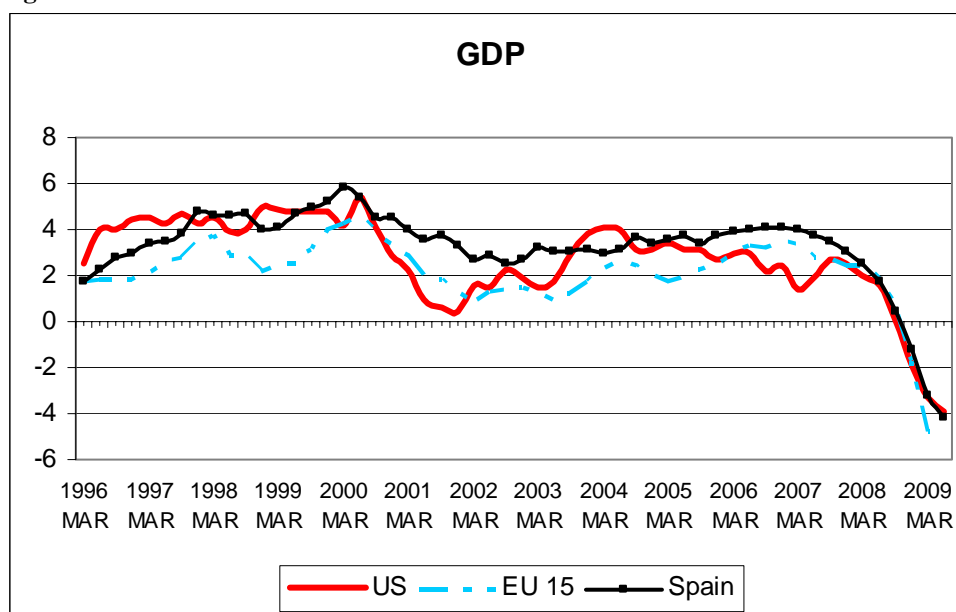
During the last 12 years, we have observed a period of prosperity, which goes from the first quarter of 1997 to the second quarter of 2007, followed by a recession, which began in the first quarter of 2008, and then a crisis, from the first quarter of 2009 up to now. The latest data on the yearly growth rate of GDP is -4.2%.

We divide this section into two parts. In the first one, we comment on Spain's period of prosperity and in the second one we deal with the causes of the downturn. And to put it in a nutshell, we believe that residential investment, funded with bank debt, has dragged economic growth upwards. However, this pattern of growth has been shown to be unsustainable, since house prices grew *pari passu* with more favourable financial conditions, thus requiring further indebtedness to put in motion the same resources. And growing indebtedness has meant growing debt service arrears which have taken away demand from other industries. Therefore, when debt service payments are not balanced with increasing indebtedness, leakages overcome inflows and, unless another agent (either the government, the trade balance or non financial corporations) takes up the baton, the economy goes into recession.

#### 1. *The period of prosperity: (1997:1 – 2007:2)*

From 1997 to mid 2007, the Spanish economy experienced a period of mild prosperity, with GDP growth rates averaging 3.85%, above the US (3.1%) and the European Union (EU, 2.5%) averages.

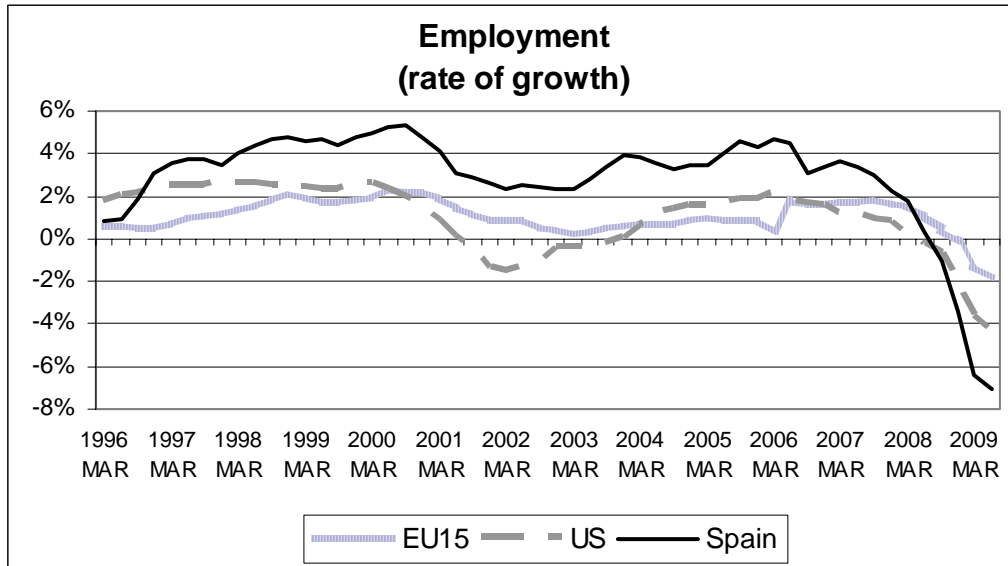
Figure 1



Source: Banco de España

This prosperity was accompanied with high rates of growth in employment: for Spain (1997 – 2007) over 3.78%, nearly three times above the US (non farm labour: 1.33%) and the EU (1.24%) rates:

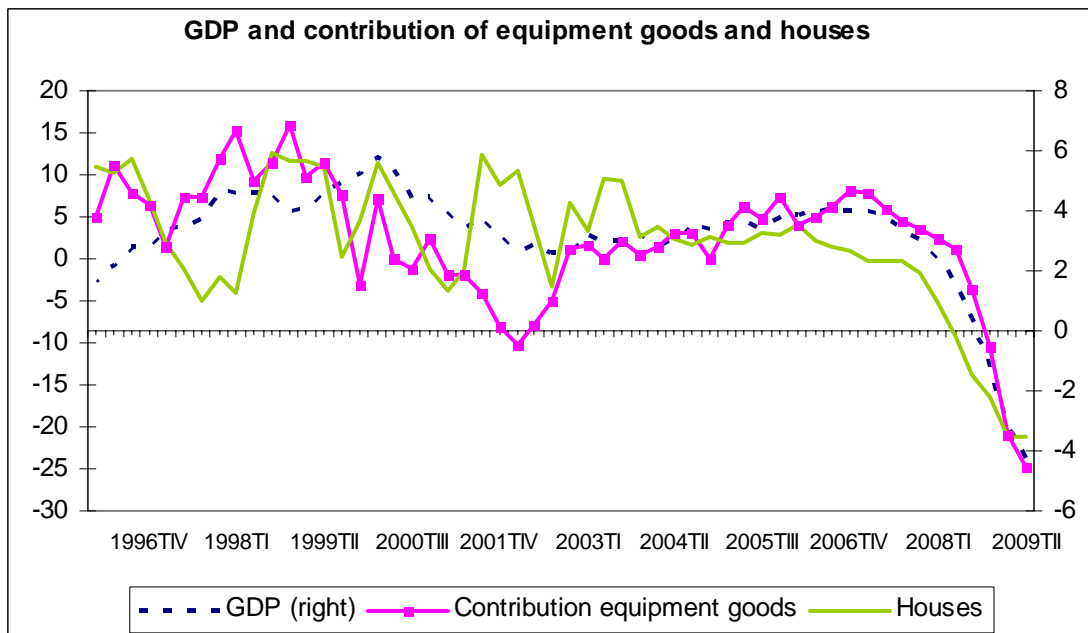
**Figure 2**



Source: Banco de España, INE and Bureau of Labor Statistics

From the demand viewpoint, Spanish GDP growth was driven, in essence, by the building and construction sector, particularly the demand for houses, and the demand for investment in equipment goods (the corresponding average rates of growth during the period 1997:1 to 2007:2 are 7.56% for houses, 7.37% for equipment goods and 3.85% for GDP). The figure below shows the rate of growth of GDP and the contributions of equipment goods and residential investment. The latter two series have been calculated as the rate of growth in equipment goods (residential investment) minus the rate of growth of GDP. Therefore, positive values indicate positive contributions to GDP growth.

**Figure 3**

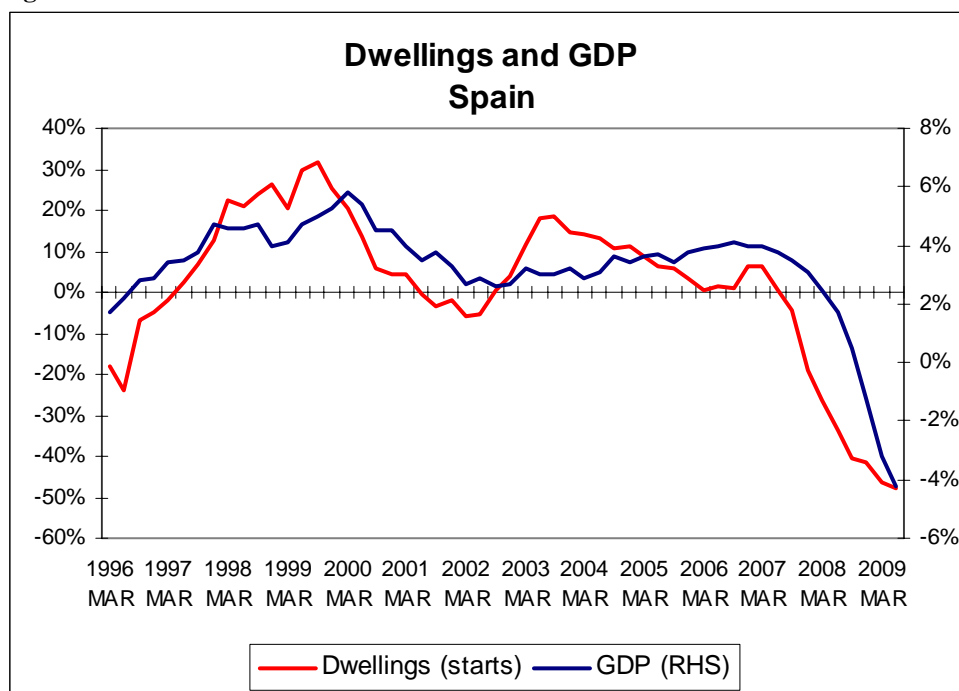


Source: INE

Nevertheless, a growing part of investment demand has been covered with imported manufacturing goods. Therefore, we conclude that the chief locomotive of the Spanish

economy has been construction, and particularly, residential investment.<sup>1</sup> Actually, as we shall try to show below, households have increased spending a lot, both in consumer goods and residential investment, funding part of this spending out of bank credit. As construction is a non-tradable good, all demand has had to be matched with domestic output and domestic employment which, in turn, has spent following a similar pattern. As household spending has grown, productive capacity has had to grow (as the accelerator theory of investment states). However, in this case, investment demand was matched in a relatively high proportion with imports. Hence, the multiplier effects of this spending have been lower.

**Figure 4**

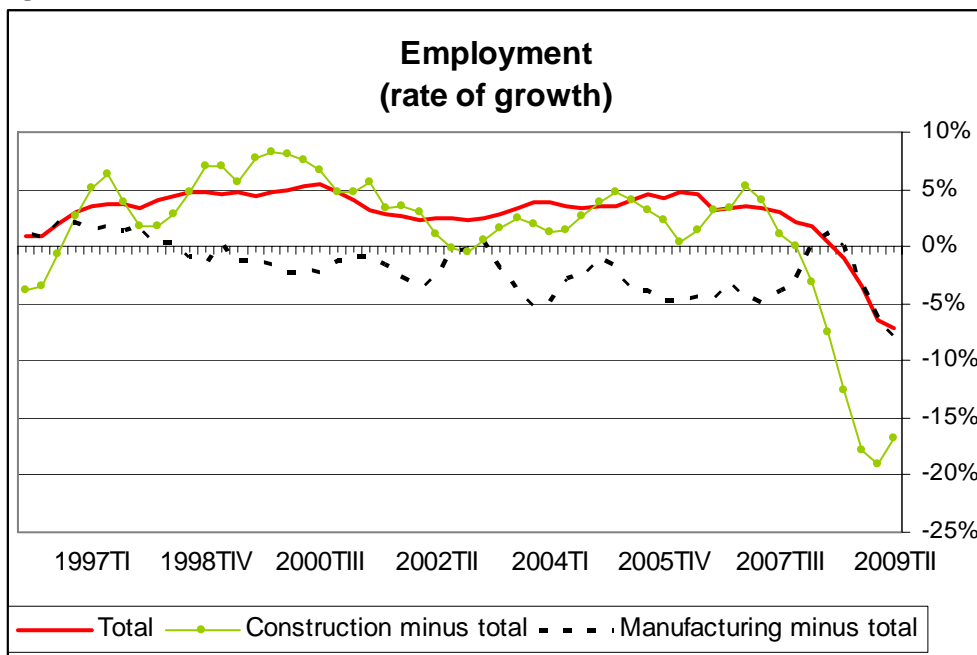


Source: Banco de España

Figure 4 illustrates the influence of residential construction on the evolution of GDP. At a glance we can see that not only do both series run in parallel, but also that dwellings precede, to some extent, GDP.

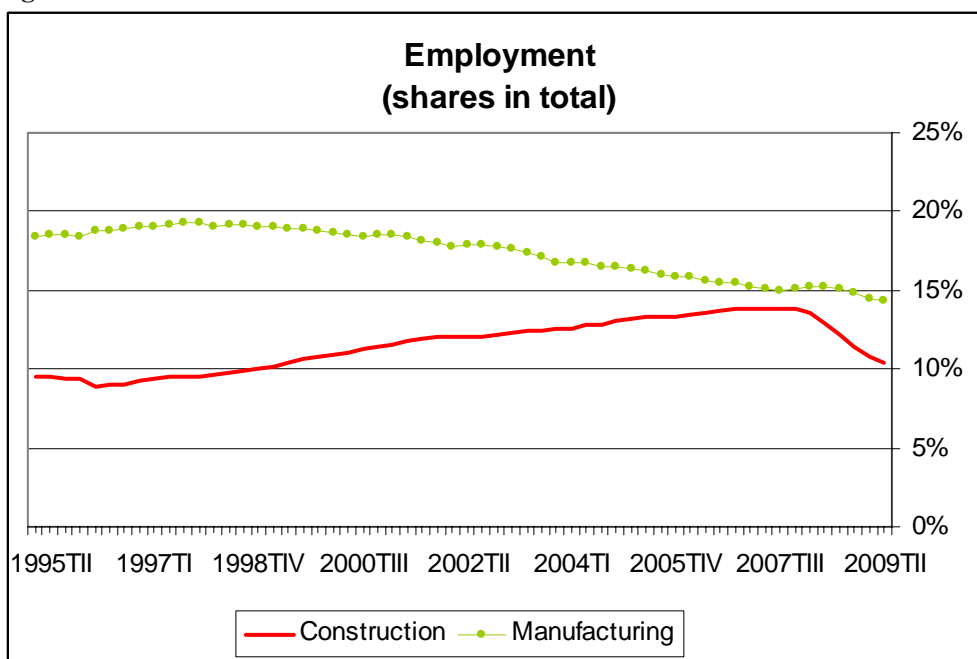
<sup>1</sup> Housing also includes furniture sales, home improvements, and so on. In a broader sense, a housing boom leads to a wealth effect which, in turn, affects consumption decisions. It is in this broader sense that we mean that housing has been a leading force during this prosperous decade.

Figure 5



Source: INE

Figure 6



Source: INE

In Figure 5, we see that employment in the construction industry grows above total employment during the period 1997 – 2007. Actually, the line represents the rate of growth of the construction industry minus the rate of growth of total employment. Furthermore, at the beginning of the period, the series takes on negative values. This is because we cannot separate the housing subsector from building and construction. Regarding manufacturing, we can see that employment grows at a slower rate than the overall total. The reader could claim that this might be due to an increase in productivity. But the real reason is that a large proportion of the demand for intermediate inputs has been covered by imported products. According to our sources, the average rates of growth of employment during the period 1997:1 to 2007:2 are

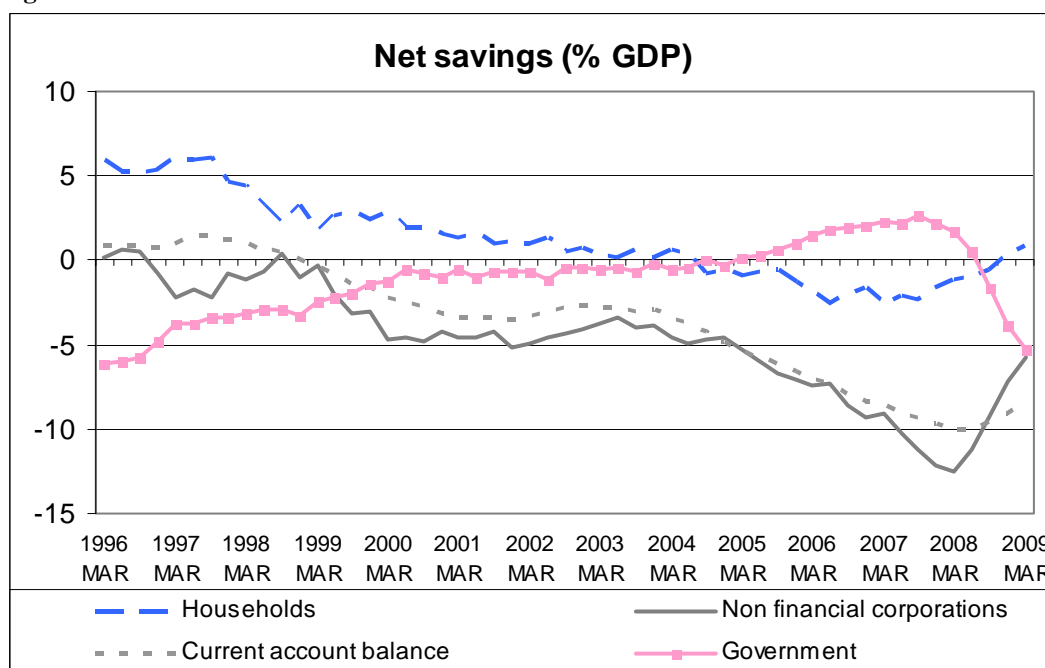
7.54% for construction, 1.91% for manufacturing goods and 3.78 for the whole economy.

Figure 6 reinforces what has been stated above: the share of employment in construction, related to total employment grows from 8.75% to 13.88% (2007:q2) and then falls, whilst employment in manufacture falls steadily from 19.01% (1997:q1) to 14.29% (2009:q2).

From this, we conclude that Spain's period of prosperity (1997 – 2007) has been driven by household spending. This has led to expanding productive capacity, though its impact on further growth has been lower since most *induced investment demand* (induced, through the accelerator, by autonomous residential investment demand) has been matched with imports.

This has led to increasing levels of household and firm's indebtedness:

**Figure 7**

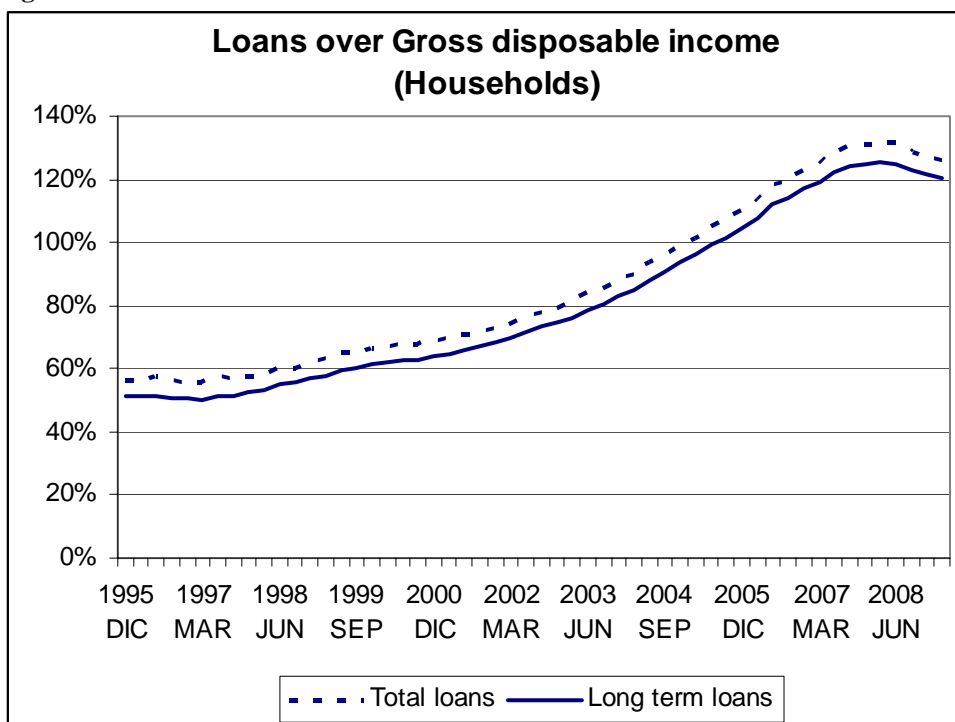


**Source: Banco de España**

Here we see that households savings over investment initiate the period of reference (1997) amounting to nearly 5% GDP. This variable reaches -2.1% in June 2007. Regarding non financial corporations, they begin the period with zero net savings, but in time, these have reached -12.48%. This figure illustrates two facts: (i) increasing private indebtedness has grown *pari passu* with public surplus; yet public savings have not been enough to compensate aggregate negative net savings; (ii) with the arrival of the crisis (third quarter of 2008), public disavings do not balance out private domestic net savings, although the trade balance improves 1.5 percentage points.

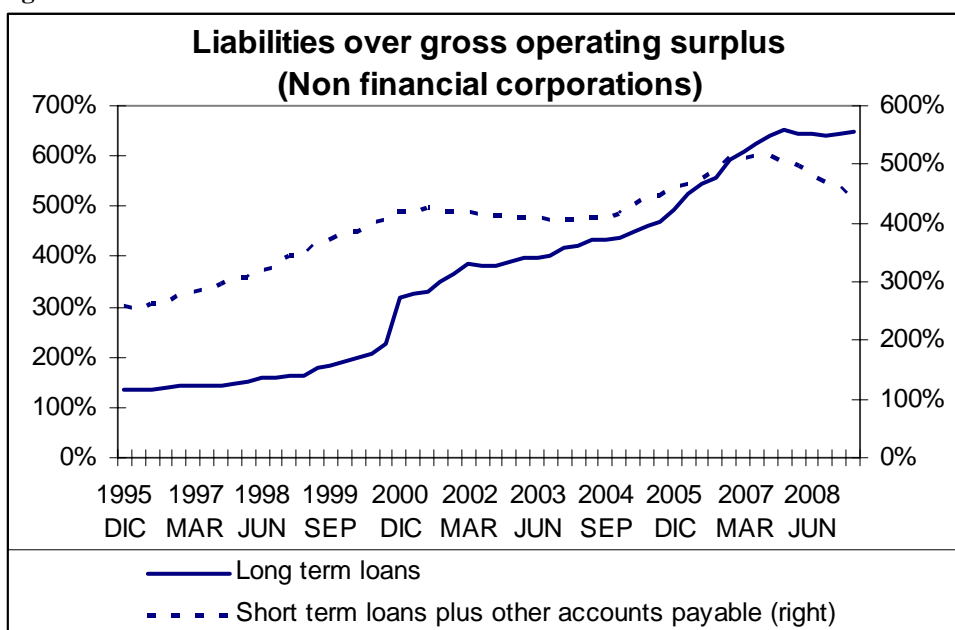
Next, we show the evolution of some financial liabilities relative to resources, for households and non financial corporations.

**Figure 8**



Source: Banco de España

**Figure 9**



Source: Banco de España

The upper figure shows the evolution of total loans and long term loans, divided by households (plus NPISHs) gross disposable income (GDI). The vertical difference between both series gives us short term loans. Long term loans relative to GDI shift from nearly 50% in 1995 to 125% at the beginning of 2008. The lower one shows the evolution, on the one hand, of the ratio of long term loans to gross operating surplus of non financial corporations<sup>2</sup> and, on the other hand, of the ratio of short term loans plus

<sup>2</sup> We inform the reader that NFC's net financial assets almost equal total loans period after period, from 1995 till the first quarter of 2009.

other accounts payable to gross operating surplus. At the end of the period, both liabilities added up to 1100 % GOS.

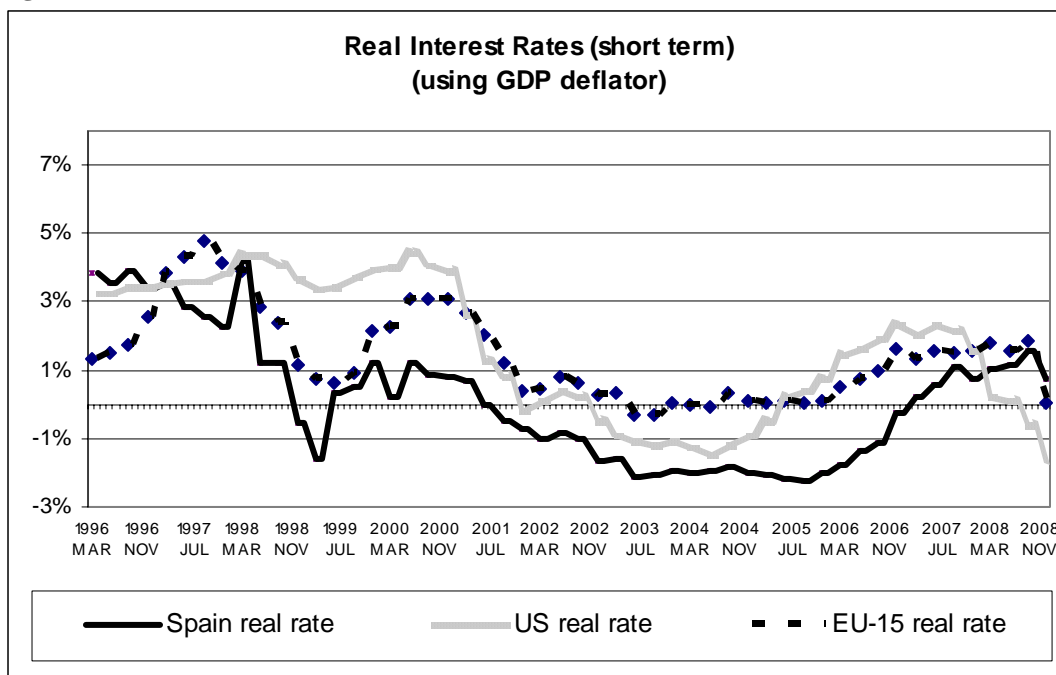
From Figure 7, on the one hand, and Figure 8 and Figure 9, on the other hand, it is easy to deduce that part of private domestic indebtedness, chiefly households, has gone to reduce public indebtedness, and the rest, non financial corporations' indebtedness, has been funded with savings from the rest of the world.

Now, we should ask what factors have led us to this situation. In this paper, we shall focus on household indebtedness. In our view, four factors explain the amazing growth of this variable:

- The fall in the real interest rates.
- The increase in the maturity on mortgage loans.
- Combined demographic / institutional factors (i.e. baby boomers are in their thirties in the mid-nineties; the immigrant population has shifted from practically zero to ten percent from 1995 to 2005; more than eighty per cent percent of the population now live in their own house following the 92-94 crisis when many people decided to delay the purchase of their own house).
- Liberalization / increasing competition amongst banks (reducing collateral requirements, reducing the differential between interest on credits and deposits).

Regarding the fall in interest rates, the next figure illustrates an international comparison of real interest rates:

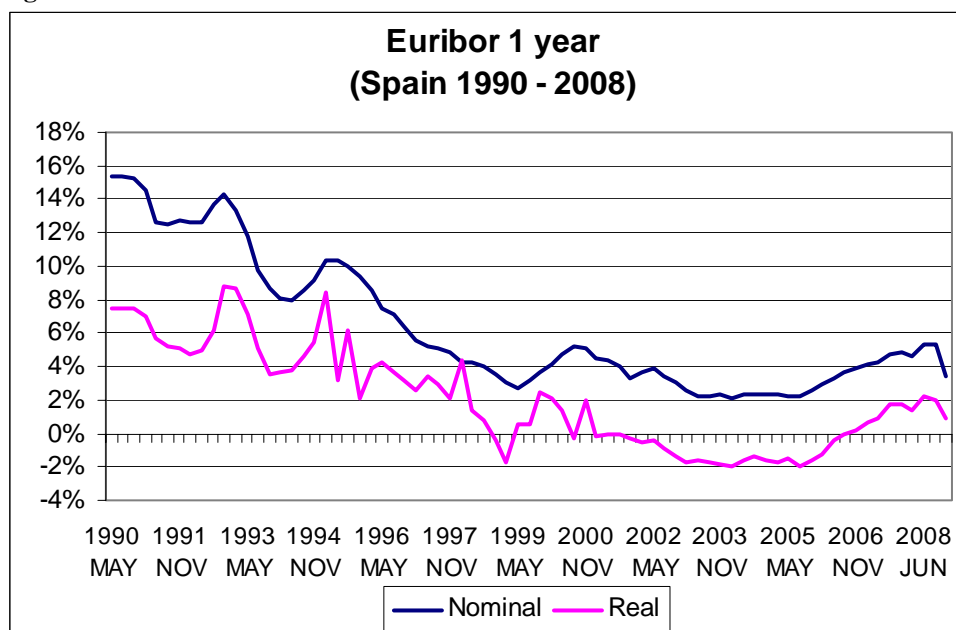
**Figure 10**



**Source: Banco de España**

Since 1998, the real short term interest rates have been, on average, below 1% in Spain, being negative from 2001 to 2006. Additionally, the period 1998-2006 has been one of historically low interest rates, in relative terms:

Figure 11



Source: Banco de España

Simultaneously, with the fall in the interest rate, we have observed a progressive lengthening in the maturity of mortgage loans.

Table 1

	Maturity (years, new mortgages)	Mortgage loan (average, euro)	Interest rate (%)	Monthly debt service payment on mortgage loan
1995	17	44303	11,07	482,87 €
1996	18	47378	9,45	457,08 €
1997	19	50786	6,91	400,64 €
1998	20	55887	5,65	389,19 €
1999	21	61829	4,72	387,16 €
2000	22	69063	5,76	462,01 €
2001	23	75645	5,76	495,15 €
2002	24	85458	4,8	500,29 €
2003	25	97202	3,59	491,32 €
2004	25	110226	3,19	533,66 €
2005	26	128534	3,18	606,00 €
2006	27	143914	3,7	703,02 €
2007	28	151432	5,8	912,49 €
2008	26	142324	5,83	886,98 €
2009 (JUN)	24	122004	3,16	604,91 €

Source: Banco de España, Asociación Hipotecaria Española, Colegio de Registradores de la propiedad y mercantiles de España and authors' calculations

From 1995 to 2003, monthly debt service payments on a current mortgage loan amount to nearly the same amount of money although the amount of money lent for any one mortgage is almost double in 2003 compared to 1995. Nevertheless, from 2004 to 2007, debt service payments increase 86 % when the average mortgage loan grows 56%.

Apart from the fall in the interest rate, a factor explaining the huge demand for houses is demographics together with the high ratio of ownership. Further, the 92-94 crisis may have delayed the decision to purchase a house in the hope of a new period of prosperity.

Table 2

	Total immigrants	Total born Spain	Total	Inmigrants / Natives	Aged 30-40	rate unemployment	Ownership
1991					5.843.224	16,33	79.30
1996	1.067.478	38.601.914	39.669.392	2.69%		21.72	
1998	1.173.767	38.678.884	39.852.651	2,95%		18,32	82.02
1999	1.290.489	39.453.206	40.202.160	3,21%		15,19	82.72
2000	1.472.458	39.027.333	40.499.791	3,64%		13,54	84.07
2001	1.969.269	39.147.573	41.116.842	4,79%	7.297.525	10,29	84.54
2002	2.594.052	39.243.842	41.837.894	6,20%		11,51	84.72
2003	3.302.440	39.414.624	42.717.064	7,73%		11,31	84.08
2004	3.693.806	39.503.878	43.197.684	8,55%		10,74	84.57
2005	4.391.484	39.717.046	44.108.530	9,96%		8,42	86.28
2006	4.837.622	39.871.342	44.708.964	10,82%		8,15	
2007	5.249.993	39.950.744	45.200.737	11,61%		8,03	
2008	6.044.528	40.113.294	46.157.822	13,10%	8.358.906	11,33	
2009	6.418.100	40.243.850	46.661.950	13,75%		17,92	

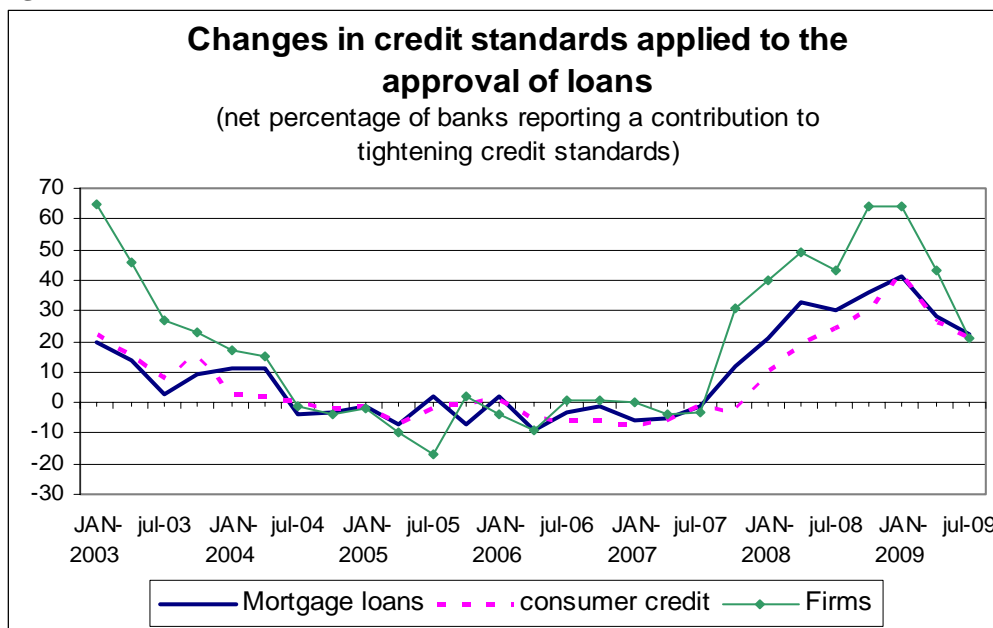
Source: INE and Banco de España

This table encapsulates some remarkable facts:

- Although the total number of people born in Spain does not grow substantially, people in the 30-40 year old bracket increase a lot (43% from 1991 to 2008 (or an accumulated yearly average rate of growth of nearly 2.13%). The baby boom took place in Spain roughly 10 years later than in the rest of Europe).
- The number of immigrants was relatively low in 1996, but it has reached an outstanding 13.75%. Some of them purchased a house during the last decade (5.14% of all purchases were made by non-EU citizens in 2006, according to the *Colegio de Registradores* – immigrants were responsible for almost 9% of all purchases).
- The rate of unemployment was very high in the first half of the nineties (nearly 20% on average for the period 1990 – 1995). However, in the 1998 – 2008 decade this variable fell 10 percentage points. This has led to a concentration of house purchases in the prosperous decade.
- Finally, we show in the last column the rate of ownership: that is, the percentage of houses owned by the households living in them. In 2005, this rate amounted to more than 86%.

A final factor contributing to the growth of household indebtedness is the level of standards required by banks to grant loans to households. Here the European Central Bank provides useful information with its "Bank Lending Survey". Unfortunately, the period reported begins in 2003. Also, the survey collects information provided by 112 European banks, only 10 of which are Spanish.

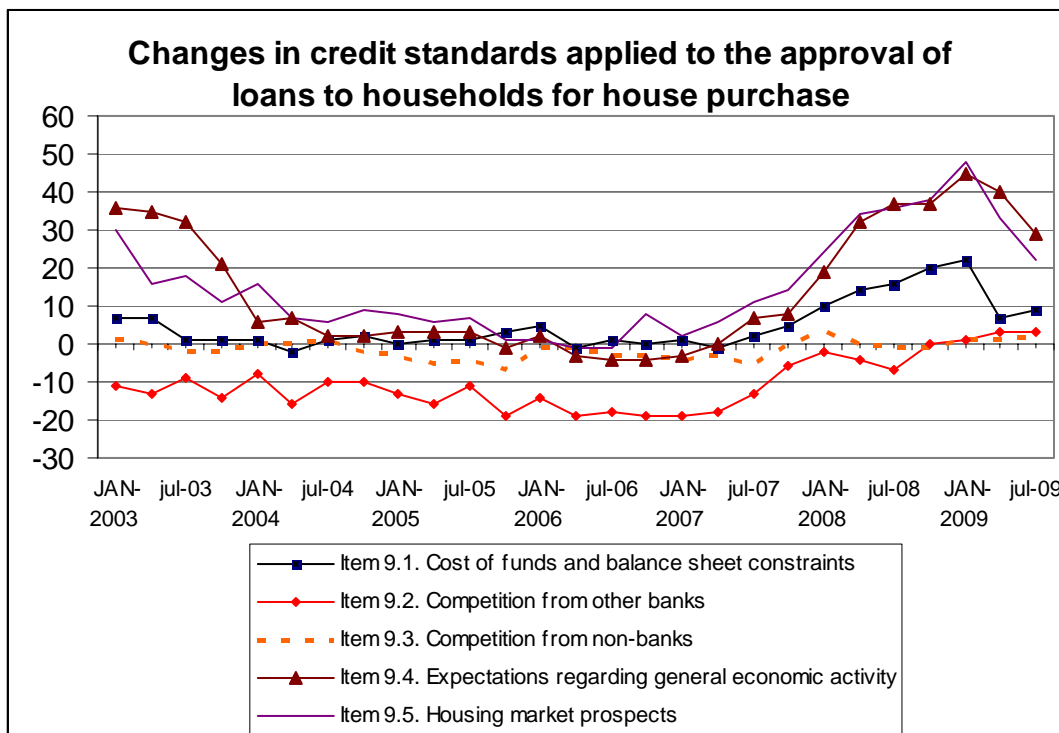
Figure 12



Source: ECB

Here we see that it is at the end of 2007 and the beginning of 2008 when banks tighten up their requirements for granting loans. From the beginning of 2003 to the end of 2007, the net percentage of banks which declare to tight standards falls. Unfortunately, the survey does not provide data before January 2003. So we cannot ascertain whether, from the end of 2007, banks are returning towards *normal* standards concerning lending criteria or they are just tightening them. According to Martínez Pagés (2008) Spanish banks are behaving in the same way as their European counterparts though their tightening up on loan facilities has been more extreme.

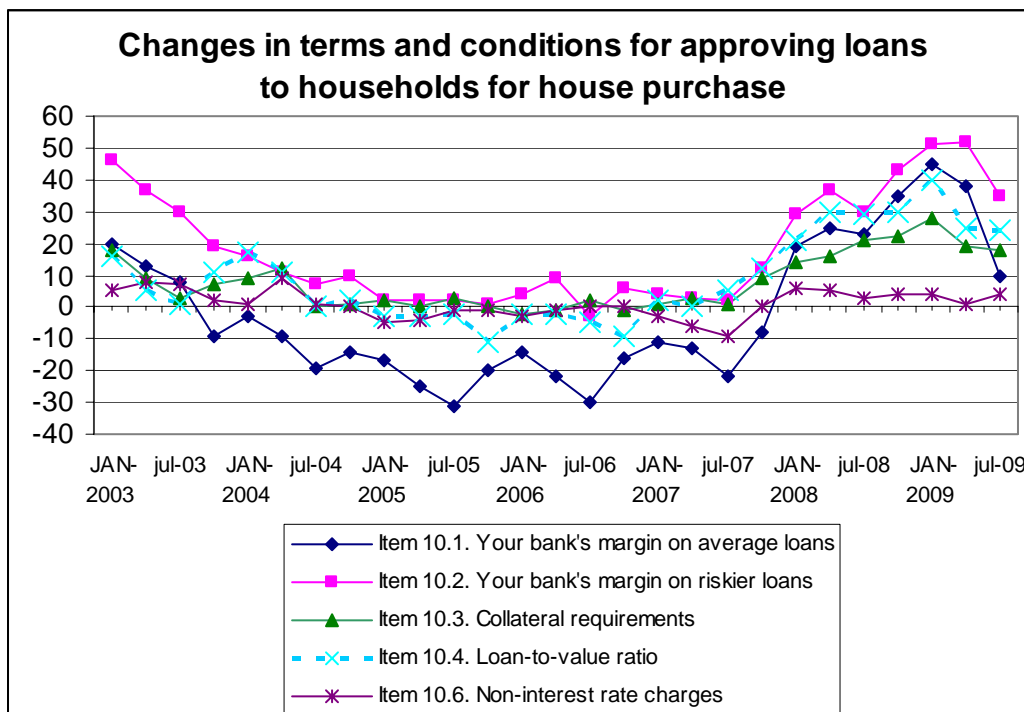
Figure 13



Source: ECB

Amongst the factors affecting this easing / tightening up, we see in Figure 13 that the most relevant ones are housing market prospects and expectations regarding general economic activity. What seems to be less relevant is the cost of funds and balance sheet constraints. Also, competition from other banks and non-banks appears to be irrelevant, whilst it had contributed in the past to ease lending.

Figure 14



Source: ECB

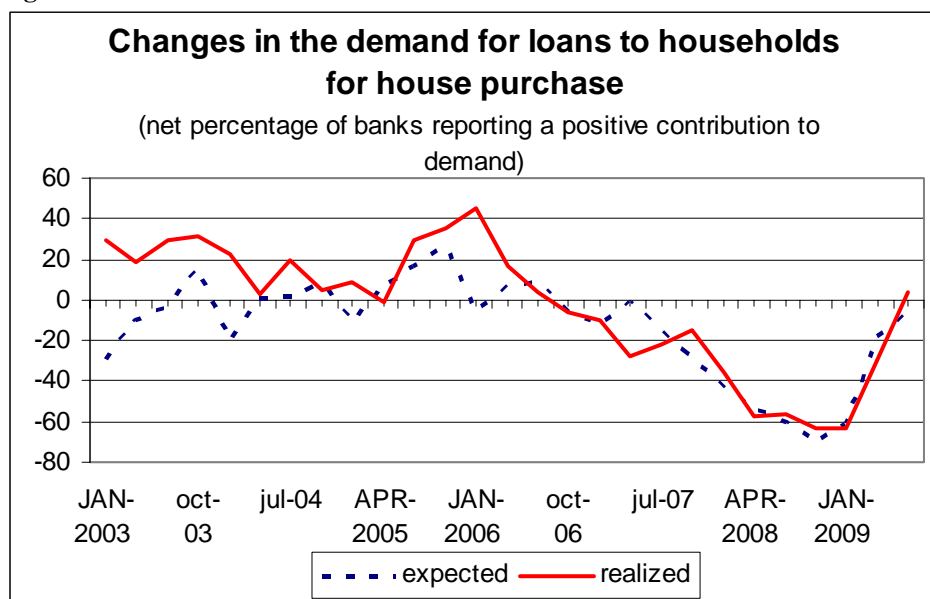
And the noose tightening up on lending adopts the form of higher margins, particularly those on riskier loans, more collateral requirements and a lower loan-to-value ratio.

From this data, we can deduce that the most relevant factors for banks constraining lending activity (related to house purchases) come from low expectations about the construction industry and the general level of economic activity. Albeit, we cannot discard the relevance of problems with bank capital, banks access to market financing and banks' liquidity position.<sup>3</sup>

And if we have a look at the demand side (i.e. the demand for credits for house purchase), the following figure is useful.

<sup>3</sup> This view is shared by García-Montalvo (2008).

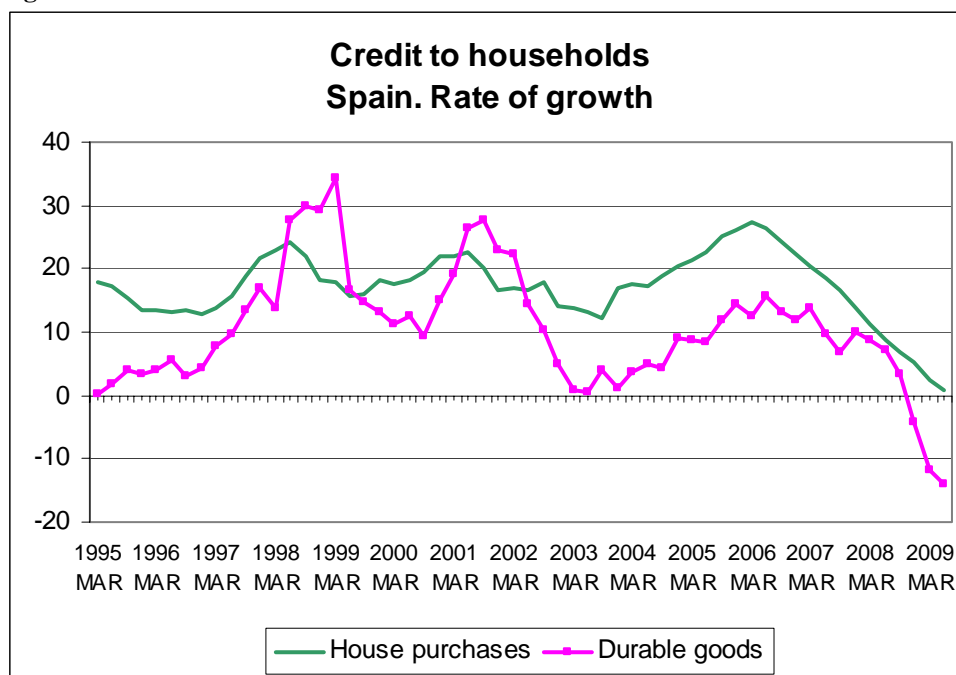
Figure 15



Source: ECB

Here we see that the growth in the demand for mortgage loans begins to decline at the end of 2006. The tightening of supply conditions coincides with the fall in the expected demand for loans (both at the beginning and at the end of the sample period). Simultaneously, this tightening takes place along with a fall in the expectations on the level of activity both at the general and the housing market level. From this we draw two conclusions: (i) the supply factors affecting bank lending are not independent from the demand ones (with the exception of bank capital and bank access to liquidity, which, in turn, is not the most relevant factor within the tightening). That is, while the demand for loans by households is growing steadily (i.e. from 2003 to the end of 2006) and banks are still confident about the state of the economy, they relax the criteria to lend; (ii) if the former holds, Spanish banks may have had low standards during the period when the demand for mortgage loans was very high (nearly 20% growth rate for the period 1997:1 to 2007:2).

Figure 16



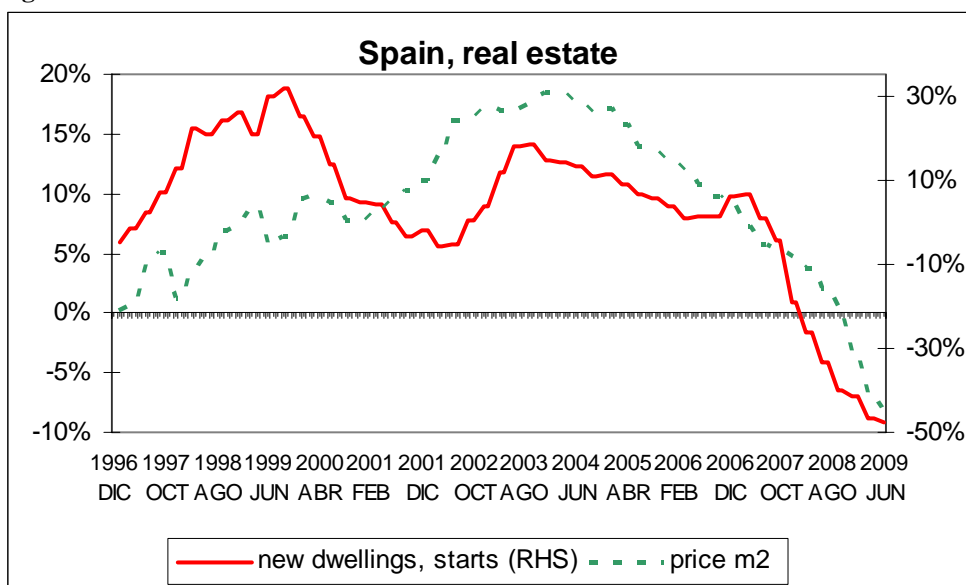
Source: Banco de España

Next, we shall focus on the evolution of the housing market during the prosperity period and the subsequent crisis. We would like to highlight the following facts:

- The number of dwelling houses which have been built and are under construction since 1997 to now amounts to 6.7 million. The yearly average for the period 1997-2008 is over 550.000 dwelling houses. Dwellings under construction peaked in 2007, with more than 760.000 units. Paradoxically, in the same year, in France 414.000 dwellings were started, whilst in Germany the figure was a little less than 248.000 units.
- These supply figures were matched with huge price increases. The price of 1 square metre of an average marketed dwelling amounted to 691 euros at the beginning of 1997, whilst, in June 2007 this amounted to 2054.5 euros (197.32% higher, after 9.5 years, or roughly an 11% increase per annum).<sup>4</sup>

<sup>4</sup> It is no coincidence that the amount of money lent for mortgages in 2007 averaged roughly 150.000 euros whilst it was 50.000 in 1997, that is, 200 % more. See Table 1 above.

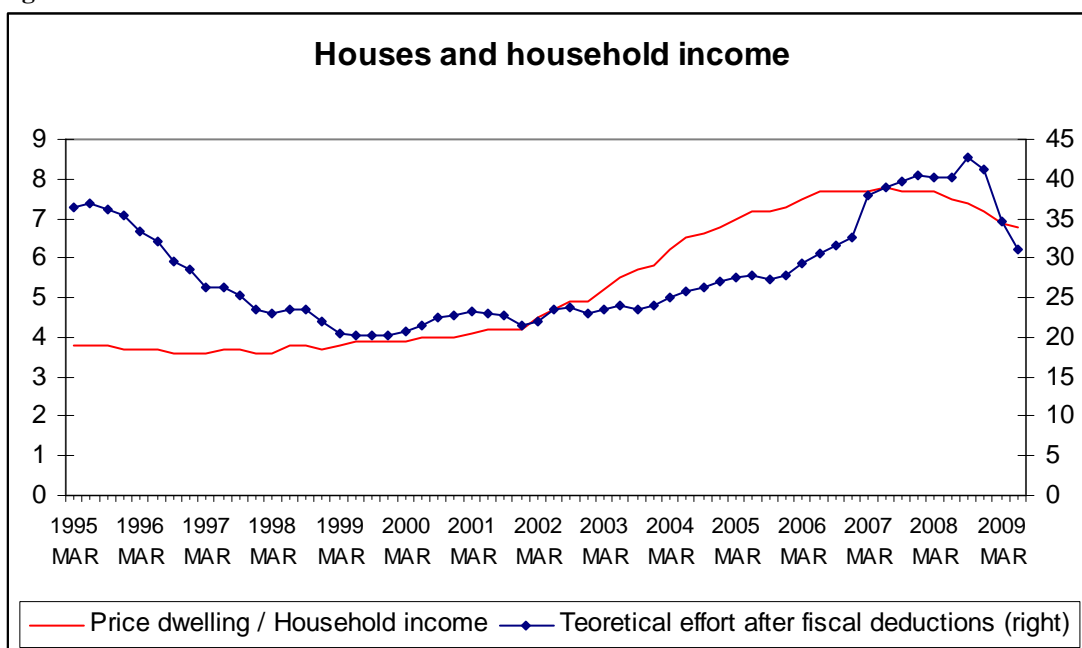
Figure 17



Source: Banco de España

- The rate of growth of the price of 1 square metre peaked in March 2004, when it reached more than 18% (yearly rate of growth). In that period, the number of dwellings under construction amounted to 14%.
- The price of an average dwelling related to an average household gross income shifted 3.8 times at the beginning of 1997 to 7.8 in mid 2007. At the end of the prosperity period, debt service payments represented almost 50% of a median household's gross disposable income.

Figure 18

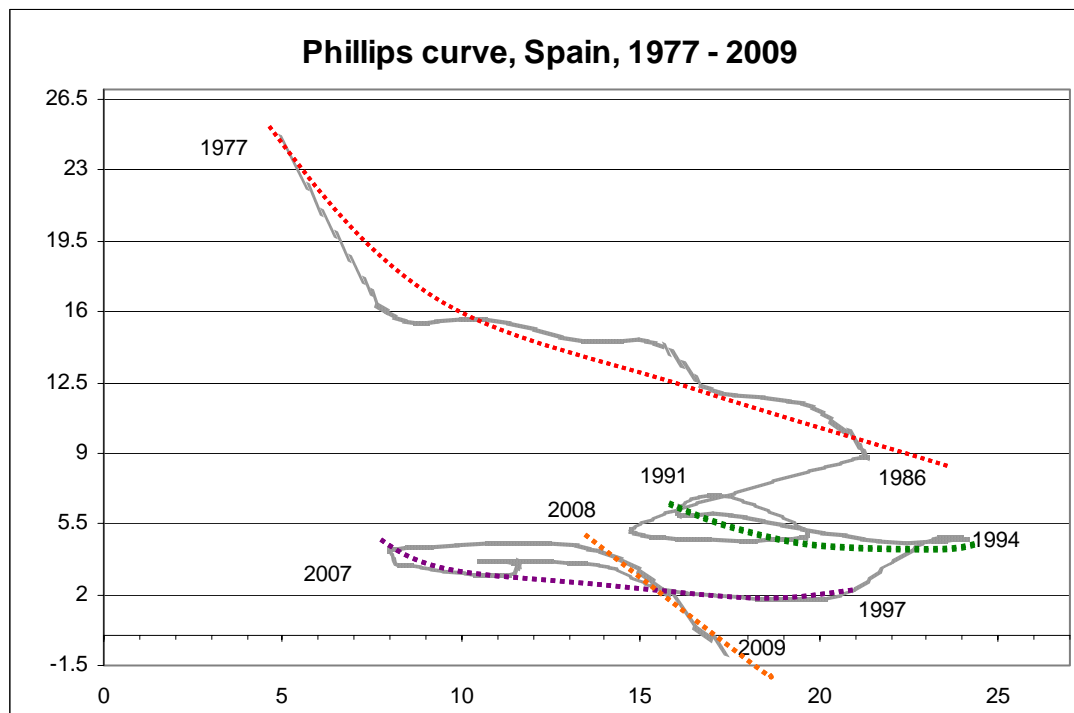


Source: Banco de España

And, before finishing this section, we may well wonder what has happened to the price of dwellings in relation to other prices (that is, CPI and wage inflation). The reader might claim that inflation in the housing market is the consequence of an effective interest rate below the *natural* one, in the Wicksellian sense. Nevertheless, if this were

so, all prices (including wages) would have had to rise if interest rates were below the natural level. Again, a quick glance refutes this claim. What we have is a Phillips curve for the Spanish economy, during the period 1977 – 2009:

**Figure 19**



**Source:** INE

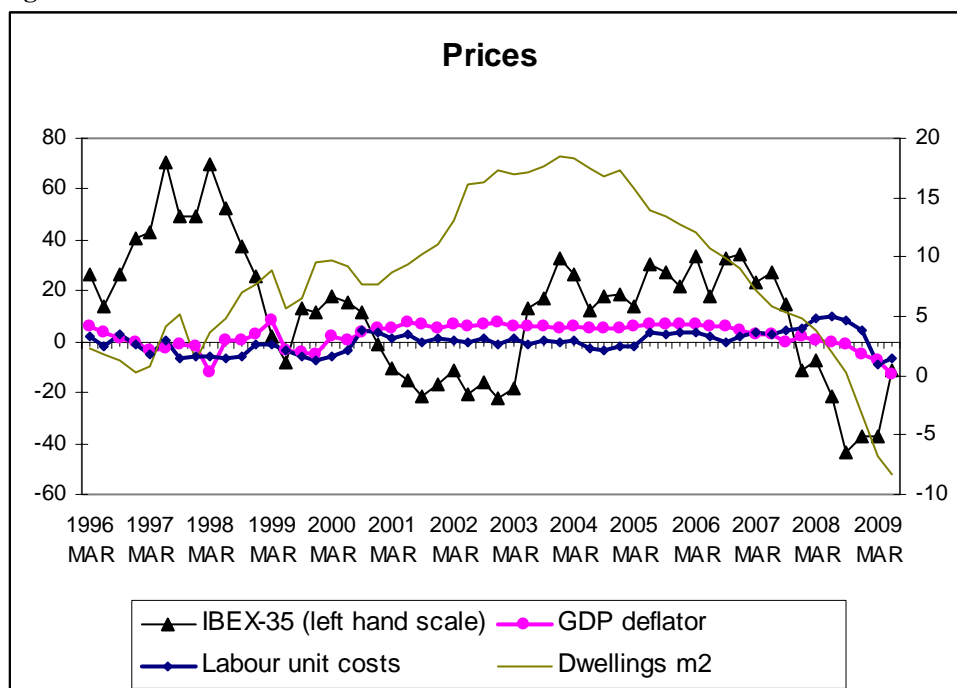
This figure illustrates, at least, two facts: (i) there is no centre of gravity around which the unemployment rate fluctuates. The figure above shows that the rate of unemployment has shifted from 4.9% in 1977 to 21.2% in 1986; from 16.1% in 1991 to 24.1% in 1994; from 20.6% in 1997 to 8% in 2007 and from 13.9% in 2008 to 17.3 in 2009. (ii) Even if we assume that the average rate of unemployment acts as an indicator for such a centre of gravity, when the effective rate of unemployment is below the average (for the period 1977 – 2009 it is 15.2%) the NAIRU concept has failed abysmally. In 1994, the rate of unemployment was 24.1% and inflation was 4.7%; in 2007 unemployment was 8% (16 percentage points lower) whilst inflation was running at 4.2%!

Regarding inflation during the prosperity period (1997:1 – 2007:2), it is true that inflation has shifted from 2% to 4.2% whilst unemployment has fallen from 20.61% to 8%. However, the price of crude oil was 18.64 USD in 1997 and 64.2 USD in 2007; and the Maastricht criteria required low inflation in order to adopt the single currency. And in the same period, unemployment fell 12 percentage points.

Therefore, we may conclude that negative interest rates have not unleashed an inflationary process.

The second figure illustrates the evolution of the GDP deflator, the labour unit costs (that is, nominal wages minus labour productivity), dwelling prices and stock prices in the main Spanish stock market, the IBEX-35. Here we find that the GDP deflator and unit labour costs increase moderately, whilst prices of real and financial assets fit the neo-Wicksellian ‘New Consensus Macroeconomics’ view: when the interest rate falls below a certain level, inflation accelerates.

Figure 20



Source: Banco de España

## 2. The housing slump and the economic downturn: (2008 - ?)

The rate of growth of GDP in Spain begins to fall at the end of 2006, when it reaches 4.05%, but it is only in mid 2008 when we can start to talk of recession. In the second quarter of 2008, the rate of growth of GDP relative to one quarter before was 0%, and in the following quarters, up to the present, it was negative.

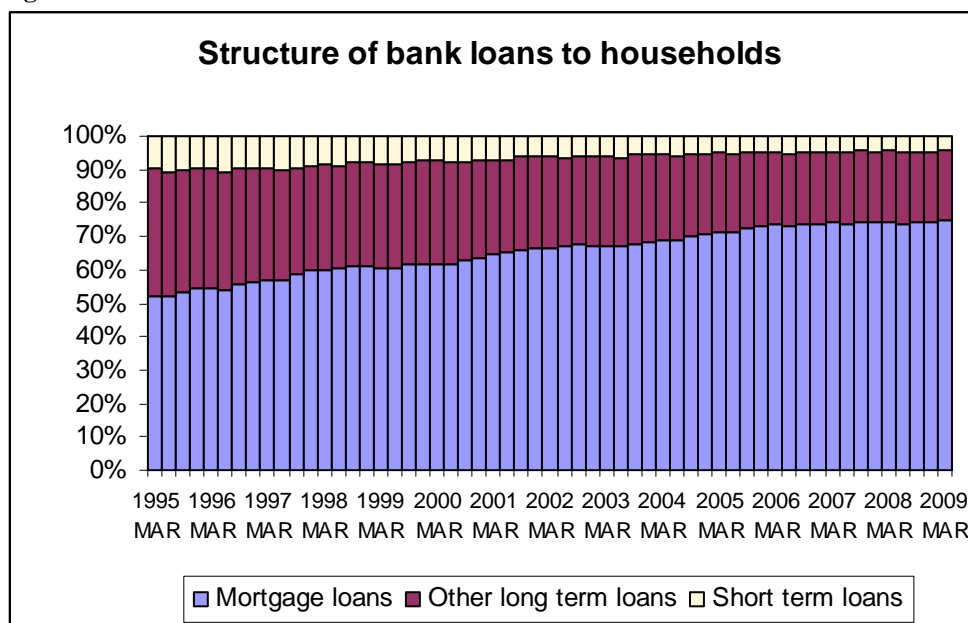
The reason for this, in our view, should be found in the lack of impetus of household spending. Actually, the real reason for this is twofold: (i) regarding residential investment, as a result of high prices, to put the same *amount* of resources in motion requires bigger loans and, therefore, growing indebtedness; this process of household indebtedness cannot go on forever (although it is not clear—at least for us—where the limit really is). (ii) Currently, growing indebtedness today means a growing debt service burden for tomorrow. This variable becomes more and more relevant as the level of indebtedness becomes higher, with the system becoming more sensitive to changes in the interest rate. What is relevant is net indebtedness, i.e. the increase in indebtedness in one period of time minus debt service payments made in the interim.

We shall show that household indebtedness loses strength in mid 2007 and this causes the downturn. In the following paragraphs we provide an account of the procedure adopted to calculate household net indebtedness and, particularly, the debt service burden.

Increasing household indebtedness has been calculated as the difference between outstanding indebtedness between two periods of time (usually, one year) and to this we add the settlement of principal on debt during the same period of time.

Regarding debt service payments, this will depend on the amount of debt, the interest rate and the maturity of the loans. In Figure 8, we see that that the ratio between total loans and household gross disposable income peaks in March, 2008, where the ratio amounts to 137.9% and then falls. Incidentally, most loans are long term as well.

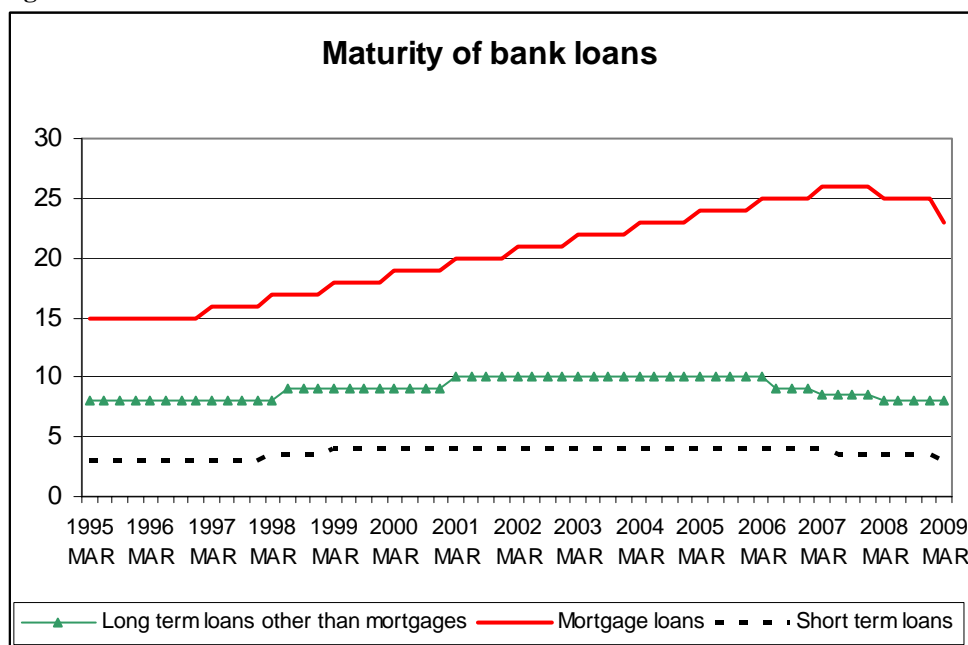
**Figure 21**



Source: Banco de España

This figure shows that the weight of short term loans falls relative to total loans and that mortgage loans increase. We shall assume the following values for the maturity on loans:

**Figure 22**

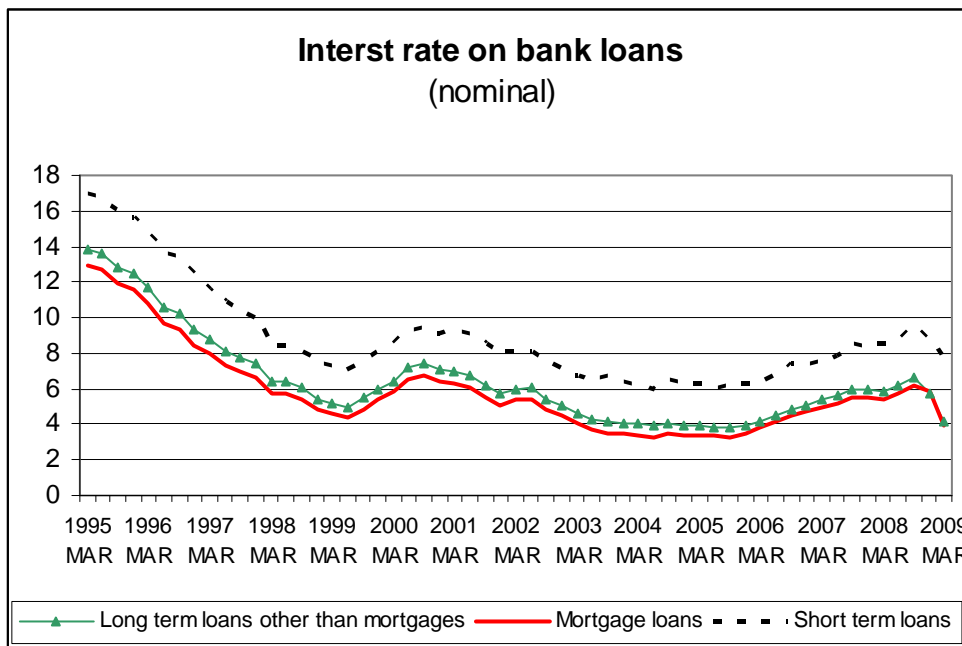


Source: Banco de España and authors' calculations.

Regarding maturities, for short term loans we have assumed, following Gento (2006), that their maturity amounts to 36 months, though this rises to up to 48 months from 1999 to 2007, when banks requisites on borrowers tighten. For long term loans, other than mortgages we assumed an 8 to 10 year maturity period. These loans are used to purchase durable consumer goods (e.g. automobiles) but also to fund the investment purchases of self employed individuals and non-corporate firms. Finally, the maturity of

mortgage loans has been calculated from data about the average maturity of loans granted in each year, provided by the Banco de España. It ranks from 15 years at the beginning of the period to 26 years in 2007, and then falls to 23 years.

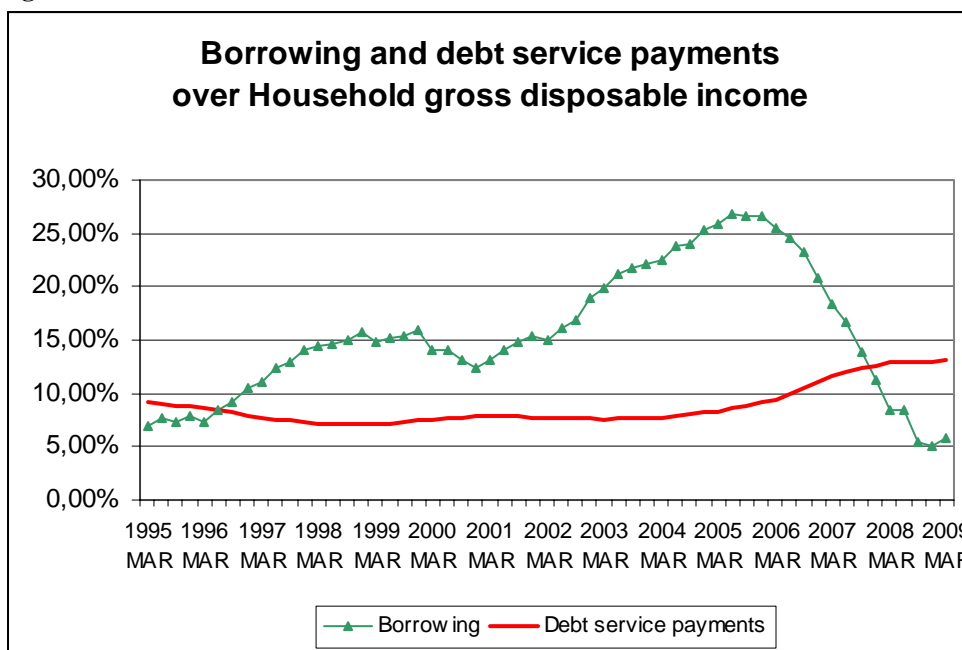
**Figure 23**



**Source: Banco de España and authors' calculations**

The Banco de España provides information for these three series from 2003 onwards. For the period between 1995 and 2002 we add the mark up corresponding to these loans in 2003 to a basic interest rate. On average, short term loans require nearly 400 basis points above mortgage loans, and long term loans roughly 100 more basic points.

**Figure 24**



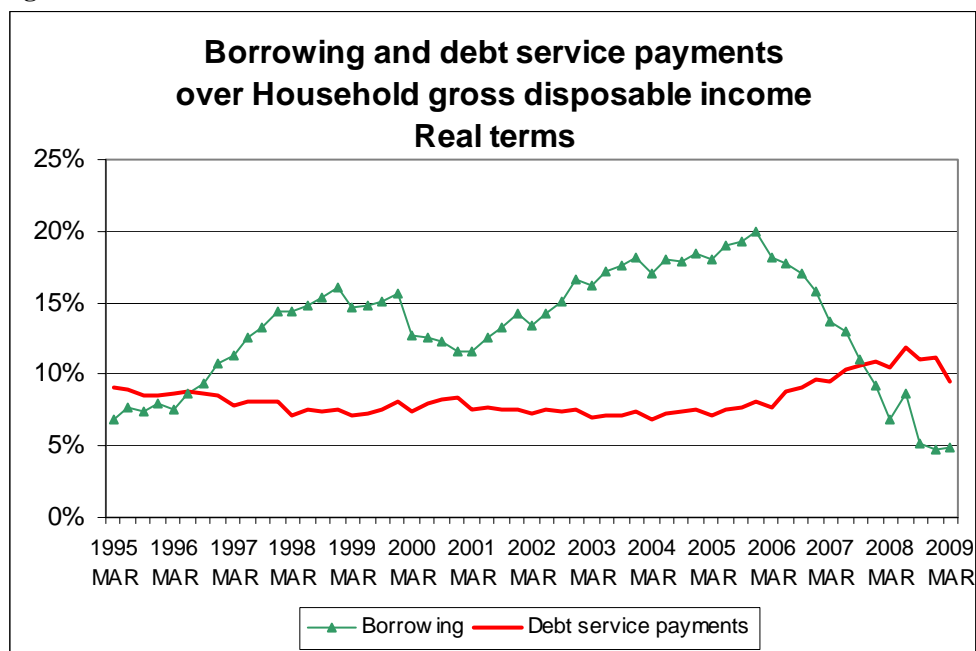
**Source: Banco de España and authors' calculations**

In the figure above, borrowing over household GDI is above debt service payments over GDI for the period 1996 – 2007. From 2008 onwards the debt service burden is larger than borrowing, which, in turn, declines.<sup>5</sup>

This figure illustrates the fact that, households are currently pulling the economy down since they are taking out more than they are putting in.<sup>6</sup> However, data is in nominal terms. Thus, if we wish to find out the impact of net borrowing on output and employment, we should take into account the effect of changes in prices on borrowing and, thus, on activity levels.

In the figure below, mortgage loans have been deflated using the price index for a square metre of a new dwelling. For long term loans (other than mortgages), we used the (industrial) price index for durable consumer goods, short term loans were deflated with the CPI. Finally, household gross disposable income was deflated with the GDP deflator.

**Figure 25**



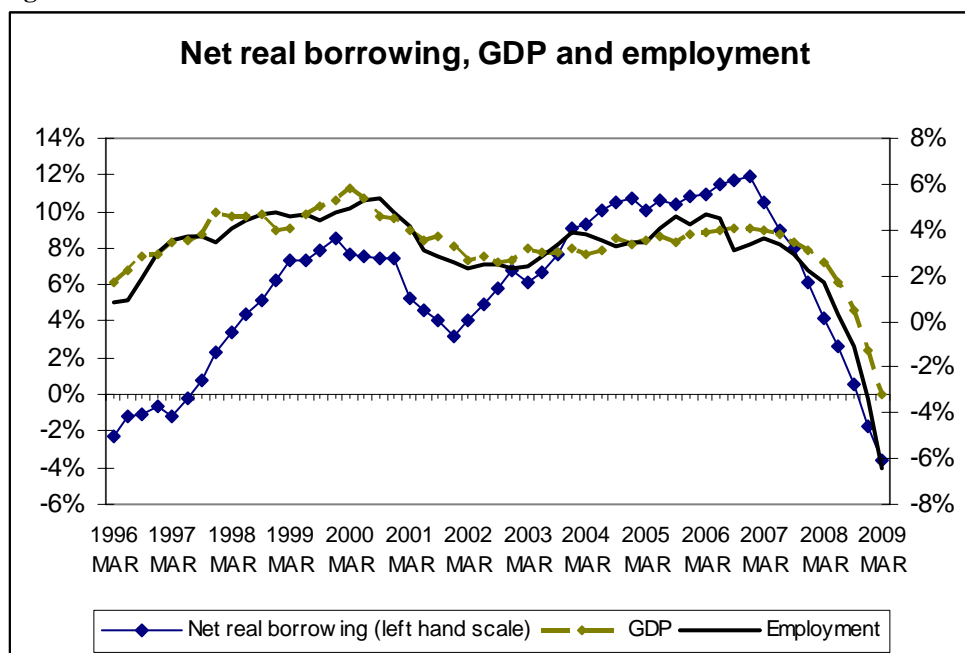
**Source: Banco de España and authors' calculations**

In this figure we see that both series reach lower values and also they cross over earlier. In the figure above (real terms) they cross over in the fourth quarter of 2006, whilst in the figure encapsulating series in nominal terms, they cross one year later.

<sup>5</sup> In figure 8, we showed that household net savings were negative during 2008, whilst in figure 24 we state that debt service payments (forced savings) are larger than borrowing so that one might think that there is a contradiction since from the latter figure we might deduce that savings are larger than investment. What may make both figures compatible is the fact (not captured) that the loan to value ratios fall from 2007. Thus, part of the investment made in 2008 had to be funded out of accumulated savings.

<sup>6</sup> In the first quarter of 2009, debt service payment over GDI is 13.05% in Spain. The corresponding figure for the US in the same period of time is 13.46%, according to the Federal Reserve statistical information on household finance.

Figure 26



Source: Banco de España and authors' calculations

Finally, we find that when household net borrowing (the difference between borrowing and debt service payments over household GDI) begins to decline (at the beginning of 2007) GDP and employment growth rates decline as well, and when net real borrowing reaches negative values (at the end of 2008), GDP and employment follow it.

### Household mortgage indebtedness and the TMC

In this section we aim to provide a logical and coherent view of household indebtedness within a Monetary Circuit framework. Our starting point can be found in Febrero (2008) and a numerical illustration of this issue is provided in an Appendix at the end of this paper. This model is now expanded to account for (1) a building sector, (2) banks granting long term loans to households to purchase houses, (3) rents of land ownership, and (4) a more general treatment of fixed capital.

First, we assume an economic system in equilibrium and then we investigate the consequences of a particular shock, specifically a fall in the interest rate relative to the rate of growth of output (a sort of Wicksellian shock). The initial equilibrium situation should be understood as a benchmark position and not as a centre of gravity of a real economy.

The equilibrium situation will be described with the help of modern theory of production, and the Classical theory of value, as revived by Sraffa (1960) and to this system we shall add the main tenets of the TMC, as developed, amongst others, by Graziani (1989, 2003).

The shock will lead to a shift from a steady state and this raises several problems for the Classical (von Neumann, 1945) approach, which can be swept under the carpet if we work at a highly aggregate level.<sup>7</sup> So we shall deal with the shock at the aggregate level, using transaction matrices as in the Stock – Flow Consistent Accounting (see, for instance, Godley and Lavoie, 2007).

<sup>7</sup> We shall see that when the interest rate falls, the composition of output changes and there will also be changes in the degree of utilization of productive capacity, affecting the useful lifetime of fixed capital leading, in turn, to changes in the industry producing fixed capital. These problems can be viewed as a question related to the *traverse* concept which shall not be dealt with here.

We shall assume a multisectoral economy growing *à la* von Neumann. There are four industries producing fixed capital, circulating capital, consumer goods and houses. Each industry produces one single type of commodity but, since all of them require fixed capital this input is treated as a particular case of joint production.<sup>8</sup>

Fixed capital, for the sake of simplicity, can be used during  $n$ -production periods, with  $n$  being the same for all industries. Wages, which are paid *ex ante*, are replaced by a basket of consumer goods and a number of houses (i.e. we shall assume that in each period of production –a year– a percentage labour force  $\lambda$ –for instance, 5%– purchases a new house).

All production processes start and finish on the same dates. After each production period and before the next one starts, a big swap over takes place. Here money is assumed to circulate through certain channels, monetizing all transactions and all distributive categories: wages, profits and rents.

Competitive conditions hold in all trades but in 'Building and Construction', our sector SIV. Here, we shall assume that the price of one house is not given by the cost of production plus a profit on advances, but by the total amount of money which banks agree to grant to creditworthy borrowers.<sup>9</sup>

In the long run equilibrium, it shall be assumed that all wages are spent either on consumer goods or on debt service payments. No hoarding of money occurs here; all rents are spent on consumer goods and all profits are saved and invested, with depreciation funds used to settle debt services. In such a steady state, all money created *ex nihilo* when banks grant credit, in the efflux phase, is destroyed when debts have to be paid back at due dates.

The following figure illustrates the flows of commodities in an input-output manner:

**Figure 27**

		Inputs					Outputs					
SI		KfN <sub>1N</sub>		Kc <sub>1</sub>	C <sub>1</sub> +C <sub>1L</sub>	H <sub>1L</sub>	→	KfN <sup>1</sup>	KfO <sup>1</sup>			
			KfO <sub>1O</sub>	Kc <sub>1</sub>	C <sub>1</sub> +C <sub>1L</sub>	H <sub>1L</sub>		KfN <sup>1</sup>				
SII		KfN <sub>2N</sub>		Kc <sub>2</sub>	C <sub>2</sub> +C <sub>2L</sub>	H <sub>2L</sub>			KfO <sup>2</sup>	Kc <sup>2</sup>		
			KfO <sub>2O</sub>	Kc <sub>2</sub>	C <sub>2</sub> +C <sub>2L</sub>	H <sub>2L</sub>				Kc <sup>2</sup>		
SIII		KfN <sub>3N</sub>		Kc <sub>3</sub>	C <sub>3</sub> +C <sub>3L</sub>	H <sub>3L</sub>			KfO <sup>3</sup>		C <sup>3</sup>	
			KfO <sub>3O</sub>	Kc <sub>3</sub>	C <sub>3</sub> +C <sub>3L</sub>	H <sub>3L</sub>					C <sup>3</sup>	
SIV	L	KfN <sub>3N</sub>		Kc <sub>3</sub>	C <sub>3</sub> +C <sub>4L</sub>	H <sub>3L</sub>			KfO <sup>4</sup>			H <sup>4</sup>
	L		KfO <sub>3O</sub>	Kc <sub>3</sub>	C <sub>3</sub> +C <sub>4L</sub>	H <sub>3L</sub>						H <sup>4</sup>

As we see, each industry includes two groups of firms. The first one produces its corresponding commodity using new fixed capital, KfN, and as a by-product, obtains old fixed capital, KfO. The second group produces the same commodity (as its main output) using old fixed capital. As stated above, fixed capital has the same useful lifetime in all trades (in our example two periods of production). The row describing the production function of a firm in one period of time, one period later describes the production function of the other one.

The column corresponding to commodity input C, consumer goods, has two elements. The first one accounts for consumer goods as an additional raw input, whilst the second stands for an element of the wage basket, the other being H<sub>iL</sub>, the amount of houses purchased by workers in this trade.

The wage per unit of labour has been defined *ex ante*. In order to avoid unnecessary conundrums, we shall assume that a representative wage basket is composed of one unit of consumer goods, C, and  $\lambda$  units of houses (as stated above, for instance 0.05).

<sup>8</sup> A good reference for this can be found in Kurz and Salvadori (1995).

<sup>9</sup> See expression (2) below.

In this economy, once a production period has finished and output is at the firms' gates, these commodities have to circulate in order to make it possible for a new production process to start. First firms have to decide how much output they are going to produce. This decision will depend on the expected demand for their produce at *normal* prices, that is those prices which cover all costs (including debt service payments) and provide an acceptable profit. Thus, uncertainty is at the very heart of the economic process.

The prices covering costs and providing a *normal* profit can be calculated *à la* Sraffa (1960). These prices make the reproduction of the system possible. Furthermore, output decisions require some coordination. Although some inventories may be assumed to exist and one can always alter the degree of utilization of productive capacity, all industries producing basic commodities (in the Sraffian sense) have to grow in the long run at the same pace. Otherwise we would find bottlenecks in production. Again, this problem of coordination is solved following von Neumann (1945).<sup>10</sup>

Once prices and production have been decided, in a monetary economy like the one we live in, and assuming a pure credit economy (Wicksell, 1898), firms have to ask for credit to banks in order to hire labour, purchase materials and pay investments in fixed capacity. As in Wicksell, in equilibrium the monetary interest rate equals the natural rate (the rate of profit). Once some payments have been made money circulates and then returns to initial borrowers who, if they have made the right decisions, will be able to cancel debts at due dates.

The following circuit has interesting properties.

1. Firms in sectors SI, SII and SIV borrow short term to pay wages.
2. Workers / households set aside a portion of their incomes to face debt service payments (corresponding to the purchase of houses in the past) and the rest goes to the consumer sector industry, SIII.
3. SIII uses the proceeds to pay wages to its workers (if this amount is insufficient it will have to borrow short term). And, similarly to what has been stated above, some of these workers pay mortgage loan instalments and the rest of their income is used to purchase consumer goods. Therefore, a part of incomes goes to debt service payment (monetary refflux) and the rest is in the hands of SIII.
4. In order to start a new production process, apart from labour, SIII requires circulating capital and, a group of firms in this industry, new machinery (the other one will work with used fixed capital –they need not purchase consumer goods, another required input, since they own their production). Proceeds from the sale of consumer goods to workers will be used to purchase circulating capital. Those firms requiring new fixed capital will ask for long term loans, matching maturity with the productive asset (in our model, two periods of production).
5. The producers of circulating capital may use the proceeds from the sale of output to SIII to cancel short term loans (for the payment of wages), and to buy some consumer goods (as raw inputs). And, as above, some firms will have to borrow long term to purchase fixed capital.
6. Producers of fixed capacity will use proceeds to cancel short term loans and to purchase circulating capital and consumer goods. They need not purchase fixed capacity as they own their produce.

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<sup>10</sup> It goes without saying that these comments boil down to price and quantity systems. For the former, the expression  $\mathbf{pA}(1 + R) = \mathbf{pB}$  holds; for the latter:  $\mathbf{Aq}(1 + G) = \mathbf{Bq}$ . Matrix  $\mathbf{A}$  stands for inputs (excluding land) and  $\mathbf{B}$  is a matrix of outputs.  $\mathbf{p}$  and  $\mathbf{q}$  are vectors of prices and quantities, respectively.  $G$  and  $R$  are rates of growth of output and profit rate, respectively. Further,  $G = R$ . The price system provides prices for all commodities (a numeraire is required) but not for the price of houses including the price of land. This price is calculated following a different assumption. See below.

7. Some workers will borrow long term to purchase a new house. This money goes to sector SIV.
8. SIV, the building sector, uses liquidity to cancel short term debt, and the rest is used to purchase circulating capital, consumer goods and land. As in other industries, some firms will have to borrow long term to purchase fixed capacity.
9. Land owners use proceeds (rents) to purchase consumer goods.

To sum up, banks create money as a consequence of credit granted to creditworthy borrowers. These banks lend short term for the payment of (a fraction of) wages and the purchase of (a fraction of) circulating capital and raw materials. Additionally, banks lend long term for the purchase of (a fraction of) fixed capacity. The rest of the liquidity required for the circulation of output is provided through the circulation of money. In the refflux phase (when debts have to be paid back at due dates), not all debts have to be cancelled: just short term debts and mortgage instalments corresponding to long term debts. Additionally, banks lend long term for the purchase of houses: this provides the system with additional liquidity for the monetization of a part of output. Within the monetization of the circulation of output, all distributive categories (that is, wages, profits and rents) are monetized as well. It should be noted that, contrary to what is usual in TMC, money which enters the system to fund a production process which will be performed during, say,  $t+1$ , need not remain inside the system until production has concluded. In our model, the funding of the circulation of commodities at the end of a period  $t$  allows a new production process to start in  $t+1$ , but also monetizes the production of period  $t$ , wages corresponding to  $t+1$  and the profits of period  $t$ .

Once this "big swap over" has taken place, so that all trades dispose of the inputs required to make the system expand at a rate  $G$ , all money which had been created by banks *ex nihilo* is destroyed in the refflux phase, leaving some (long term) debts outstanding. After circulation, we find that in each trade, firms which have used new capacity have a money surplus equal to the deficit corresponding to firms which have purchased new capacity. We interpret this fact as follows: users of new capacity will spend their surplus repaying the second loan instalment, corresponding to the purchase of the fixed capacity one period of time earlier (this instalment includes interest on pending debt). Firms which have purchased fixed capital in the current period show a deficit corresponding to the second instalment (since the loan for purchasing the fixed capacity matches maturity with it). This pending debt, plus interest on it, will have to be settled in the next period of time.

Another difference with respect to what is traditionally assumed by TMC, is that households get access to bank credit as well. Here in our model, they borrow long term (mortgage loans) to fund the purchase of houses. Curiously, in a von Neumann steady growth model the amounts of money which are destroyed within the refflux phase coincide with inflows in the efflux stage. As stated above, we assume that a constant fraction of the labour force purchases a standard house each period (for instance  $\lambda = 5\%$ ). And let us assume that the interest rate (equal to the rate of growth of output) and the maturity of mortgage loans (for instance, 30 years) are given as well. Hence, in each period of time, those who have purchased a house during the last 30 years will have to pay a mortgage loan instalment,  $z$ , which is given by a constant fraction (say, for instance, 30%) of their income (given by the monetary wage,  $w$ ). Then the amount of money required to settle debt service payments corresponding to outstanding household debt is given by the expression:

$$(1) \quad DSP_{Ht} = z \cdot \lambda \cdot (L_{t-1} + L_{t-2} + \dots + L_{t-30}) = z \cdot \lambda \cdot L_t \cdot \left( \frac{(1+g)^{30} - 1}{g(1+g)^{30}} \right)$$

On the other hand, the inflow of liquidity which originates in indebtedness for the purchase of houses depends on (i) the amount of people purchasing houses and (ii) house prices. Regarding the latter, we assume that the price of houses is ruled by the amount of money that banks agree to lend. This depends on three factors: the maturity of the mortgage loan, the interest rate and the percentage of income that borrowers are expected to set aside to face loan instalments. The price of one house (the standard mortgage loan granted by banks) is:

$$(2) \quad p_H = \frac{z}{(1+i)} + \frac{z}{(1+i)^2} + \dots + \frac{z}{(1+i)^n} = z \cdot \left( \frac{(1+i)^n - 1}{i(1+i)^n} \right)$$

Where  $p_H$  is the price of one house,  $i$  is the interest rate and  $n$  is the mortgage loan maturity (for instance, 30 years). As stated above,  $z$  is the percentage of income which borrowers have to set aside to settle debt services, something usually determined *a priori* by banks and which depends on the ‘level’ of risk that banks are willing to accept.

If in the current period of time the percentage of the labour force purchasing a house remains the same (given by parameter  $\lambda$ ), then residential investment,  $I_{Ht}$ , amounts to:

$$(3) \quad I_{Ht} = \lambda \cdot z \cdot L_t \cdot \left( \frac{(1+i)^{30} - 1}{i(1+i)^{30}} \right)$$

At a glance, we can see that if  $i$  equals  $g$  then (3) equals (1).

It should also be noted that rents on land mean a redistribution of wages in favour of land owners who, in turn, spend their proceeds on consumer goods. This assumption will be removed soon, though it is required for the system to expand in a balanced manner.

As a consequence of the treatment of the funding of long term assets (fixed capital and houses), as stated above, after each circulation, there are long term outstanding debts with no deposits as a counterpart. In our view such a situation can be described with the help of a bank T-account as follows:

**Figure 28**

Bank balance sheet			
M	Long term loans to firms	Bank capital	M+N
N	Mortgage loans to households		

The question which we raise next is as follows: what happens when the interest rate falls relative to the rate of growth of output? We intend dealing with this question with the help of transaction matrices as is usual in Stock – Flow Consistent Accounts (see Godley and Lavoie, 2007). When  $i$  equals  $g$ , then we have:

**Table 3: Transaction matrix when  $i = g$** 

	Households	Land owners	Firms		Banks		$\Sigma$
			Current	Capital	Current	Capital	
Consumption	- $C_{dH}$	- $C_{dL}$	+ $C_S$				0
Investment	- $p_H \cdot \Delta H$		+ $I_S$	- $I_D$			0
Wages	+ $W_S$		- $W_d$				0
Firms (net) Profits			- $F_U$	+ $F_U$			0
Banks profits					- $F_B$	+ $F_B$	
Rents		+ $R$	- $R$				0
Interest	- $i \cdot L_{dH-1}$		- $i \cdot L_{dF-1}$		+ $i \cdot L_{S-1}$		0
$\Delta$ Loans	+ $\Delta L_{dH}$			+ $\Delta L_{dF}$		- $\Delta L_S$	0
$\Delta$ Money							
Issue equities							
$\Sigma$	0	0	0	0	0	0	0

We see that the rows for ' $\Delta$  Money' and 'Issue equities' are empty. This is because we have assumed that, in our hypothetical equilibrium, savings are zero. The row for ' $\Delta$  Loans' stands for net changes in outstanding debt (that is, loans granted minus the principal on loans repaid during that period). Firms undistributed profits,  $F_U$ , do not include the payment of interest on outstanding debt. Therefore, according to the column for firms current account, we have  $GDP = C + I_S = W_d + F_U + R + i \cdot L_{dF-1}$ , where the last term accounts for interests,  $i$ , on outstanding loans to firms,  $L_{dF-1}$ . Banks profits come from the payment of interest on loans (we have assumed that the working capital required to manage banks as another firm is nil). These profits increase bank capital which, in turn, is matched by increasing loans to firms and / or households.

Now what happens when the interest rate falls relative to the rate of growth of output? Let us proceed step by step. Regarding households:

- Indebted households (those which purchased a house in the past and have outstanding debt), will face lower debt service payments. This amount can either be saved (increasing bank deposits or, as we shall see below, by holding equity stock) or spent on consumer goods.
- Those who were going to purchase a house when the interest rate falls, will ask for more money, since the same mortgage loan instalments can now cancel a larger loan. This, in turn, will lead to higher house prices and, as a consequence, higher land rents.<sup>11</sup> Additionally, people who could not afford to borrow, can do so now when loan instalments fall in relation to the same mortgage loan.
- The increase in the price of houses will give rise to a wealth effect resulting in more consumption.

Total household spending may be assumed to fit the expression:

$$(4) \quad H_{et} = C_H + I_H^R = c_H (wL_{t-1} - DSP_{Ht}) + \alpha_H \Delta W_{Ht-1} + I_H^R$$

<sup>11</sup> After the fall in the interest rate, the only price which changes is that of houses. The rest of prices are assumed to remain constant. Some circuitists believe that all prices should fall when financial costs fall. Nevertheless, we believe that this hypothesis does not hold because (i) a fall in the interest rate reduces the proceeds required to fund the growth of productive capacity and (ii) why should entrepreneurs reduce prices if they are facing a stronger demand? On this we follow Nell (1999). See also Mongiovi and Rühl (1993).

Where  $H_{et}$  is household spending in period  $t$ ,  $C_H$  is household consumption and  $I_H^R$  is residential household investment. Next,  $c_H$  is household propensity to consume out of wages paid one period earlier,  $wL_{t-1}$ , minus debt service payments corresponding to past mortgage loans paid in the current period,  $DSP_{Ht}$ , and  $\alpha\Delta W_H$  is the influence of changes in real estate wealth on consumption.  $I_H^R$  is residential investment.

Land owners:

- They will increase consumption, though it is reasonable to assume that consumption will increase less than proceeds. Therefore, they will save part of their income.

Their spending behaviour can be formalized as follows:

$$(5) \quad H_L = C_L = c_L R = c_L (p_H - BC_H) H$$

$H_L$  is land owners spending, which equals spending on consumer goods,  $C_L$ ;  $c_L$  is their propensity to consume, and  $R$  is land rent;  $(p_H - BC_H)$  is the difference between the price of one house and building costs (that is, the rent corresponding to one house), and  $H$  is the number of houses sold in one period of time.

Firms:

- As the demand for houses and consumer goods increases, firms may cope, in the short run, by increasing the degree of use of productive capacity (and with some existing inventories).
- When existing productive capacity *generates* more output, the profit rate rises even with constant prices. This, notwithstanding, more intensive use of productive capacity leads to the shorter useful lifetime of capital stock.
- Firms' outstanding debt generates a lower debt service payment when the interest rate falls.
- Increasing profits and decreasing debt service payments make it easier to either distribute some profits and / or cancel some outstanding debt.
- The value of firms equity stock will rise, reflecting larger profits.
- The funding of fixed capacity becomes less dependent on bank loans, since now firms can collect households and (especially) rentiers savings by issuing assets in financial markets.

Firms spending goes, as is usually assumed, to the purchase of productive capacity. In formal terms:

$$(6) \quad I_{Pt} = I_0 + v(Y_t^e - Y_{t-1}) + v(Y_{t-1} - Y_{t-1}^*) + \theta((B_{t-1} - i \cdot D_{t-1}))$$

Here,  $I_0$  is autonomous investment,  $v$  is the capital output ratio,  $Y^e$  is expected output,  $Y^*$  is *normal* output (corresponding to the *normal* degree of utilization of productive capacity),  $B$  is profits,  $i$  is interest rate and  $D$  is debt;  $\theta$  is a positive parameter encapsulating the influence of profits after interest payments on investment spending.

Banks:

- Lower interest rates mean lower bank profits. This may be compensated with more mortgage loans.
- Household deposits are a wedge between loans (bank assets) and capital. Bank balances become more fragile.

The new situation is encapsulated in the following matrix:

**Table 4: Transaction matrix when  $i < g$** 

	Households	Land owners	Firms		Banks		$\Sigma$
			Current	Capital	Current	Capital	
Consumption	$- C_{dH}$	$- C_{dL}$	$+ C_S$				0
Investment	$- P_H \cdot \Delta H$		$+ I_S$	$- I_D$			0
Wages	$+ W_S$		$- W_d$				0
Firms (net) profits	$+ F_{DH}$	$+ F_{DL}$	$- (F_{DH} + F_{DL} + F_U)$	$+ F_U$			0
Banks profits					$- F_B$	$+ F_B$	
Rents		$+ R$	$- R$				0
Interest	$- i \cdot L_{dH-1}$		$- i \cdot L_{dF-1}$		$+ i \cdot L_{S-1}$		0
$\Delta$ Loans	$+ \Delta L_{dH}$			$+ \Delta L_{dF}$		$- \Delta L_S$	0
$\Delta$ Money	$- \Delta M_{dH}$	$- \Delta M_{dL}$				$+ \Delta M_S$	0
Bonds / equities Issue	$- \Delta p_e \cdot e_{dH}$	$- \Delta p_e \cdot e_{dL}$		$+ \Delta p_e \cdot e_S$			0
$\Sigma$	0	0	0	0	0	0	0

Now is the right time to reconsider this situation ( $i < g$ ) in the ‘Classical-Circuitist’ framework, with regard to Spain’s recent period of prosperity. According to (4) and (2) when the interest rate falls, household spending rises for three reasons: (i) DSP fall – note that in Spain more than 95% of mortgage loans have a variable interest rate; (ii)  $\Delta W_H$  rises since  $p_H$  rises; (iii)  $I_H$  rises if, as has happened in Spain, banks reduce standards on credit when the expectations on the housing market improve.<sup>12</sup> Additionally, from (5) and (2) land owners’ spending will rise as well, although it should not be expected to grow in the same proportion as rents. Firms will expand capacity according to (6) because (i) the rate of growth of output increases, (ii) the degree of utilization of productive capacity increases, and (iii) profits increase whilst interest on outstanding debt falls. And regarding the funding of the expansion of productive capacity, we find that, on the one hand, the price of equity stock rises (as the discount factor falls, whilst profits rise), and, on the other hand, after having settled all debts at due dates, some liquidity (bank deposits) remains inside the system which may compete with bank lending for the funding of future investment.

When  $i < g$  the bank balance sheet (Figure 28) becomes:

**Figure 28.bis**

Bank balance sheet			
N	Long term loans to firms	Deposits (households and land owners)	D
M	Mortgage loans to households	Bank capital	C

The existence of deposits on the liability side of the bank balance sheet leads to bank capital growing less than the asset side which, in turn, is what puts the productive system in motion. Therefore, it appears that when  $i < g$  bank capital grows slower than the rest of the economy. In order to keep apace with the whole system, banks will try to adopt a more aggressive lending policy, thus reducing standards on loans.

This naturally leads us to ask whether this situation is sustainable. And in order to provide an answer we return to the Spanish experience during the last decade or so. Let us take our starting point for our comments at the turn of the 21st century.

<sup>12</sup> See Gual (2009).

- When the interest rate falls, households become more and more indebted to banks. The perceived state of business is optimistic: inflation is low, interest rates are relatively low, the level of activity is high (also in the EU), unemployment is falling, stock prices are rising and houses are still affordable at least related to historical standards.
- Then, the building and construction sector (particularly the residential construction one) begins to act as a drag on the level of output and employment. House prices begin to rise, roughly paralleling the rate of growth of the average mortgage loan granted by banks. Rents are appropriated by property developers which are channelled towards reinvesting in the sector, lending to other firms or takeovers, through leveraging.
- In order to match growing demand, firms require more capacity which is imported from abroad. Part of the liquidity created by banks to fund the purchase of houses is captured by the government, which cancels debt, and part of this is used by firms to fund imports. Due to this, bank deposits grow less than credits. Therefore, Spanish banks have to collect liquidity from abroad.
- The economy thus becomes more and more dependent on household indebtedness: rents are not spent on consumer goods; this type of consumption is made by households, and firms growing capacity is not attended with domestic production so that part of the liquidity created through household bank indebtedness cannot be used to cancel debt, as a refflux mechanism.
- Banks, in an excess of optimism (some people would have called this plain greed) had reduced standards, increased maturities and raised loan to value ratios in their mortgage loan business, fuelling the process. However, in 2007 we are faced with rocketing house prices, rising interest rates (because of the ECB fear of unleashing inflationary processes due to high oil prices) and already highly indebted households. At this juncture banks become more moderate. To this we should add the difficulties in the access to liquidity in international markets.<sup>13</sup>
- When household spending stops pulling the economy (that is, its rate of growth turns down to the average one, though still remaining positive), and with debt service payments increasing (relative to household GDI) the rate of growth of GDP starts to decline.
- Residential investment stops pulling the economy because of the following factors: (i) the interest rate rises in 2007, leading to a debt service which is 50% larger than in 2005, on average (see Table 1 above); (ii) the price of one square metre of a new dwelling is 17% higher in 2007 than in 2005 (which in turn was 33% higher than in 2001); (iii) from July 2006 to June 2007, more than 770.000 dwellings were under construction and this building activity cannot go on indefinitely; (iv) household indebtedness had reached historically high levels and in a very short period of time; (v) Spanish banks began to encounter difficulties in accessing liquidity in money markets, because of the financial turmoil generated by US subprimes.<sup>14</sup> Finally, it should be added that the decision to purchase a house is strongly affected by the perceived probability of not being fired. As the activity in the housing market declines, the rate of unemployment rises and this makes the former accelerate towards its fall.

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<sup>13</sup> When indebted agents do not cancel debt at due dates, the price of bank assets will fall making bank capital to fall as well. A lender of last resort will be needed for banks to be able to deal with deposit withdrawals.

<sup>14</sup> Álvarez (2008). Nevertheless, this author states that the main cause of the fall in lending is due to poor perspectives for the general level of economic activity.

Before finishing this section, we develop an algebraic device in order to understand the evolution of output under this pattern of growth. We assume the principle of effective demand:

$$(7) \quad Y_t = AD_t$$

where AD stands for aggregate demand.

$$(8) \quad AD_t = H_{et} + H_{Lt} + I_{Pt}$$

That is, aggregate demand equals spending by households, land owners and firms. Plugging (4), (5) and (6) into (8) we obtain:

$$(9) \quad Y_t = c_H(wL_{t-1} - DSP_{Ht}) + \alpha_H \Delta W_{Ht-1} + I_{Ht} + c_L(p_{Ht} - BC)H_t + I_0 + v(Y_t^e - Y_{t-1}) + v(Y_{t-1} - Y_{t-1}^*) + \theta((B_{t-1} - iD_{t-1}))$$

Now, we lay on the following definitions, whose significance becomes self-evident:

$$(10) \quad \begin{aligned} \varpi_t &= \frac{wL_t}{P_t Y_t} \\ v &= \frac{K^*}{Y^*} \\ Y_t^e &= Y_{t-1}(1 + g_t^e) \\ u_t &= \frac{Y_t}{Y_t^*} \\ r_t &= \frac{B_t}{K_t} \\ d_t &= \frac{D_t}{K_t} \end{aligned}$$

Then, after due arrangements, we have a first order linear difference equation:

$$(11)$$

$$Y_t = \left( c_H \varpi_{t-1} + v \left( 1 + g_t^e - \frac{1}{u_{t-1}} (1 - \theta(r - id)) \right) \right) Y_{t-1} + (\alpha_H \Delta W_{Ht-1} + I_{Ht} - c_H DSP + c_L (p_{Ht} - BC)H + I_0)$$

whose solution is:

$$(12)$$

$$Y_t = \frac{1}{1 - \left( c_H \varpi_{t-1} + v \left( 1 + g_t^e - \frac{1}{u_{t-1}} (1 - \theta(r - id)) \right) \right)} (\alpha_H \Delta W_{Ht-1} + I_{Ht} - c_H DSP + c_L (p_{Ht} - BC)H + I_0)$$

In expression (11) we see that when the wealth effect on consumer spending plus residential investment are above debt service payments (multiplied by the household propensity to consume) the second factor is positive even though land owners' spending on consumer goods and  $I_0$  is nil. However these factors are interrelated since, as previously commented on above, more residential investment means more debt, and more debt today leads to more debt service payments tomorrow.<sup>15</sup> When indebtedness reaches a threshold it stops growing, though debt service payments will remain relatively high for a long period of time. However, if residential investment declines (and, for instance, in Spain it was impossible to start building 750.000 new dwellings every year, more than those in France, Germany and Italy altogether) output will fall when debt service payments outstrip increasing indebtedness, unless other autonomous spending compensates for this leakage.

Finally, expressions (11) and especially (12) illustrate a fact that counters Keynesian conventional wisdom: investment in productive capacity responds endogenously to autonomous demand driven by household spending.<sup>16</sup> Although part of productive investment is placed on the autonomous demand factor ( $I_0$ ) it only encapsulates investment demand for modernizing capacity.<sup>17</sup> The portion of investment explained by the accelerator becomes endogenous. If we add to this the fact that most investment demand is matched with imports in the recent Spanish case, we conclude that firms spending is not what has driven our economy. And now we see the results.

### **The conventional Theory of the Monetary Circuit, household indebtedness and non-productive assets.**

Let us take Graziani, 1989, 2003, as a good reference for what may be called the "conventional" Theory of the Monetary Circuit. In these works, the Italian author provides a coherent account of how money puts the wheels of production in motion. In tune with Keynes, he stresses the link between firms and banks (and also between firms and households) within a monetary economy of production.

Although we agree with the basic tenets of the TMC, here we highlight a couple of elements which, in our opinion, cannot be properly dealt with by this strand. These are household borrowing to fund the purchase of consumer durables and / or residential investment and borrowing to fund the purchase of equity stock.<sup>18</sup> What both elements have in common is that agents ask for credit to purchase 'something' which shall not be used to produce 'something' later.

Regarding household indebtedness related to the purchase of houses, we have seen in this paper that it does not pose any relevant problem which challenges the validity of the TMC. Furthermore, in our view, this fact makes TMC closer to the real world.<sup>19</sup> The TMC, as everyone knows, conceived the workers / households as mere recipients of liquid funds in exchange for labour services which, in turn, were used to purchase consumer goods or, alternatively, saved. Now, households can borrow as well but, unlike firms, the assets they buy are not used as intermediate inputs, only as durable consumer goods.<sup>20</sup> Gnos (2006, p. 97) provides a solution to this question which we

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<sup>15</sup> An alternative formalization, though with similar outcomes, can be found in Palley (2009).

<sup>16</sup> See Leamer (2007).

<sup>17</sup> See Dejuán (2004).

<sup>18</sup> See Howells (2006) and the references listed there.

<sup>19</sup> In our model, we have assumed that all household borrowing goes to the purchase of new houses, leaving aside the question of second hand goods. Nevertheless, the latter are a different problem which requires a different treatment.

<sup>20</sup> According to data provided by the Spanish Central Bank (Banco de España), loans made by financial institutions to households represented 37% of all loans in 1991 whilst loans to non financial corporations amounted to 46%. In mid 2005, these figures were 49% and 43%, respectively. Since then, the former has declined and the latter has risen (44% and 48%).

believe is rather troublesome. In his view, loans to households can be understood as a loan (indirectly) made by households from households current income to other borrowing households. We believe that, on the contrary, household indebtedness need not be funded with pre-existing household deposits (which are the consequence of firms indebtedness to fund production). In our description of the channels through which money circulates, the purchase of new houses was placed at the end. Nevertheless, we could have placed it at the beginning of the swap over and it would have been clearer that banks create money *ex nihilo* when they grant mortgage loans to households to purchase houses just as they create money when they lend to firms.

Of course, household indebtedness makes it possible for other agents to reduce their outstanding debts to banks as all circuitists agree. However, those debts need not be directly caused by the funding of the working capital corresponding to a current process of production. As shown elsewhere by Febrero (2008), outstanding debts may exist even before banks grant credit to fund working capital for a production process. This outstanding debt is the consequence of long term credit to purchase long term productive assets.

And as far as borrowing to purchase equity stock (e.g. a takeover)<sup>21</sup> is concerned, yet again we have agents borrowing to purchase something that will not be used to produce commodities in the future. This is something akin to the situation commented on in the previous paragraph. Banks may create new liquidity when they grant credit to households / firms to purchase equity stock.<sup>22</sup> In principle, in our model we have seen that when the interest rate falls relative to the rate of growth of output, firms' profits increase. Also, this makes the discount factor fall, leading to a rise in the price of equity. Hence, financial investors may perceive two potential earnings when the interest rate falls: (i) larger profits make it possible for firms to distribute a larger dividend amongst their shareholders, and (ii) shareholders may make a capital gain if they buy them before the price rises and sell them later. In our model, we assume that when the interest rate falls, land owners, who can be identified with property developers, may save part of their proceeds and use them to buy shares in other industries. Nevertheless, in some cases, proceeds may not suffice to make the purchase so that these agents may borrow from banks, using the shares to be purchased as collateral. And, under certain circumstances of excessive optimism and herd behaviour, this may unleash an inflationary process in stock markets.<sup>23</sup>

## Conclusions

In this paper, we draw conclusions at two levels: empirical and theoretical. Regarding the former, the Spanish economy has experienced a decade (1997 – 2007) of mild prosperity, based on household spending and not on productive capital accumulation. And in 2008, it goes into recession and then into crisis, not because banks stop lending as a consequence of the international financial turmoil, but chiefly because the pattern of growth had become unsustainable.

According to our estimations, in 2008, 8.6% GDP went to settle household debt services (a refflux mechanism) whilst new indebtedness (efflow) amounted to 3.3%. With the government still showing a balanced budget, a weak demand for Spanish exports and a

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<sup>21</sup> Here, all kinds of speculative purchases, including houses, may be included. In other words, all purchases with the finality of selling later at a higher price in order to make a (speculative) capital gain.

<sup>22</sup> Therefore, and contrary to what the conventional TMC holds, the purchase of shares can be funded either with savings (consequence of prior indebtedness) or with borrowing.

<sup>23</sup> We shall not deal with the question of the influence of the demand for deposits on interest rates. On this, see for instance Howells, *op.cit.* and the references listed there. See also Toporowski (2005), pp. 8-10 and chapter 11.

weak demand from the corporate sector and matched to a great extent by imports, the Spanish economy had to fall into crisis.

What could have been done to avoid the crisis? This question is hard to answer, even *a posteriori*. Many commentators state that the residential building sector had grown too much and that now it is returning to a more natural level. However, this argument has several flaws: (i) why did it grow so much in the first place? There were two reasons: people needed dwellings and banks were eager to lend. Regarding the latter, perhaps the monetary authority could have avoided the enlargement of maturities and the loan-to-value ratios. This would have prevented rocketing household indebtedness. But this also raises the question of whether more than six million houses would have been built or not? (ii) What might have happened if the building sector had not grown so much? Supply side commentators may well claim that building has crowded out other productive, more dynamic sectors. However, this argument is unacceptable: in 2006, when the rate of unemployment reached a historical minimum, it was 8%! Furthermore, the number of university students has not dropped because they preferred to work, rather than study, as bricklayers for a wage which greatly outstripped that of a university professor. Actually, the number of students has remained quite stable during the period of analysis.

And what is being done today? Spain's government is running under a large deficit (nearly 10% GDP) but is considering raising taxes and reducing spending. This, we believe, is not going to help restore the required level of aggregate spending. On the other hand, inflation is negative so we expect nominal wages, determined in collective bargaining, to grow no more than 0.3%, so this is not going to help either.

And regarding the theoretical side of our paper, we conclude that household indebtedness can be incorporated without any trauma into the TMC. It is true that when doing so we admit that banks create money for ends other than production. But that is what happens in the real world.

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**Appendix. Monetary circulation in an economy growing *à la* von Neumann with indebted households purchasing houses. A numerical illustration.**

We assume an economic system whose productive side can be described with the help of an input – output system. The following figure illustrates this point.

**Table A. 1: Physical input-output system.**

	Inputs								Outputs								
	T	NM	OM1b	OM2b	OM3b	OM4b	KC	C	L	NM	OM1b	OM2b	OM3b	OM4b	KC	C	H
Sla		1						10	5	5	5	1					
Slb			1					10	5	5	5						
SIIa		1						10	10	5		1			25		
SIIb				1				10	10	5					25		
SIIIa		1						10	10	10			1			40	
SIIIb					1			10	10	10						40	
SIVa	1	1						5	10	20				1			20
SIVb	1					1		5	10	20							20

There are four industries, each one including two groups of firms. The first industry, S1, produces new machinery (fixed capital), NM, by means of fixed capital, circulating capital, consumer goods and labour. A first subset, Sla, produces new machinery with new machinery and a second subset, Slb produces the same kind of output with old machinery, OM1b. The second industry, SII, produces circulating capital, KC with fixed capital, circulating capital, consumer goods and labour. And, as above, a first subset, SIIa, uses new machinery whilst a second subset, SIIb, uses old machinery, OM2b. The third industry produces consumer goods, C, partly using new machinery as input, and partly using old machinery, OM4b. Finally, the fourth industry, SIV, produces houses, H, by means of fixed capital, circulating capital, consumer goods, labour and land, T. Again, we can distinguish users of new and used fixed capital.

Fixed capital is assumed to have a useful lifetime amounting to two periods of production (say, two years). We treat it as a particular case of joint production. That is, once new machinery is used in a production process, we obtain, apart from the main output, one-year-old fixed capital which is treated as a different commodity.

Next, we define the nominal wage received by one unit of labour by the basket of commodities corresponding to the *subsistence* level. Here, for the sake of simplicity, we assume the following: the total amount of labour hired, L, purchases L units of consumer good (that is, each worker purchases one unit of consumer goods) and, additionally, a given percentage of the labour force, say 5%, purchases one house each period of production. Hence, one wage unit is given by the following expression:

$$(A.1) \quad w = p_C + 0.05p_H$$

Then, the column corresponding to labour input in Table A.1. can be replaced by the corresponding wage basket (under the assumption that all wages are spent).

**Table A. 2. Physical input-output system. Wage basket replaced for labour.**

	Inputs								Outputs								
	T	NM	OM1b	OM2b	OM3b	OM4b	KC	C	L	NM	OM1b	OM2b	OM3b	OM4b	KC	C	H
Sia		1						10	5+5	0,25	5	1					
Sib			1					10	5+5	0,25	5						
SIIa		1						10	10+5	0,25		1			25		
SIIb				1				10	10+5	0,25					25		
SIIIa		1						10	10+10	0,5			1			40	
SIIIb					1			10	10+10	0,5						40	
SIVa	1	1						5	10+20	1				1		20	
SIVb	1					1	5	10+20	1							20	

Now we define an input matrix  $\mathbf{A}$  including all inputs in Table A.2 except land, and an output matrix  $\mathbf{B}$ , we have a price and a quantity system:

$$(A.2) \quad p' A(1 + R) = p' B$$

$$(A.3) \quad Aq(1 + G) = Bq$$

Where  $\mathbf{p}'$  is a (row) vector of prices,  $\mathbf{q}$  is a (column) vector of quantities and  $R = G$  are the rates of profit and growth respectively (thus, all profits are saved and invested). It goes without saying that, (A.2) and (A.3) are eigensystems so that  $(1+R)^{-1}$  equals the maximum eigenvalue associated with matrix  $\mathbf{A} \mathbf{B}^{-1}$  (the same holds for  $(1+G)^{-1}$ ). Vector  $\mathbf{p}'$  has the same proportions as the left hand side eigenvector of  $\mathbf{A} \mathbf{B}^{-1}$  associated with the maximum eigenvalue of that matrix. Vector  $\mathbf{q}$  has the same proportions as the right hand side eigenvector of  $\mathbf{B}^{-1} \mathbf{A}$  associated to the maximum eigenvalue of that matrix. Solving (A.2) we have:

$$\begin{cases} p_{NM} = 0.6601 \\ p_{OM} = 0.3397 \\ p_{KC} = 0.1563 \\ p_C = 0.1146 \\ p_H = 0.2552 \end{cases} \quad R = 0.0604$$

And (A.1) gives:

$$w = 0.1273$$

Solving (A.3), we have:

$$\begin{cases} q_{NM} = 1 \\ q_{OM1} = 0.9430 \\ q_{OM2} = 3.8472 \\ q_{OM3} = 3.6284 \\ q_{OM4} = 4.1312 \\ q_{KC} = 3.8959 \\ q_C = 0.1835 \\ q_H = 0.1730 \end{cases} \quad G = 0.0604$$

Next, the price system encapsulated in (A.2) gives us the prices of all commodities, except land. Also, the price for one house does not include the value of land. Now we solve this problem by assuming that the price of one standard house is given by the maximum amount of money which banks lend to workers in the form of mortgage loans. This amount depends on three factors: (i) the interest rate; (ii) the percentage income that banks believe that borrowers can set aside to settle debt services; (iii) the maturity of the mortgage loan. Then, the price of one house is given by the mortgage loan which banks grant:

$$(A.4) \quad p_{HT} = z \cdot w \cdot \left( \frac{1}{(1+i)} + \frac{1}{(1+i)^2} + \dots + \frac{1}{(1+i)^n} \right)$$

Where  $z$  is the percentage income which goes to debt service payments (we shall assume for the sake of simplicity that this is 30%),  $w$  is the wage and here it represents a standard household income,  $i$  is the interest rate, and  $n$  is the maturity of the mortgage loan (we shall assume  $n = 30$ ). Note also that  $p_{HT}$  stands for the price of one house including the strip of land it is built on; the reader will see that  $p_H$  (see (A.1) above) accounts for the price of one house which does not include the price of land: the direct building costs plus the profit on advances). Under the hypothesis that  $G = R = i$  we have:

$$p_{HT} = 0.5236$$

Further, when land is taken in advance for the building industry (SIV) and assuming that 20 houses can be built on one unit of land, the price of one unit of land is:

$$p_T = 5.0619$$

Then, the sequence of inputs and outputs for, say, periods  $t$  and  $t+1$ , in monetary terms, when the economy is expanding *à la* von Neumann is:

**Table A. 3: Input-output system in monetary terms.**

	Period $t$																
	Inputs									Outputs							
	T	NM	OM1b	OM2b	OM3b	OM4b	KC	C	L	NM	OM1b	OM2b	OM3b	OM4b	KC	C	H
SIa	0,660						1,563	0,572	0,636	3,300	0,339	0	0	0	0	0	0
SIb			0,320				1,474	0,540	0,600	3,112							
SIIa		2,539					6,013	4,407	2,449			1,306			15,034		
SIIf				1,232			5,671	4,156	2,309						14,177		
SIIIa		2,726					6,457	4,733	5,260			1,403				18,933	
SIIf					1,323		6,089	4,463	4,960							17,854	
SIVa	0,928	0,121					0,143	0,210	0,467					0,062			1,921
SIVb	0,875					0,058	0,135	0,198	0,440								1,812

	Period $t+1$																
	Inputs									Outputs							
	T	NM	OM1b	OM2b	OM3b	OM4b	KC	C	L	NM	OM1b	OM2b	OM3b	OM4b	KC	C	H
SIb		0,699	0	0	0	0	1,657	0,607	0,675	3,499	0,360	0	0	0	0	0	0
SIa			0,339	0	0	0	1,563	0,572	0,636	3,300	0	0	0	0	0	0	0
SIIf		2,692	0	0	0	0	6,376	4,674	2,597	0	0	1,385	0	0	15,942	0	0
SIIa		0	0	1,306	0	0	6,013	4,407	2,449	0	0	0	0	0	15,034	0	0
SIIf		2,891	0	0	0	0	6,847	5,019	5,578	0	0	0	1,488	0	0	20,076	0
SIIIa		0	0	0	1,403	0	6,457	4,733	5,260	0	0	0	0	0	0	18,933	0
SIVb	0,984	0,128	0	0	0	0	0,152	0,222	0,495	0	0	0	0	0,066	0	0	2,037
SIVa	0,928	0	0	0	0	0,062	0,143	0,210	0,467	0	0	0	0	0	0	0	1,921

The circulation of commodities has to take place after the production process corresponding to period  $t$  has finished and before the next production process (to start at the beginning of period  $t+1$ ) starts. Note that the row corresponding to a subset of each industry in period  $t$  corresponds to subset b in period  $t+1$ .

The monetization of the circulation of commodities can be described as follows.

1. Industries SI, SII and SIV ask for short term loans to pay wages, in order to hire workers. These short term loans amount to 7.3214 monetary units (m.u. onwards).
2. Workers in these sectors set aside 20.56% of their income to settle debt service payments corresponding to past borrowing on mortgage loans and spend the rest of their income on consumer goods. This liquidity, 5.8161 m.u., goes to industry SIII.<sup>24</sup> We assume that SIIIa sells 3.0548 m.u. and SIIIb sells 2.7613 m.u.
3. Firms in SIII, the producer of consumer goods, have to borrow short term to pay wages (their sale proceeds are not enough). SIIIa borrows 2.2057 m.u. and pays wages amounting to 5.2605 m.u. and SIIIb borrows 2.8170 and pays 5.5782 m.u.
4. Workers in SIII spend 2.2284 m.u. paying debt services and the rest, 8.6102 m.u. purchasing consumer goods. They purchase 4.1784 m.u. from SIIIa and 4.4313 from SIIIb. Firms in SIII cancel short term debt.
5. SIIIa repays bank debt and then borrows short term 4.4844 m.u. for the purchase of circulating capital from SIIa amounting to 6.4576 m.u.. SIIIb borrows 5.2332 and then spends 6.8476 m.u. on the purchase of circulating capital from SIIb.
6. SIIa uses proceeds from the sale of its produce to SIIIa to purchase consumer goods amounting to 4.4079 from SIIIa. SIIb purchases 4.6741 m.u. of consumer goods from SIIIb. SIIb purchases 4.6741 m.u. of consumer goods from SIIa. The remaining proceeds from past sales are used to cancel part of the outstanding short term debt.

<sup>24</sup> The percentage of labour income required to face debt service payments is given by the expression:

$$z \cdot \lambda \left( \frac{(1+g)^n - 1}{g(1+g)^n} \right) \text{ where } z \text{ is the percentage of household income which is set aside to face debt}$$

service payments (30%),  $\lambda$  is the percentage of the labour force purchasing a house each period (5%),  $g$  is the rate of growth of employment and  $n$  is the maturity of mortgage loans (30 years).

7. SIIb ask for a long term loan (two periods of maturity) amounting to 2.8916 m.u. for the purchase of new machinery from SIa. Similarly, SIIb asks for another long term loan to buy new machinery amounting to 2.6928 m.u.; 2.4124 m.u. goes to SIb and the rest goes to SIa.
8. In order to produce more machinery, SIa requires 1.5631 m.u. of circulating capital, which is purchased from SIIa. It also needs 0.5729 m.u. of consumer goods, bought from SIIIa. SIb buys 1 m.u. of circulating capital from SIIa and 0.6575 from SIIb. It buys 0.6075 m.u. of consumer goods from SIIIa.
9. Workers borrow long term 3.7337 m.u. as mortgage loans to purchase new houses. 1.9216 m.u. goes to SIVa and 1.8121 to SIVb.
10. SIVb buys fixed capital amounting to 0.1284 m.u. from SIa with a long term loan. It also buys 0.1521 m.u. of circulating capital from SIIb, 0.2229 m.u. of consumer goods from SIIIb and 0.9849 m.u. of land from land owners. These items are funded with a short term loan, after discounting proceeds from the sale of houses to workers. On the other side, SIVa buys 0.1434 m.u. of circulating capital from SIIb, 0.2102 m.u. of consumer goods from SIIIb and 0.9849 m.u. of land.
11. Land owners spend their proceeds on the purchase of consumer goods, 1.3779 m.u. going to SIIIa and the rest, 0.5358 m.u. to SIIIb.

Once monetary circulation has concluded, the balance sheet for all agents is as follows:

SIa:	+0.5277 m.u.
SIb:	-0.5277 m.u.
SIIa:	+2.1632 m.u.
SIIb:	-2.1632 m.u.
SIIIa:	+2.4817 m.u.
SIIIb:	-2.4817 m.u.
SIVa:	+0.1718 m.u.
SIVb:	-0.1718 m.u.
Workers:	-51.1745 m.u.
Land owners:	0 m.u.

We interpret these findings as follows. Firms in subsets 'a' obtain a surplus which is used to pay back the second instalment corresponding to, in essence, a long term loan for the purchase of fixed capacity one period earlier (including interest on debt). Firms in subsets 'b' finish the monetary circulation with outstanding debt which will have to be repaid at the end of the next production period.

Workers outstanding debt corresponds to the purchase of houses during the last 30 years (corresponding to the maturity of the mortgage loans).

After money has circulated through all the channels described above, we discover that:

- All transactions required for the economic system to grow at a rate  $G$  have been monetized.
- All distributive categories, wages, profits and rents, have been monetized.
- All money which had been created by banks *ex nihilo* is destroyed so there is no liquidity remaining inside the economic system.
- Despite all money created in the efflux stage having been destroyed within the refflux stage, some (long term) debts still have to be cancelled.
- The purchase of long term real assets has been funded with bank credit, and not with a 'revolving fund of finance'. There is no saving-investment channel.
- Workers / households are borrowers, like firms. However, they do not use borrowing to fund a production process: only to fund the purchase of houses (or, in a broader sense, the purchase of durable consumer goods).