THE WEALTH EFFECT ON CONSUMPTION IN THE PORTUGUESE ECONOMY*[1]

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1. INTRODUCTION

Throughout the 1990s, household wealth in Portugal rose considerably, in parallel with strong growth in private consumption and a fall in the saving rate, from close to 20 per cent in the early 1990s to around 10 per cent at the end of the decade. These developments did not occur solely in Portugal, being referred to in the literature as a common phenomenon in various industrialised economies.[2]

Economic theory, in particular the Permanent Income Theory [Friedman (1957] and the Life-Cycle Hypothesis [Modigliani and Brumberg (1954)], states that household wealth is a key element for determining private consumption. According to these models, private consumption is a function of human wealth, measured as the current value of expected lifetime income, and of financial wealth, corresponding to the stock of assets held by households and the corresponding income. Consumers therefore tend to smooth consumption by taking expected income into account; they borrow while they are young, save throughout their working life and consume accumulated savings during retirement. Any unanticipated rise in (both human and financial) wealth is distributed over the remaining lifetime, raising not only current consumption but also future consumption, the aim being to maintain a relatively stable pattern over time.

Several authors have developed empirical models based on the life-cycle theory, in order to quantify the relationship between aggregate consumption, income and wealth. Some works in this area are worth mentioning, among them, Ludvigson and Steindel (1999), Boone *et al.* (2001), Davis and Palumbo (2001), Mehra (2001), Bertaut (2002), Palumbo *et al.* (2002), Bayoumi and Edison (2003) and Donihue and Avramenko (2006). Most of the literature on this subject shows evidence of a significant effect of wealth on private consumption; however, there is some disparity in the findings, not only as regards the magnitude of the marginal propensity to consume out of the various wealth components, but also as regards values estimated for the same country in different studies.

Understanding the relationship between changes in household wealth and the behaviour of private consumption is crucial to interpret the evolution of the Portuguese economy in the recent past and also to forecast the future. This article aims to estimate the wealth effect on private consumption in Portugal for the 1980-2005 period, by distinguishing two components: housing stock and financial wealth. It will also test for empirical evidence of how financial liberalisation, which took place in Portugal in the early 1990s, impacted on the elasticity of consumption to wealth and income. Finally, an attempt will be made to quantify the effect of rising wealth on private consumption through the 1990s, thereby contributing to a better understanding of the factors underlying the strong consumption growth and the fall in the saving rate over the period under analysis.

There is virtually no literature relating to wealth effects on consumption in the Portuguese economy. This is largely due to the fact that long and homogeneous series on household wealth have only become available recently. The paper by Cardoso and Cunha (2005) is an important contribution, providing the groundwork for further research in this field of macroeconomic analysis in Portugal.

This article is organised as follows. Section 2 gives a brief description of the role of wealth in private consumption and the various financial and housing wealth transmission mechanisms to household consumption. Section 3 summarises developments in household wealth in Portugal over the past few decades. Section 4 introduces the model used in the analysis. Section 5 discusses the empirical results obtained in the estimation of the long-term relationship and of the dynamic equation of private consumption and describes two exercises structured to quantify the impact of an increase in wealth on private consumption growth. Section 6 summarises the main conclusions.

2. THE ROLE OF WEALTH IN PRIVATE CONSUMPTION

The wealth effect on private consumption is traditionally analysed through life-cycle models based on the seminal work of Modigliani and Brumberg (1954). According to these models, consumption depends on the current and expected income (human wealth) and on the stock of assets held by households and the corresponding income (financial wealth). Accumulation essentially reflects two factors: savings out of current income and asset valuation changes. The main transmission channels usually considered to account for a wealth shock on private consumption are the sale of assets to finance consumer spending and the use of wealth as collateral in borrowing operations.[3] Occasionally, reference is made to an additional transmission channel linked to changes in future income and wealth expectations.

An important factor in this analysis is the nature of wealth: it is not homogeneous, since it consists of various components with different characteristics as regards risk, collateral and liquidity. An important part of the literature distinguishes financial assets from the housing stock and within the former equity wealth is occasionally analysed separately. A number of arguments support such a distinction.[4] First, there are differences in asset liquidity. For example, potential gains in securities, such as bonds and shares, are traditionally easier to realize directly than those from real estate valuation, in particular from an increase in house prices. However, this has been changing in some countries, since it has become increasingly easy to obtain mortgage-backed loans for purposes other than acquisition of a residence, based on potential gains in the housing market.[5] Second, the extent to which consumers view their currently-measured wealth as temporary or uncertain may be different in their consideration of housing wealth and financial asset wealth. For example, the price of some financial assets, for example shares and other equities, tends to be more volatile than house prices, which makes it more difficult to assess whether a change in asset prices are permanent or temporary. Credit institutions/households will therefore be more cautious when lending/borrowing operations are backed by increases in financial asset wealth than when they are backed by increases in housing wealth. Third, house

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(3) Where wealth is used as collateral, the effect on consumption largely depends on the development and depth of the financial market.

(4) For more details, see Bayoumi and Edison (2003) and Case *et al.* (2001).

(5) In the case of Portugal and resorting to the ad-hoc question from the Bank Lending Survey of July 2006, the share of loans to households secured by real estate for purposes other than the acquisition of a principal residence is negligible although it increased throughout 2006. According to responses to the question "On the basis of the information available to you, what share of the volume of the outstanding amount of loans to households secured by real estate currently on the books of your bank do you estimate was used for purposes other than the acquisition of a principal residence?", four of the five banking groups included in the sample reported that in relation to loans used for purposes other than the acquisition of a principal residence this share was lower than 10%; only one bank indicated that the figure was between 10% to 20%. As regards the question "How does the share of loans to households secured by real estate contracted over the last 12 months for purposes other than the acquisition of a principal residence compare with the share of such loans in the previous 12-month period?", two banking groups considered that this share was "somewhat higher" and one that it was "considerably higher". The remaining banking groups reported that it was "basically unchanged".

purchase is largely financed with borrowed money, while securities purchases are not. Consequently, an increase in house prices has a potentially higher net return as a percentage of household investment than a corresponding rise in the price of financial assets. Finally, wealth components have different characteristics if one of the reasons for accumulation is to bequest to future generations.

There are empirical results to be found in the literature regarding the estimation of the marginal propensity to consume out of the different types of wealth but they do not provide the basis for a general conclusion on which effect has a larger impact on consumption. For example, Case *et al.* (2001) used a panel data on 14 developed countries for the 1975-1999 period and a series of panel data on the United States for the 1982-1999 period. They concluded that there was a stronger impact on consumption from the housing market for both the United States and the panel of other developed countries than from the stock market. Bayoumi and Edison (2003) also concluded that increases in housing wealth have a stronger impact on consumption than rises in financial wealth. Campbell and Cocco (2005) used microeconomic data for the United Kingdom and found that house prices had an important effect on consumption. In turn, Ludwing and Slok (2002) studied the impact of stock and house prices on consumption based on data from 16 OECD countries. One of the main conclusions was that the long-term impact of stock market wealth on private consumption was approximately twice as much as the impact of changes in housing wealth. These results are far from homogeneous, and general conclusions drawn from them have been contested in recent studies. For example, according to Attanasio *et al.* (2005), Aron and Muellbauer (2006) and Benito *et al.* (2006) there is a correlation between private consumption and the housing market because they both react to common factors, which are not usually considered in this type of analysis.

Some studies conclude that the different findings obtained in estimating the marginal propensity to consume out of wealth relate to specific features of any given country, namely the nature of the financial system. These studies consider two types of economies: bank-based and market-based.[6] In market-based systems, a larger proportion of household wealth is usually made up of financial assets, especially shares, and therefore the distribution and ownership of shares tends to be wider. In countries that are characterised by this type of financial system, it is generally easier for households to borrow against their assets (equity withdrawal), since the financial system is more developed and more financial instruments are available. As a result, it is often stated that the wealth effect on consumption will be stonger in market-based systems than in bank-based systems. In this sense, the marginal propensity to consume out of wealth is likely to increase over time, as financial markets become more developed.

For example, according to Ludwing and Slok (2002) results suggested that stock price changes have a greater impact on consumption in economies with market-based financial systems, than in economies with bank-based systems. Results also suggested an increased impact of the stock market on consumption over time, both in market-based and bank-based economies. Boone *et al.* (1998) presented a study on the impact of stock market fluctuations on consumption for the main OECD countries. They concluded that the effect of the stock market on consumption is stronger in the United States than in the other G7 countries, especially in continental countries in Europe, where there is smaller stock ownership, less equal distribution and later financial liberalisation. Slacalek (2006) also concluded that there was a higher wealth effect on consumption in countries with higher stock market capitalisation.

Finally, it is also important to mention a number of empirical works that study the effect of financial market liberalisation on private consumption, in particular the impact on wealth and income elasticities.

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(6) Bank-based economies such as Germany and Japan are characterised by relatively less developed capital markets, in which only a small portion of corporate financing needs are met through the issuance of securities. Companies borrow from banks, which cover their refinancing needs through the central bank. On the other hand, in market-based economies such as the United States and the United Kingdom companies cover most of their financing needs by issuing financial securities (shares, bonds, commercial paper, etc.) directly to investors.

Barrell and Davis (2004) presented an estimation of a consumption function for 7 industrialised countries and concluded that in the wake of financial liberalisation, consumption became less dependent on income and more dependent on wealth. According to Boone *et al.* (2001), financial liberalisation caused the wealth effect to impact significantly on private consumption in the United States, the United Kingdom and Canada, while results for France and Italy are inconclusive.

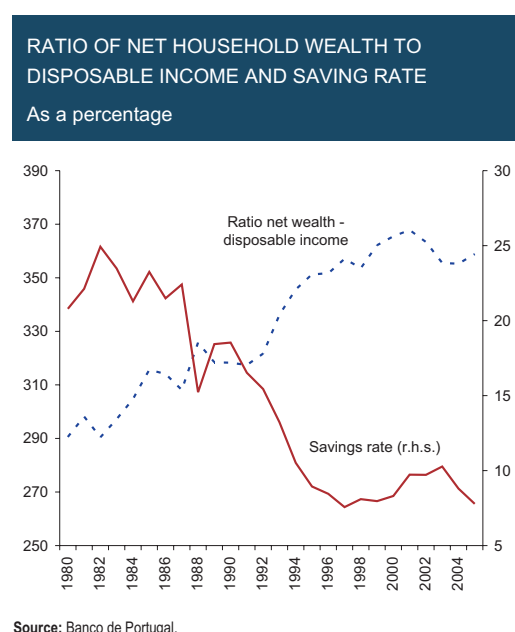## 3. THE EVOLUTION OF HOUSEHOLD WEALTH IN PORTUGAL

This section gives a brief description of the changes in household wealth in Portugal over the past few decades. For a more detailed description and international comparison, see Cardoso and Cunha (2005).

In the course of the 1990s, household wealth rose significantly in a number of countries, largely driven by big asset valuation, often associated with a fall in the personal saving rate.[7] These developments, widely mentioned in the literature, are also suggested by the data on Portugal (Chart 1).

Gross household wealth as a percentage of disposable income has increased over the last 25 years, from around 320 per cent in the early 1980s to around 480 per cent in the most recent period (Table 1). This increase was considerably more marked for financial assets, in particular shares and other equities, implying a significant change in the composition of household wealth. In the early 1980s housing accounted for around 63 per cent of total household wealth, but during the 1990s this trend changed, and now financial assets account for the highest share, i.e. around 56 per cent. Net wealth recorded a considerable increase over that period, despite the big rise in household liabilities, remaining on an upward trend until the late 1990s, followed by relative stabilisation in the most recent years.

This evolution is common to other industrialised economies. In fact, countries such as Italy, the United Kingdom, the United States, Spain and France also saw considerable increases in household wealth

Chart 1

RATIO OF NET HOUSEHOLD WEALTH TO
DISPOSABLE INCOME AND SAVING RATE
As a percentage

Source: Banco de Portugal.

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(7) For example, according to Lusardi *et al.* (2001), macroeconomic estimates suggested that the rise in wealth through capital gains in the stock market in the United States from 1988 to 2001 implied that personal savings fell by around 3.4 to 4.6 percentage points, i.e. 40% to 50% of the fall decline since 1988.

Table 1

| | | | Of which: Shares | Non-financial | Financial | |
	Gross wealth	Financial assets	and other equity	assets	liabilities	Net wealth
HOUSEHOLD WEALTH AND INDEBTEDNESS						
As a percentage of disposable income						
1980-1985	321	117	16	204	22	299
1986-1990	346	146	25	200	29	317
1991-1995	374	177	40	197	40	334
1996-2000	437	236	71	201	79	358
2001-2005	477	266	76	211	117	360

Source: Cardoso e Cunha (2005), "Household wealth in Portugal: 1980-2004", *Working Paper* nº 4, Banco de Portugal.

as a percentage of disposable income, particularly in the second half of the 1990s, in both the housing and financial components. In most of these countries, however, as in Portugal, this increase was greater in financial wealth, with a consequent decline in the proportion of the housing component to total assets.

In terms of developments in Portuguese household financial wealth, it is worth mentioning that the shares and other equities component grew markedly, from around 20% of disposable income in the early 1980s to 80% in 2000. [8] The growing importance of shares in the portfolio of Portuguese households was boosted by two factors: firstly, the privatisation process, which started in the late 1980s and gathered momentum in the second half of the 1990s; and secondly, the rise in stock market prices. As for the composition of household financial assets, there has been an increase in insurance technical reserves, above all life insurance and pension funds, since the mid-1990s (Chart 2).

Housing wealth as a percentage of disposable income did not grow as markedly as financial assets, rising from around 200 per cent in the 1980s to 212 per cent in 2005. Housing demand was particularly strong in the second half of the 1990s, a fact which seems to have been associated with a steady decline in nominal and real interest rates and expectations of favourable economic growth. In more re-

Chart 2

COMPOSITION OF THE HOUSEHOLD ASSET PORTFOLIO
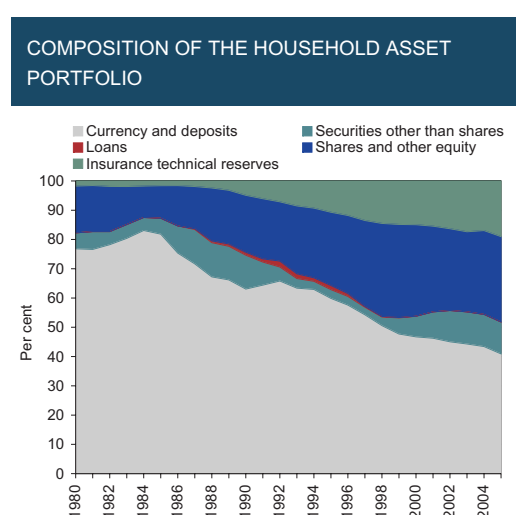
Source: Banco de Portugal.

(8) The shares and other equities component includes holdings in investment funds, where fixed income funds are an important component.

cent years, housing investment has fallen steeply, partly induced by intertemporal household budget constraints stemming from high indebtedness levels as a percentage of disposable income.

According to the data presented in Cardoso and Cunha (2005) Portuguese households hold the smallest share of housing in their investment portfolio and the lowest ratio of housing wealth to disposable income compared with France, Germany, Italy, Spain, and the United Kingdom. For example, in Spain, France and the United Kingdom, housing wealth as a percentage of disposable income increased between 1995 and 2003 by around 260, 80 and 163 percentage points (p.p.) respectively, whereas the rate in Portugal was 17 p.p.. One of the factors accounting for this result is the big rise in house prices in these countries over the past few years, in contrast to the subdued growth visible in the data available for Portugal (Chart 3).[9]

Additionally, in terms of the financial liabilities of households, the ratio of loans for housing purchase to housing wealth in Portugal (Chart 4) shows that there is a significant increase in the proportion of the housing value that is obtained by recourse to bank loans from the second half of the 90s. This ratio was approximately 5 per cent in the 1980s and increased to around 40 per cent in 2005, which accounts for the sharp downward trend in non-mortgage housing wealth as a percentage of disposable income.

The increase in households financial assets and housing wealth was clearly accompanied by a big rise in indebtedness, i.e. from around 25 per cent of disposable income in the 1980s to around 130 per cent in 2005, at which point it was amongst the highest in the European Union.
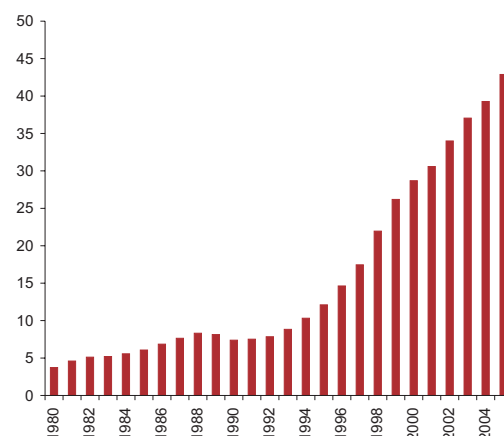
Chart 3

CHANGE IN THE REAL HOUSE PRICE OVER THE LAST 10 YEARS (1996-2006)
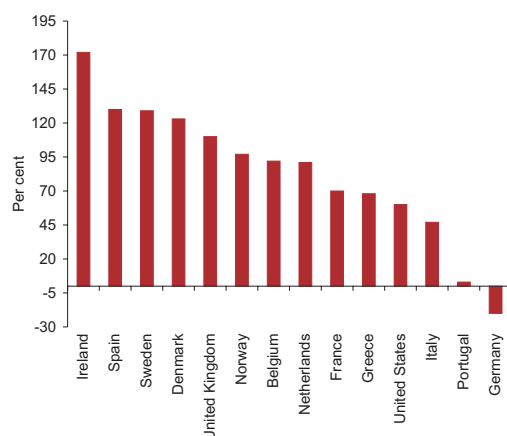
Source: Morgan Stanley "Financial innovation and European Housing and Mortgage Markets" July 2007.

Chart 4

LOANS FOR HOUSE PURCHASE
As a percentage of housing wealth

Source: Banco de Portugal.

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(9) The series on housing wealth in Portugal detailed in Cardoso and Cunha (2005) was valued using the deflator of gross fixed capital formation in housing, while the series shown in Chart 3 corresponds to the index released by Confidencial Imobiliário. The two series, however, do not in fact differ significantly.

4. THE MODEL

After the article of Hall (1978), most of the literature on consumption considers that decisions relating to it are determined through an intertemporal optimisation process of a representative consumer, with forward-looking behaviour, whose future income is subject to uncertainty. This type of model, which includes the Permanent Income Theory and the Life Cycle Hypothesis, postulates a simple model composed of a consumption function, with labour income and household wealth as determinants. These theories state that consumption is determined according to permanent income, defined as the present value of wealth, including human wealth (labour income) and non-human wealth, usually termed financial wealth (financial assets and housing stock). Hence, consumption varies according to unexpected fluctuations in permanent income, but remains virtually unchanged as a result of transitory fluctuations in current income.

The traditional methodology for an estimation of the wealth effect on private consumption is based on the assumption that there is a cointegration relationship among aggregate consumption (c_t), financial wealth (a_t) and aggregate labour income (y_t), using the following relationship:[10]

$$c_t = \alpha + \beta a_t + \delta y_t + u_t$$

where lowercase letters represent logarithms and parameters β and δ stand for the elasticities of consumption to wealth and income, respectively.[11]

If a cointegration relationship exists between the previous variables, then consistent estimates for β and δ can be obtained using, e.g. the Ordinary Least Squares (OLS) method. The existence of a cointegration relationship is an important property, given that the estimation of the cointegration parameters with OLS is robust to the presence of endogeneity in regressors [see Phillips and Durlauf (1986)]. The section below tests for the existence of a cointegration relationship based on the previous equation and estimates elasticities and marginal propensities to consume out of disposable income and wealth.

5. EMPIRICAL RESULTS

The series used in this study will be found in the quarterly series for the Portuguese economy detailed in the June 2006 issue of the Banco de Portugal Economic Bulletin for the 1980Q1-2005Q4 period and the household wealth series detailed in Cardoso and Cunha (2005).

An important issue widely discussed in the literature is the choice of the consumption series to be used. It is often argued that the definition of consumption implied in life-cycle models is not observable[12], because it includes not only the consumption of non-durable goods and services, but also the services associated with durable goods consumption. In this context, the series on consumption of non-durable goods and services is often used as a proxy, given that in most cases there is no series available for the services associated with durable goods consumption. This study has followed such an

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(10) Lettau and Ludvigson (2001, 2004) provide a theoretical justification for the cointegration approach based on the log-linear approximation of consumer's intertemporal budget constraint.

(11) The relationship between consumption, income and wealth is usually estimated with the variables in logs. On the one hand, the variables in question are typically integrated of order 1 and their first difference is integrated of order 0 only in logarithms and not in levels. On the other hand, estimation in levels often gives rise to heteroscedasticity problems.

(12) One of the hypotheses underlying these models is the separability of utility over time, which means that the marginal rate of substitution between two periods is independent from the level of consumption in any other period. This hypothesis excludes at least two important things: the formation of consumption habits and durable goods.

approach, and thus the consumption series used accounts for around 90% of the total consumption of Portuguese households.

The literature on the estimation of consumption functions also discusses which income series should be used. According to economic theory, the figures used should be labour income net of taxes, as in Lettau and Ludvigson (2003). However, disposable income is frequently used as a proxy, given that there is no available series of labour income net of taxes (see for example Bayoumi and Edison (2003)). This study followed this approach.[13]

The household wealth series detailed in Cardoso and Cunha (2005) is available on an annual basis from 1980 to 2004, so it had to be extended until 2005 and disaggregated into quarterly figures.[14] Household wealth series includes financial assets and liabilities and housing. The housing stock results from the application of the permanent inventory method, which consists in the accumulation of gross fixed capital formation (GFCF) in housing at constant prices in a given year and in the application of a linear depreciation. The housing stock is subsequently valued at market prices using the deflator of GFCF in housing. According to Cardoso and Cunha (2005), the lack of information on house purchases in Portugal, especially for more distant years, gives rise to some problems in the use of this deflator in housing stock valuation.[15]

The analysis presented in this study takes into account three measures of wealth: (i) total net wealth, i.e. financial assets and housing net of financial liabilities; (ii) net financial wealth, financial assets net of financial liabilities except loans for house purchase; and (iii) non-mortgage housing wealth, i.e. the housing stock net of loans for house purchase.

Before estimating the long-term relationship, it is important to test for the existence of a cointegration relationship between the consumption of non-durable goods, disposable income and wealth, and to check the order of integration of the series. In order to test for the stationarity of these variables around a linear trend or a stochastic trend, unit root tests were performed to variables in logarithms. The results obtained were consistent with the existence of a unit root in all series (see Annex A).

Since the series used are integrated of order 1, I(1), it is possible to test for the existence of a common trend in these variables.[16] In this context, two types of test were performed, the Shin test, in which the null hypothesis is the existence of cointegration, and the augmented Dickey-Fuller (ADF) test, in which the null hypothesis is the absence of cointegration.

As regards the ADF test, it can be concluded that the null hypothesis of no cointegration can be rejected at a 5 percent significance level in the specification with aggregate net wealth, while in the specification with disaggregated wealth it is no longer possible to reject the null hypothesis at 5%, although a rejection at 10% is quite close (see Annex B). In the Shin test, the null hypothesis of cointegration is not rejected in any of the cases, regardless of the number of leads and lags considered. In this sense, a long-term relationship can be deemed to exist between consumption and its economic determinants, i.e. income and wealth.

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(13) The household disposable income account does not enable labour income to be directly extracted, since the share of self-employed is not registered on an individual basis, and is instead included in the item business and property income.

(14) Quarterly figures are obtained by a smoothing process which minimizes the sum of square of their first differences, see Boot *et al.* (1967).

(15) House prices index from *Confidencial Imobiliário* could also be used to value the housing stock. However the evolution is similar to the GFCF housing deflator, so the use of *Confidencial Imobiliário* index is likely to give rise to similar results. It should also be highlight that the way house prices have moved in Portugal over the last decade is quite different from most European countries.

(16) Tests were performed to check for the existence of a cointegrating vector between consumption of non-durable goods and services, disposable income and net household wealth and between consumption of non-durable goods and services, disposable income, net financial wealth and non-mortgage housing wealth.

5.1. Long-term equation for private consumption: marginal propensities to consume out of income and wealth

Table 2 displays the results of the consumption function estimation based on the dynamic OLS procedure proposed by Stock and Watson (1993), in order to obtain efficient estimators.[17] The equations to be estimated may be written as:

$$LP1\,model: pcr_t^{nd} = \alpha + \beta pyr_t + \delta fwr_t + \sum_{i=-k}^{i=k}\beta_i \Delta pyr_{t+i} + \sum_{i=-k}^{i=K}\delta_i \Delta fwr_{t+i} + \varepsilon_t$$

$$LP2\,model: pcr_t^{nd} = \alpha + \beta pyr_t + \eta fwr_t^{hab} + \gamma fwr_t^{af} + \sum_{i=-k}^{i=k}\beta_i \Delta pyr_{t+i} + \sum_{i=-k}^{i=k}\eta_i \Delta fwr_{t+1}^{hab} + \sum_{i=-k}^{i=k}\gamma_i \Delta fwr_{t+i}^{af} + \mu_t$$

where lowercase letters represent the logarithms of the corresponding variables: pcr^{nd} stands for consumption of non-durable goods and services, pyr for disposable income, fwr for aggregate net wealth, fwr^{af} for net financial wealth and fwr^{hab} for non-mortgage housing wealth. Δ represents the first difference operator. The parameters of the equations above reflect consumption elasticities with respect to income (β), net wealth (δ), non-mortgage housing wealth (η) and net financial wealth (γ). Marginal propensities to consume (MPC), presented in Table 2, were calculated using sample averages of the consumption to disposable income ratio and the consumption to wealth ratio.[18]

Results show that changes in disposable income and net wealth have a positive and significant impact on private consumption of non-durable goods and services. Long-term elasticity of consumption to net wealth is 0.43, according to the aggregate household wealth model, and the marginal propensity to

Table 2

ESTIMATION OF THE LONG-TERM EQUATION FOR CONSUMPTION OF NON-DURABLE GOODS AND SERVICES				
	LP1 model		**LP2 model**		**LP3 model**
	Elasticity	MPC	Elasticity	MPC	Elasticity
pyr_t	0.64	0.48	0.81	0.61	0.77
	(3.17)		(5.27)		(6.07)
fwr_t	0.43	0.03	-	-	0.32
	(3.08)				(3.01)
fwr_t^{hab}	-	-	0.17	0.02	-
			(3.27)		
fwr_t^{af}	-	-	0.14	0.02	-
			(2.26)		
$pyr_t lib_t$	-	-	-	-	-0.21
					(-3.16)
$fwr_t lib_t$	-	-	-	-	0.05
					(3.58)

Note: A constant was included in the estimation. Estimation period: 1981Q1 to 2005Q4. Equations were estimated using the logs of variables and the "leads and lags" procedure proposed in Stock and Watson (1993). The t-ratios were adjusted according to the Stock and Watson method (1993). The LP1 model is the aggregate net wealth model and the LP2 model is the net wealth model broken down into non-mortgage housing wealth and net financial wealth, which corresponds to financial assets net of financial liabilities excluding housing loans.

(17) This procedure consists in adding leads and lags of the first difference of the righ-hand-side variables to eliminate the effects of regressor endogeneity. T-statistics presented in Table 2 were adjusted according to the Stock and Watson methodology (1993), and can therefore be compared to the standard tables of t-distribution.

(18) The marginal propensity to consume out of wealth can be proxied by the following formula: $\varepsilon = (\Delta PCR / PCR) / (\Delta FWR / FWR) = (\Delta PCR / \Delta FWR) \times (FWR / PCR) = mpc \times (FWR / PCR)$, where ε is the elasticity of consumption in relation to wealth and mpc is the marginal propensity to consume out of wealth. This implicitly assumes that the ratio of consumption to wealth is stable throughout the sample period.

consume implied in this estimate is 0.03, which suggests that the effect on consumption of a €1 increase in net wealth is around €0.03.[19]

A separate analysis of the elasticity of consumption in relation to housing wealth and to net financial wealth shows that elasticity is very similar, at 0.17 and 0.14 respectively, and implied responses to a €1 increase in wealth stand at approximately €0.02. The long-term elasticity of consumption to disposable income stands at 0.64 according to the aggregate household wealth model, and the marginal propensity to consume implied in this estimate is €0.48 per euro. In the disaggregated wealth model, elasticity of disposable income is higher, at 0.81, and the marginal propensity to consume is €0.61 per euro.

Although the results in the literature are relatively dissimilar not only as regards the magnitude of the marginal propensity to consume in different countries but also in the same country in different studies, most results point to a significant effect of wealth on private consumption. According to Altissimo *et al.* (2005) the disparity in results cannot be explained only in the light of economic theory; they propose that incomparable measures of wealth may be an important source of differences in the estimates on the marginal propensity to consume out of wealth. In fact, one of the main limitations in these studies is related to the absence of relatively long household wealth series. For this reason, proxies are often used, e.g. the stock market index for financial wealth and the house price index for non-financial wealth.

Notwithstanding these limitations, findings in the literature may act as a reference for figures on the marginal propensity to consume out of wealth in Portugal. First, figures presented in Botas (1999) for Portugal also indicate a value of 0.03. With regard to international comparisons, Slacalek (2006) presented some results for the marginal propensity to consume out of wealth in G8 countries and in some European countries, using the cointegration methodology. Figures obtained ranged between 0.004 (Netherlands) and 0.05 (United States). According to Bertaut (2002), results stand at 0.05 for the United States, 0.04 for the United Kingdom, 0.08 for Canada and 0.05 for Australia. Estimates of Boone *et al.* (2001) were slightly lower, i.e. 0.02 for the United Kingdom and Japan, 0.03 for France and Italy, 0.04 for the United States and 0.06 for Canada. For the United States, additional results regarding the marginal propensity to consume out of wealth may be mentioned: in Mehra (2001) the figure is 0.03, in Davis and Palumbo (2001) it is 0.04, in Ludvigson and Steindel (1999) it is 0.02, and in Palumbo *et al.* (2002) and Donihue and Avramenko (2006) it is 0.04.[20]

In order to analyse the stability of parameters over the sample period, the LP1 model was estimated using the recursive least squares method.[21] Charts 5 and 6 point to a decline in the value of the coefficient associated with disposable income and an increase in the coefficient associated with net wealth in the early 1990s, indicating that the sensitivity of consumption to disposable income and wealth changed over the sample period.

The Portuguese financial system had been subject to tight regulations in the early 1980s and was the subject of far-reaching reforms in the 1990s. Financial deregulation and liberalisation led to important changes in the banking sector stimulating competition, above all through the creation of new financial instruments and a squeeze on the financial intermediation margin. These measures made it easier for economic agents to make use of the credit market.

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(19) As previously mentioned, the marginal propensity to consume was calculated on the basis of the average ratio of consumption to wealth. However, considering the average for the past year, a value of approximately €0.03 would be also obtained.

(20) A detailed description of results and the main differences between the above-mentioned papers is beyond the scope of this study. For a detailed discussion of some of this issues see Altissimo *et al.* (2005).

(21) According to the results presented in Table 2 there is no evidence of a significant difference in the elasticity of consumption to the two measures of wealth, and the LP1 model was therefore chosen for the following analysis.

Chart 5

Chart 6

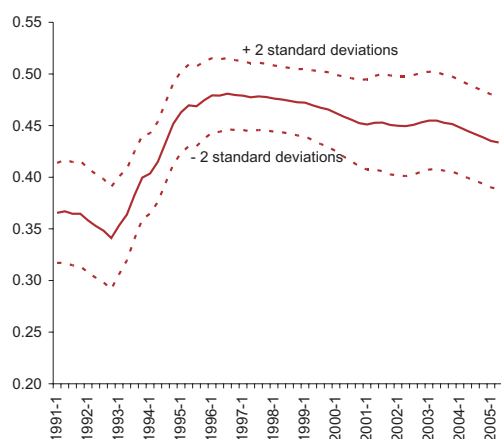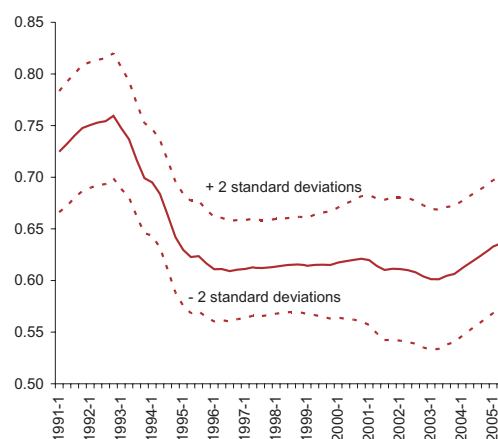| RECURSIVE ESTIMATION OF THE NET WEALTH COEFFICIENT |
| LP1 Model |

| RECURSIVE ESTIMATION OF THE DISPOSABLE INCOME COEFFICIENT |
| LP1 model |

As previously mentioned, some literature on the effect of wealth on private consumption analyses the impact of financial liberalisation on the consumption and wealth relationship. For example, Barrell and Davis (2004) presented a study for the main industrialised economies and concluded that the coefficients of the consumption function should be estimated separately for the periods before and after financial liberalisation. This could be done by reducing the sample period or by introducing additional variables which allow for time-varying coefficients. The LP1 model was re-estimated and a dummy variable was introduced in the coefficients as in Barrell and Davis (2004), allowing the effect of wealth and income on private consumption to vary throughout the sample period. The choice of the dummy variable (lib_t) was based on the implementation date of the main measures in the financial liberalisation process in Portugal (Annex C). The lib_t variable stood at zero before the second quarter of 1990, when credit ceilings became indicative, and at 1, five years later. The transition path is given by a logarithmic trend. The new model to be estimated is given by,

$$LP3\ model: pcr_t^{nd} = \alpha + \left(\beta + \beta' lib_t\right)pyr_t + \left(\delta + \delta' lib_t\right)fwr_t + \sum_{i=-k}^{i=k}\beta_i \Delta pyr_{t+i} \sum_{i=-k}^{i=k}\delta_i \Delta fwr_{t+i} + \upsilon_t$$

As the financial sector liberalisation occurred in parallel with other major structural changes in the Portuguese economy, the lib_t variable may capture other effects on consumption function parameters such as favourable expectations regarding future developments in the Portuguese economy, associated with Portugal's participation in the euro area and lower interest rate volatility.

Results presented in Table 2 and Chart 7 point to a significant effect (with the expected signal) of financial market liberalisation on the elasticities of consumption to income and wealth. In the case of disposable income, an analysis of the periods before and after financial liberalisation shows that the value of the coefficient fell markedly, by around 0.2. In the case of elasticity with respect to wealth, differences are not so marked, although the lib_t variable is also significant. The results are in line with the notion that financial market liberalisation and the decline in interest rates led to a reduction of liquidity constraints of households, due to easier access to the credit market, thus allowing for a greater smoothing

Chart 7

DEVELOPMENTS IN LONG-TERM ELASTICITY OF
PRIVATE CONSUMPTION TO INCOME AND
WEALTH
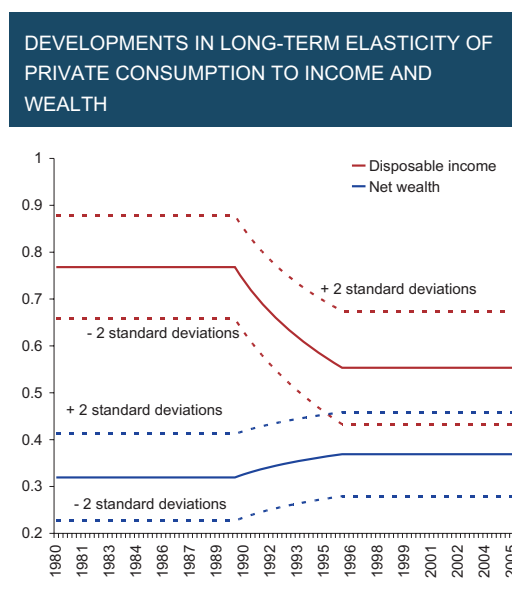
of household consumption throughout the life cycle and a lower dependency of consumption on current income [see Castro (2006)].

Barrell and Davis (2004) also concluded that the behaviour of consumers changed significantly following financial market liberalisation, which led to a greater influence of wealth on long-term consumption and lower dependency on disposable income. In this respect, Ludwing and Slok (2002) and Boone *et al.* (1998) point to greater marginal propensity to consume out of wealth in market-based systems as opposed to bank-based systems, and concluded that the marginal propensity to consume out of wealth increases as financial markets become more developed.

5.3. The dynamic equation of private consumption

This subsection presents the findings for the estimation of the dynamic equation in which changes in consumption are related to changes in disposable income, in wealth, in the long-run deviation calculated on the basis of the parameters estimated in the LP3 model, and in other variables not included in the long run, which may help to explain consumption (Z_t).

$$\Delta pcr_t = \theta(L)\Delta pyr_t + \lambda(L)\Delta fwr_t + \rho(L)\Delta Z_t + \tau\left[pcr - \alpha - (\beta + \beta' \, lib)pyr - (\delta + \delta' \, lib)fwr\right]_{t-1} + \nu_t$$

Δ represents the first difference operator, τ measures the speed at which the consumption of non-durable goods and services responds to deviations from long-term equilibrium, and the Z_t vector is a nominal interest rate, which can be seen as an indicator of consumer accessibility to the credit market and may also be an indicator of liquidity constraints.[22]

Table 3 presents the results obtained in the estimation of the previous equation.[23] Coefficients obtained are statistically significant and have the theoretically expected signal. In particular, the coefficient estimated for the error correction mechanism is negative, indicating that consumption gradually

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(22) The unemployment rate was also taken into account, but was not significant.

(23) As in Barrell and Davis (2004), the introduction of the *lib_t* variable was tested in short-term coefficients and in the error correction term. However, it was not significant in any of the cases.

Table 3

ESTIMATION OF THE DYNAMIC EQUATION FOR CONSUMPTION OF NON-DURABLE GOODS AND SERVICES	
$Dpcr\_nd_{t-2}$	0.24 (3.51)
$Dpcr\_nd_{t-3}$	0.26 (3.66)
$Dpyr_t$	0.23 (3.75)
$Dfwr_{t-2}$	0.24 (3.12)
$Dstn_{t-3}$	-0.01 (-2.18)
MCE_{-1}	-0.09 (-2.30)
Estimation period	1985Q1-2005:Q4
Standard deviation	0.0048
Number of observations	84
AR 1-5 test	$F(5,69) = 0.875 [0.503]$
ARCH 1-4 test	$F(4,66) = 0.389 [0.816]$
Normality test	$Chi^2(2) = 2.754 [0.252]$
Heteroscedasticity test	$F(16,57) = 0.529 [0.920]$
RESET test	$F(1,73) = 2.998 [0.088]$

Note: D represents the first difference of the logs of variables and ECM corresponds to the error correction mechanism.

adjusts to its long-term equilibrium level. Short-term coefficients estimated for disposable income and wealth suggest that consumption responds contemporaneously to changes in income and with some lag to changes in wealth. Finally, changes in nominal interest rates are also important to explain consumption variations.

5.3. Quantification of the wealth effect on private consumption

This section presents two exercises aiming to quantify the effect throughout the 1990s of the increase in wealth on household expenditure in the consumption of non-durable goods and services. The analysis is in part in line with the literature[24] and allows for some interesting conclusions. However, it should be noted that a partial equilibrium model is subject to a number of caveats; the results should therefore be taken cautiously. One of the main limitations of this type of analysis is the impossibility of correctly assessing the importance of a structural shock, given that variables are endogenous and potential feedback effects are ignored.

First, the long-term equation previously estimated with aggregate wealth (the LP3 model) was used to forecast the consumption level in the first quarter of 2000. This calculation was based on actual disposable income and on two alternatives for the evolution of wealth, i.e. its historical value and the level of wealth compatible with the maintenance of the ratio of wealth to disposable income at the level observed in the first quarter of 1990.[25] The hypothesis regarding the evolution in wealth indicates that between 1990 and 1999 it grew in real terms at an annual average rate of 3.2 per cent, which compares with the observed 4.7 per cent. By comparing the simulation results with the historical and the alternative measure of change in wealth, it is possible to quantify, albeit in a simplified and merely illustrative form, the "wealth effect" on consumption throughout the 1990s. The exercise implies an impact of the "wealth effect" of around 1 p.p. on the annual average growth of consumption of non-durable goods

(24) See Mehra (2001), Davis and Palumbo (2001) and Bertaut (2002).

(25) This hypothesis is mostly equivalent to considering the average value of the ratio of net wealth to disposable income between 1981Q1 and 1989Q4.

and services in the 1990s. According to this exercise, the exceptional increase in net wealth with re-spect to disposable income growth partly explains the strong private consumption growth and the decline in the household saving rate.

In order to analyse the contribution of wealth in each year to the growth in private consumption of non-durable goods and services, the annual rate of change of consumption was decomposed into the contributions associated with the explanatory variables. The model used was the dynamic equation estimated in the previous sub-section.
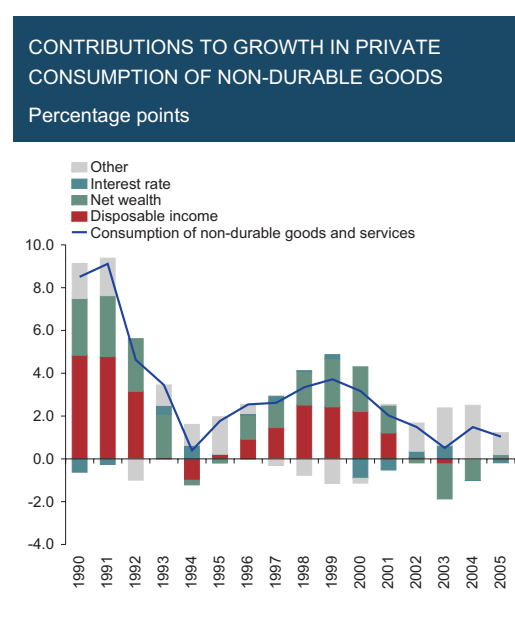
The contribution of variable X to consumption growth C_t^X in period t, can be computed as:

$$C_t^X = \sum_{j=0}^{J} \Phi_j^X X_{t-j}$$

where X_{t-j} is the change of the explanatory variable in period t-j and Φ_j^X is the impact on consumption growth j periods after a 1% shock in variable X in period t.[26]

Some interesting conclusions may be drawn from this exercise (Chart 8). First, wealth seems to have played an important role in private consumption growth in Portugal throughout the 1990s, with a contri-bution virtually similar to the one from disposable income from the second half of the 1990s up to 2001. From 2001 onwards the contribution of net wealth to consumption growth became negative, particu-larly during the period 2003-2004, associated with high growth of household indebtedness for housing purchase well above that of the housing stock, which implied a decline in net household wealth.[27] There is also a virtual nil contribution of disposable income to consumption growth after 2001. The gradual decline in interest rates had a slightly positive contribution to growth in consumption of non-du-rable goods and services throughout the 1990s, a trend that was interrupted in 2000 and 2001 with the increase in interest rates. In 2002 and 2003 consumption benefited further from the decline in interest rates. Finally, special mention should be made of the big contribution of the non-explained component

Chart 8

CONTRIBUTIONS TO GROWTH IN PRIVATE
CONSUMPTION OF NON-DURABLE GOODS

Percentage points

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(26) In order to calculate contributions, data since the early 1980s were used, given that effects on consumption of shocks in explanatory variables only unwind after approximately 10 years.

(27) It is important to note that the deflator implicit in the household wealth series grew moderately during the period under review.

to consumption growth from 2002 onwards. The behaviour of private consumption over the past few years, which apparently is not explained by the usual macroeconomic fundamentals, may be associated with the maintenance of very favourable conditions in the credit market. These conditions are associated with the supply of new financial products and types of contracts, which made it possible to contain the household debt service burden.

This exercise highlights the contribution of wealth to growth in private consumption of non-durable goods and services in the 1990s. This result, always bearing in mind the above-mentioned limitations, helps to understand the behaviour of private consumption in Portugal throughout this period and the downward trend of the household saving rate, which moved from levels close to 20 per cent in the early 1990s to levels around 10 per cent in the most recent period.

6. CONCLUSION

Throughout the 1990s, the increase in net household wealth in Portugal was accompanied by strong consumption growth and a significant fall in the saving rate. These developments did not occur solely in Portugal, and were common in a number of other industrialised economies.

This paper estimates the wealth effect on private consumption in Portugal, broken down into financial wealth and housing wealth, and presents empirical evidence regarding the importance of the wealth variable in explaining the consumption growth and the decline in the saving rate throughout the 1990s. The results of the estimation of the long-term relationship for the period 1981-2005 suggest that the marginal propensity to consume out of wealth in Portugal is 0.03, i.e. each additional euro of net wealth leads to an increase of €0.03 in expenditure of non-durable goods and services. This figure for Portugal is similar to that presented in Botas (1999) and is in line with the results reported in previous papers for other countries.

Although economic literature stresses that the impact on private consumption of the various wealth components may be different according to the risk, collateral and liquidity of each asset, results in this paper for the estimate of the marginal propensity to consume out of financial and housing wealth suggest very similar figures.

Results also point to a slight increase in elasticity of consumption with respect to wealth and to a decrease in elasticity of consumption with respect to disposable income throughout the 1990s. This is in line with the notion that access to the credit market became easier with financial liberalisation, enabling consumers with previous liquidity constraints to smooth consumption over their life cycle through loans from the credit market. Moreover, according to the findings, the fact that throughout the 1990s net household wealth, on average, grew at a higher rate than disposable income may help to explain the strong growth in consumption of non-durable goods and services (around 1 p.p. of the average annual growth rate) and the decrease in the saving rate.

A more detailed analysis of the annual contribution of wealth to growth in private consumption of non-durable goods and services shows that this variable may explain part of consumption growth throughout the 1990s. In the second half of the 1990s that contribution was relatively similar to that of disposable income. Moreover, there is a virtual nil contribution of disposable income to consumption growth after 2001 and a negative contribution of net wealth to consumption growth in 2003 and 2004. During this period a negative growth of real net wealth was observed, which was due to the strong growth in household indebtedness for house purchase well above growth in the value of the housing stock. However, the negative effect on consumption was dampened by the maintenance of very fa-

vourable financing conditions in the credit market, linked to the supply of new financial products and types of contract that made it possible to contain the household debt service burden.

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ANNEXES

Annex A: Unit root tests

Table 1A shows the results for the augmented Dickey-Fuller tests for a unit root in consumption of non-durable goods $\left(pcr^{nd} \right)$, disposable income (pyr), net wealth (fwr), net financial wealth $\left(fwr^{af} \right)$ and non-mortgage housing wealth $\left(fwr^{hab} \right)$.

Table 1A

AUGMENTED DICKEY-FULLER (ADF) UNIT ROOT TEST		
	ADF t-statistic	**Critical value**
Private consumption of non-durable goods and services	-1.34	-3.45
Household disposable income	-1.63	-3.45
Net wealth	-0.37	-3.45
Net financial wealth	-1.52	-3.45
Non-mortgage housing wealth	0.86	-3.45

Note: Unit root tests were performed for variables in real and per capita terms and in logarithms. The model includes a constant and a linear trend. According to the ADF test, the p-order of the autoregressive process for each regression was chosen in order to ensure that residuals are not correlated.

Annex B: Cointegration tests

In order to study the existence of a cointegration relationship between consumption, disposable income and net household wealth, two types of test were implemented: the Shin test, in which the null hypothesis is the existence of cointegration, and the augmented Dickey-Fuller test, in which the null hypothesis is the absence of cointegration. Ogaki and Park (1997) argue that the tests taking as null hypothesis the absence of cointegration are known to have low power in identifying a false null hypothesis, and therefore the probability of non-rejection of a false null hypothesis is high, even though variables are cointegrated. Ogaki and Park claim that when the economic model postulates the existence of a long-term relationship between variables, such as the case under review, it is more appropriate to test as null hypothesis the existence of cointegration rather than testing its absence. Results obtained are show in Tables 1C and 2C.

Table 1B

COINTEGRATION TESTS (ADF AND SHIN) WITH AGGREGATE WEALTH							
Augmented Dickey-Fuller test			**Shin test (C_μ statistic)**				
Critical values							**Critical value**
t-value	5%	10%	Lag=1	Lag=2	Lag=3	Lag=4	5%
-3.91	-3.83	-3.51	0.137	0.131	0.125	0.120	0.221

Table 2B

COINTEGRATION TESTS (ADF AND SHIN) WITH DISAGGREGATE WEALTH							
Augmented Dickey-Fuller test			**Shin test (C_μ statistic)**				
	Critical values						**Critical value**
t-value	5%	10%	Lag=1	Lag=2	Lag=3	Lag=4	5%
-3.80	-4.21	-3.89	0.063	0.063	0.061	0.062	0.159

Note: The Shin test statistic was applied to cointegration regression residuals of consumption in disposable income and in net wealth or, alternately, in housing wealth net of housing loans and net financial assets wealth excluding loans for house purchase.

Annex C: Main measures of financial liberalisation and deregulation in Portugal

Table 1C

MAIN MEASURES OF FINANCIAL LIBERALISATION AND DEREGULATION	
February 1984	Start of the removal of barriers to the entry of new banking institutions and of restrictions on the expansion of the network of bank branches
June 1984	Liberalisation of deposit rates, excluding the rate on deposits with a maturity of 180 days up to 1 year
August 1985	Liberalisation of lending rates, excluding those on operations with a maturity of 90 up to 180 days, 2 up to 5 years and of over 5 years, for which a ceiling was set
September 1988	Liberalisation of lending rates, excluding those related to loans for house purchase
March 1989	Start of the reprivatisation process and elimination of ceilings on all lending rates
March 1990	Suspension of the compulsory credit ceiling system
January 1991	Elimination of compulsory or indicative quantitative credit limits
May 1992	Liberalisation of all deposit rates
December 1992	Conclusion of the process for liberalisation of international capital movements