What Drives Personal Consumption? The Role of Housing and Financial Wealth*

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Abstract

I construct a new dataset with financial and housing wealth in 16 countries and investigate the effect of wealth on consumption. The baseline estimation method based on the sluggishness of consumption growth implies that the long-run marginal propensity to consume out of total wealth averaged across countries is 5 cents. I find substantial heterogeneity in the wealth effects: the individual country estimates typically lie between 0 and 10 cents. The wealth effects are more powerful in market-based, Anglo–Saxon and non euro area economies. The effect of housing wealth is somewhat smaller than that of financial wealth for most countries, but not the US and the UK. The housing wealth effect has risen substantially after 1988 as it has become easier to borrow against housing wealth.

Keywords: housing prices, wealth effect, consumption dynamics, portfolio choice.

JEL classification: E21, E32, C22

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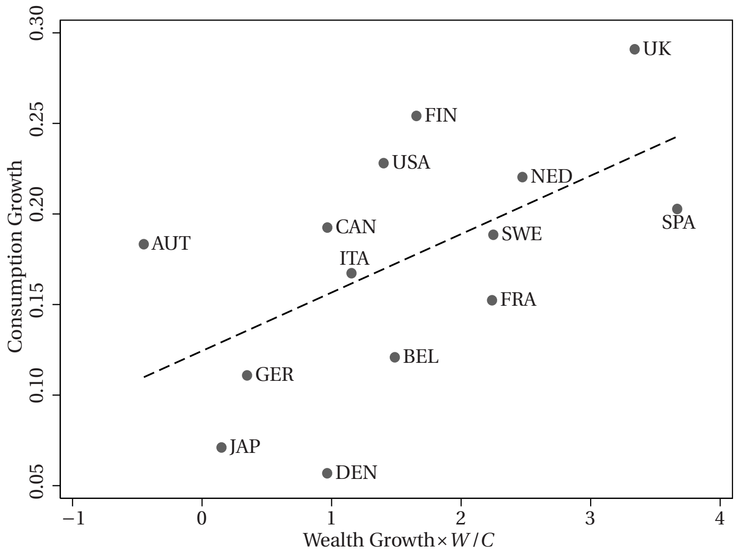
Figure 1: Consumption Growth and Wealth Growth 1994–2002



Note: Consumption growth and rescaled wealth growth between 1994Q4 and 2002Q4; wealth growth is rescaled by multiplying with the wealth–consumption ratio of 1994Q4. Slope of the regression line, $\text{MPC}_w^{\text{LR}} = 0.032$, t-stat: 2.36, p-value: 0.018.

1 Introduction

Figure 1 plots consumption growth in major industrial countries against wealth growth multiplied with the wealth–consumption ratio.[1] It suggests that larger household wealth is associated with higher personal consumption. The slope of the regression line is a rough estimate of the size of the marginal propensity to consume out of wealth (MPCW): about 3 cents are consumed from an additional $1 of wealth. The figure also indicates that countries lying above the regression line, including the US and the UK, have larger wealth effects than others. Analogous scatter plots for disaggregated wealth components—housing and financial wealth—imply similar marginal propensities to consume.

While the surges in the stock and housing prices of the late 1990s and early 2000s spurred much interest among economists, little systematic work in international context exists on the effect of financial and in particular of housing wealth on consumption. The principal reason is the lack of standardized international data on financial and housing wealth. This study uses the best available

[1] The growth rate of wealth in figure 1 is multiplied with the wealth–consumption ratio so that the slope of the regression line can be interpreted as the marginal propensity to consume. The positive significant relationship remains to hold between (non-rescaled) growth rates of consumption and wealth.

wealth data to estimate the wealth effect. I compare the estimates from various estimation methods, wealth components, countries and periods.

My baseline estimation method is based on Carroll, Otsuka, and Slacalek (2006) and consists of three steps. First, I document substantial persistence (denoted χ) in consumption growth in almost all countries in my dataset. The benchmark IV estimate of χ is about 0.6.[2] One practical implication of the fact that $\chi \gg 0$ is that consumption responds *sluggishly* to shocks (contrary to the standard permanent income hypothesis (PIH) model of Hall (1978), which imposes $\chi = 0$). Consequently, the initial response to a new information is smaller than in the PIH model but the effect is long-lasting. $\chi = 0.6$ implies that the long-run effect is 2.5 times larger than the immediate impact. The two remaining steps of the estimation procedure are identifying the immediate MPC out of wealth and finally combining the immediate MPC with χ to back out the long-run MPC.

My main findings are as follows. First, the full-sample estimates imply that the marginal propensities to consume out of total, financial and housing wealth averaged across all countries lie in the neighborhood of 5 cents. Second, there are distinct statistically significant differences between countries. Consumers in Anglo–Saxon and market-based economies and those outside the euro area react more strongly to wealth shocks: they spend between 4 and 6 cents per additional $1 of wealth. On the other hand, consumption expenditure in most of continental Europe is much less responsive to wealth shocks (and the wealth effect is only about 1 cent). Third, while the housing wealth effect grew substantially stronger after 1988 from roughly zero to about 3 cents, financial wealth effect remained unchanged around 3–4 cents. These findings may reflect that as the financial infrastructure develops, it is becoming easier to borrow against housing wealth in some countries (especially in continental Europe) and over time. As housing wealth becomes more liquid, households adjust their portfolios more often (e.g. by borrowing against housing wealth) and, consequently, the link between housing wealth and spending tightens up.

Section 2 below documents that housing prices and housing wealth are much smoother than equity prices and financial wealth. This fact, together with the sluggishness of aggregate consumption growth, has important implications for policy-makers. The good news is that large sudden declines in housing prices are unlikely and even when they occur their immediate impact on personal consumption is limited by consumption sluggishness. On the other hand, I also report substantial autocorrelation in housing prices. This means that periods of

[2] This value of χ can be motivated by habit formation or consumers' inattentiveness to macroeconomic developments. Considerable positive χ is in line with findings of a number of theoretical and empirical papers from various fields of macroeconomics. Campbell and Cochrane (1999) and others argue that habit formation can explain the equity premium puzzle; Carroll, Overland, and Weil (2000) report that it can provide a rationale for the Granger causality of economic growth for saving and Fuhrer (2000) finds that it captures the hump-shaped response of consumption to income shocks.

falls in housing prices may be long—even several years—which in turn magnifies the total effect on consumption.

One critique of essentially any estimate of the wealth effect based on macro data is endogeneity: wealth is not exogenous with respect to consumption but rather jointly endogenously determined. Both variables are partly driven by other macroeconomic variables, in particular income. I follow other work with macro data in implicitly assuming that a large fraction of fluctuations of housing wealth is exogenous and its dynamics have not been substantially affected by the decision about consumption. More practically, I include a number of control variables (denoted Z), including income, in my baseline wealth effect regressions to filter out some endogenous movements.

An alternative approach to estimate the wealth effect, probably more immune to endogeneity, is to use micro data, where housing wealth is to a smaller extent determined by macroeconomic circumstances. I find it reassuring that the recent estimates of Disney, Henley, and Jevons (2003) of the wealth effect in micro data (from the UK) are broadly consistent with my principal findings.[3]

Determinants of the Wealth Effect—Literature Review

The standard infinite horizon model with liquid assets, perfect capital markets, no uncertainty and CRRA utility implies that consumption C is a linear function of asset holdings W and human wealth H (or the discounted sum of future incomes):

$$C_t = \left(1 - R^{-1}(R\beta)^{1/\rho}\right)(W_t + H_t),$$

where R is the interest factor, β the discount factor and ρ the coefficient of relative risk aversion. The marginal propensity to consume out of wealth is $1 - R^{-1}(R\beta)^{1/\rho}$, which if $R\beta = 1$ equals $(R-1)/R \approx R - 1$. Table 1 below shows that the average growth of household wealth is $R - 1 = 2.8$ percent $=$ MPCW. As the model does not distinguish between housing and financial wealth, the MPCs to consume out of them are the same.

In the more up-to-date models (with uninsurable income risk, illiquid assets, participation costs, etc) and in reality the relative size of marginal propensities to consume out of housing and financial wealth is ambiguous and not available in closed form. It is affected by a number of factors, such as the degree of liquidity of housing, persistence of wealth shocks and cross-section distribution of assets.

The recent theoretical models of portfolio choice in presence of housing[4]

[3] Two other recent micro studies by Bostic, Gabriel, and Painter (2005) on American data and Campbell and Cocco (2006) on the UK data report elasticities of consumption with respect to wealth (rather than MPCWs). The estimates of Bostic, Gabriel, and Painter (2005) are somewhat lower than those implied by my findings, those of Campbell and Cocco (2006) are higher.

[4] See Grossman and Laroque (1990), Flavin and Yamashita (2000), Cocco (2005), Hu (2005), Yao and Zhang (2005), Campbell and Cocco (2006) and others. Lustig and Van Nieuwerburgh (2005) propose and estimate a model in which housing serves as a collateral. An increase in housing

capture some of the relevant features of housing wealth. For example, Cocco (2005) presents a life-cycle model in which housing enters utility function, its adjustment is subject to transaction costs and entering the stock market is subject to participation costs. The degree of liquidity of an asset affects the consumption response: transaction costs on housing diminish the consumption response to small shocks; in contrast, the reaction to large shocks is more pronounced than in the frictionless model (see also Grossman and Laroque (1990) and Otsuka (2004)).

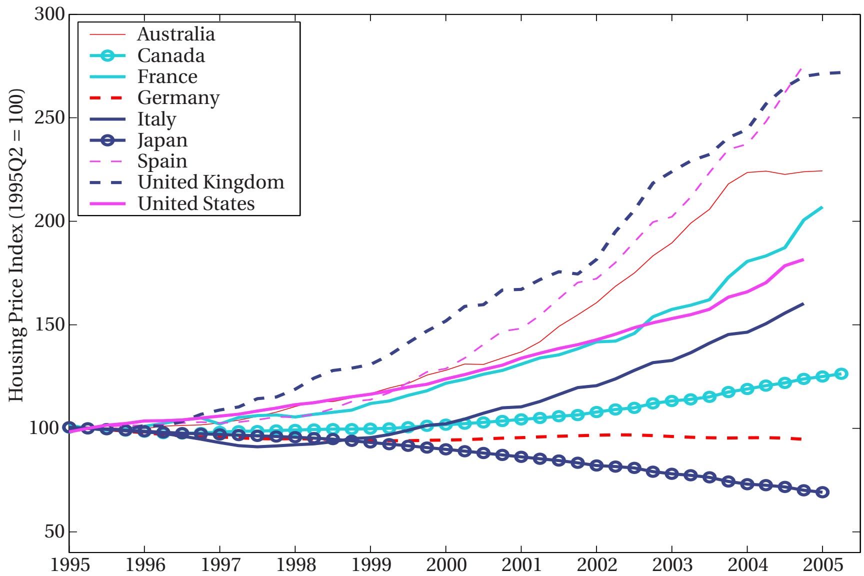
The estimated size of financial and housing wealth effects in aggregate data is influenced by additional factors that are not present in the theoretical work cited above. First, the aggregate MPCs are in part driven by the cross-section distribution of assets. As pointed out by Carroll (2004), the median dollar of financial wealth is held by substantially wealthier household than the median dollar of housing wealth. Since the MPC is stronger for poorer consumers, housing wealth effect should be greater than the financial wealth effect. Second, evidence shown in table 1 below implies that shocks to housing wealth are substantially more persistent than shocks to financial wealth. Consequently, the initial impulse to housing wealth signals additional effects to come, which also increases the consumption response to housing wealth shocks. On the other hand, it is likely that housing wealth is measured relatively imprecisely (compared to financial wealth; see e.g., European Central Bank (2003) and Ahnert and Page (2005)), which may bias the estimates of the wealth effect toward zero. In sum, while theory suggests the MPC out of wealth is about 5 cents, it is not sharp enough to pin down relative size of MPCs out of housing and financial wealth. The hope is that empirics can shed more light on these important parameters.

A number of recent empirical studies including Fernandez-Corugedo, Price, and Blake (2003) and Hamburg, Hoffmann, and Keller (2005) follow Lettau and Ludvigson (2004) in using estimation methods that impose cointegration between consumption, income and wealth in national contexts. Cross-country comparative work includes Bertaut (2002), Ludwig and Sløk (2002), Catte, Girouard, Price, and André (2004), Case, Quigley, and Shiller (2005) and Labhard, Sterne, and Young (2005). The implications of these papers are constrained by data limitations, which I try to alleviate. In particular, the above papers do not investigate housing wealth effect (Bertaut (2002) and Labhard, Sterne, and Young (2005)), use annual data (Case, Quigley, and Shiller (2005) and in part Catte, Girouard, Price, and André (2004)), relatively few countries (Bertaut (2002) and Catte, Girouard, Price, and André (2004)) or proxy wealth variables with stock and real estate prices (Ludwig and Sløk (2002)).

The literature agrees that the estimates of the marginal propensity to consume out of wealth lie between 0 and 10 cents. Conventional wisdom is that the wealth effects are larger in Anglo–Saxon economies, around 4–5 cents, than

prices reduces household's exposure to idiosyncratic risk and diminishes the sensitivity of consumption to income shocks.

Figure 2: Nominal Housing Prices in Selected Countries, 1995–2005



elsewhere (roughly 1–3 cents).[5] Because of data limitations there is not much consensus on how the wealth effects differ for housing and financial wealth. While Case, Quigley, and Shiller (2005) and Catte, Girouard, Price, and André (2004) find that the housing wealth effect is substantially stronger than financial wealth effect, Ludwig and Sløk (2002) report the opposite.

2 Stylized Facts about Wealth and Housing Prices

Figure 2 illustrates recent evolution of nominal housing prices in G7 countries, Australia and Spain. The housing price dynamics have been extremely varied. While in some countries, most notably Germany and Japan, real estate prices have over the past ten years fallen, in others including United Kingdom and Spain they have almost tripled. The figure also documents that housing prices are very smooth and have a considerable momentum. If they start moving in one direction, they tend to do so for several years which magnifies the overall impact on consumption.[6]

The data I use for estimation are quarterly (unless otherwise noted) and cover roughly the last 35 years (as indicated in tables 3 and 4) and the follow-

[5] Ludwig and Sløk (2002) and Catte, Girouard, Price, and André (2004) bring some evidence on this, which I confirm and extend below.

[6] The dynamics of real estate prices are driven by demand factors: disposable income and (long-run) interest rates, and supply factors: costs of construction and land and zoning restrictions (see European Central Bank (2003) for an impressive analysis of these issues).

ing 16 countries: the United States, Australia, Canada, France, Germany, Italy, Japan, the United Kingdom, Austria, Belgium, Denmark, Finland, Ireland, the Netherlands, Sweden and Spain. Most data were taken from the database of the NiGEM model of the NIESR Institute, London. Original sources for most of these data are OECD, Eurostat, national statistical offices and central banks. The appendix describes in more detail the data and how I construct housing wealth using housing prices from the Bank for International Settlements.

Figures 3 and 4 plot housing, financial and total wealth. Table 1 shows means, standard deviations and first autocorrelations of growth rates of real per capita wealth. The figures and the table illustrate some stylized facts about financial and housing wealth:

- Financial wealth grows by 3.7 percent a year on average, about 1.2 percentage points or 50 percent higher than housing wealth.
- Financial wealth growth is in terms of standard deviations almost twice as volatile as housing wealth growth.
- Growth of housing wealth is substantially more persistent than growth of financial wealth. First autocorrelation of the former is almost 0.6, compared to 0.27 for the latter (in annual data).

The dynamics of housing wealth are driven primarily by housing prices.[7] Financial wealth on the other hand is more weakly related to stock prices as equities typically make up only about 20–40 percent of net financial wealth (and 10–20 percent of net worth). Compared to other countries, the correlation between stock prices and net financial wealth is quite strong in the US, where people invest a lot of their assets in equities.

The growth of financial wealth is substantially stronger than of housing wealth for two reasons. First, the return on many financial assets is higher, reflecting their higher volatility. Second, people tend to hold more financial assets as their incomes rise.[8] In addition, it is likely that as financial markets become more efficient and more complete, more households use financial instruments to smooth their consumption expenditures.

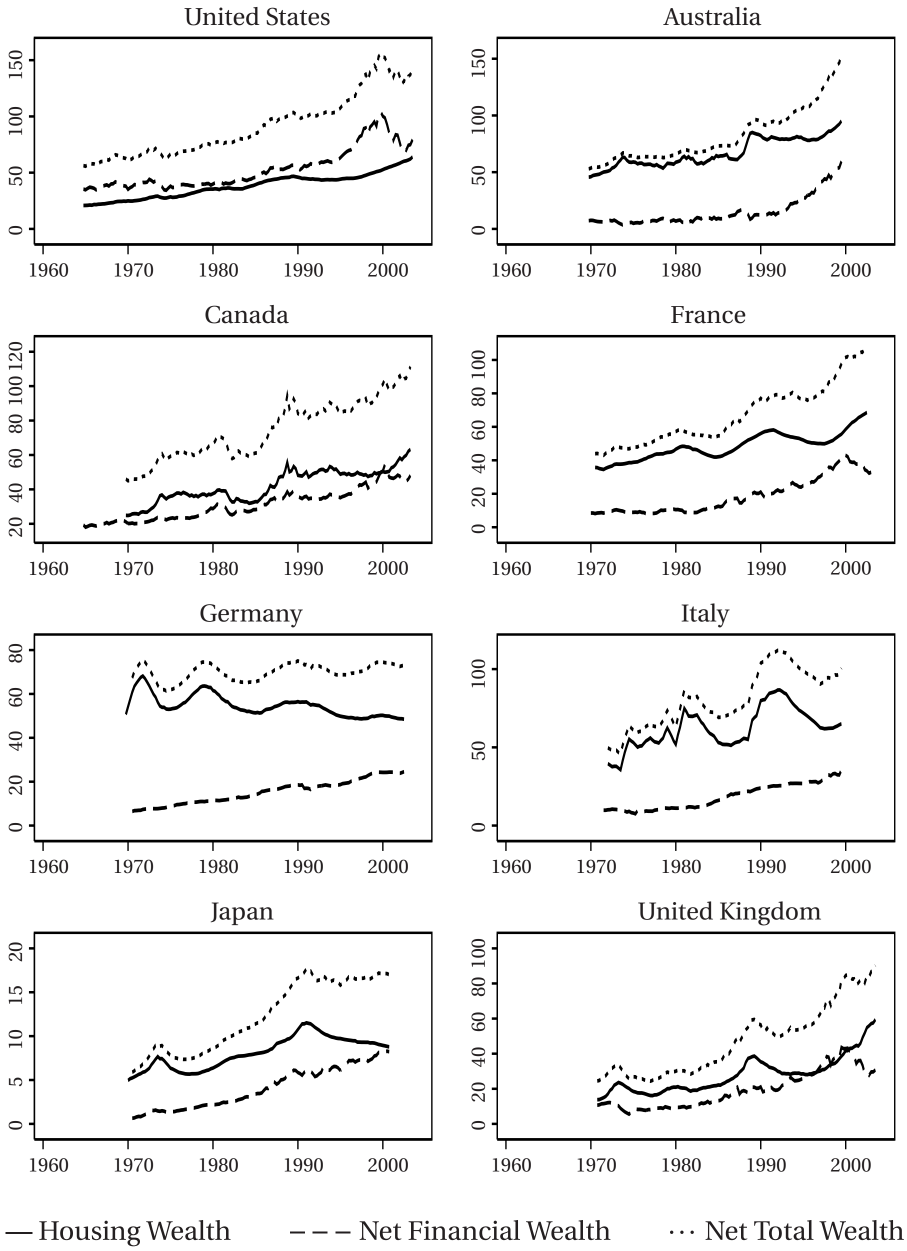
Figures 3 and 4 document the finding of Helbling and Terrones (2003) that sharp housing price decreases are infrequent—substantially rarer than stock price

[7] This is in part due to how housing wealth is approximated: To construct housing wealth I multiply housing prices with home ownership rates and population series. Since home ownership rates and population are very smooth (compared to housing prices), large portion of the dynamics of housing wealth is driven by housing prices.

There are good reasons to expect that the approximation error is relatively small as the changes in quantity of housing are limited. For the US, where both the "true" housing wealth series and its approximation are available, the correlation between the quarterly *growth rates* is 0.86.

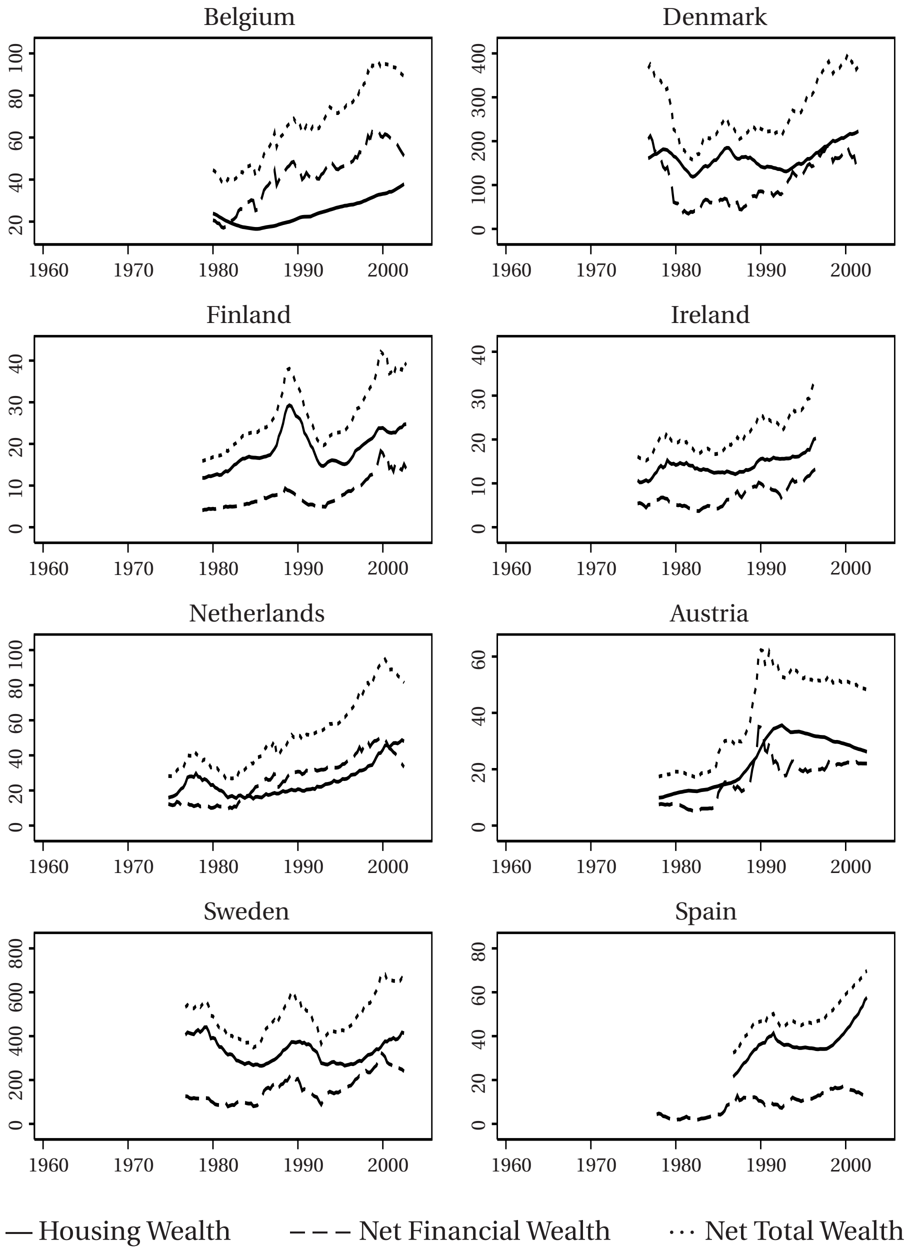
[8] This holds both in absolute terms and relative to housing: rich people tend to hold larger fraction of net worth in financial instruments and smaller in tangible assets (see e.g., the work collected in Guiso, Haliassos, and Jappelli (2001)).

Figure 3: Financial and Housing Wealth I.



Note: Per capita real terms, local currency.

Figure 4: Financial and Housing Wealth II.



Note: Per capita real terms, local currency.

Table 1: Housing and Financial Wealth Growth—Descriptive Statistics

Country	Housing Wealth			Financial Wealth			Total Wealth		
	Mean	St Dev	AC(1)	Mean	St Dev	AC(1)	Mean	St Dev	AC(1)
United States	2.84	2.72	0.53	2.00	6.19	0.32	2.35	3.97	0.30
Australia	2.34	5.64	0.22	6.97	19.45	−0.06	3.44	4.13	0.43
Canada	2.76	6.35	0.43	2.63	5.92	−0.02	2.58	5.47	0.19
France	1.99	4.46	0.64	4.52	9.44	0.14	2.65	3.96	0.47
Germany	−0.74	4.31	0.50	4.04	3.80	0.27	−0.12	3.57	0.67
Italy	2.11	10.28	0.33	4.41	6.26	0.39	2.82	7.71	0.22
Japan	1.49	6.17	0.61	7.82	9.24	0.28	3.31	5.88	0.52
United Kingdom	4.36	9.86	0.56	3.04	12.45	0.15	3.84	7.43	0.38
Belgium	1.67	5.93	0.75	3.98	10.00	0.19	2.87	6.75	0.24
Denmark	1.25	8.02	0.44	−1.52	24.14	0.48	−0.18	11.56	0.56
Finland	2.85	11.26	0.58	5.36	12.51	0.50	3.76	10.98	0.56
Ireland	2.96	5.92	0.50	4.58	14.04	0.25	3.62	7.03	0.35
Netherlands	3.91	9.68	0.65	3.87	11.08	0.44	3.89	8.17	0.44
Austria	3.95	8.14	0.74	3.89	21.44	0.29	3.92	11.25	0.47
Sweden	0.09	7.85	0.67	2.19	17.30	0.22	0.80	9.14	0.50
Spain	5.80	8.26	0.77	2.06	27.21	0.57	4.55	5.69	0.47
Mean	2.48	7.18	0.56	3.74	13.15	0.27	2.76	7.04	0.42

Notes: Mean, standard deviation (St Dev) and first autocorrelation (AC(1)) of real per capita annual growth rates over the estimation sample shown in table 4. I use annual data in this table so that my results are not affected by the fact that housing prices for some countries are available at semiannual (Italy and Japan) or annual (France, Germany, Belgium and Austria) frequency only.

Table 2: Wealth–Income Ratios in 2002

	Wealth		
Country	Total	Housing	Financial
United States	6.85	3.01	3.84
Australia	–	6.91	–
Canada	5.99	3.29	2.69
France	8.42	5.51	2.90
Germany	5.84	3.90	1.93
Italy	13.78	9.51	4.27
Japan	7.57	3.78	3.78
United Kingdom	8.26	5.05	3.21
Belgium	7.07	2.92	4.15
Denmark†	3.00	1.80	1.20
Finland	3.10	1.93	1.18
Ireland†	–	4.35	–
Netherlands	6.73	3.78	2.95
Austria	3.90	2.14	1.76
Sweden†	4.32	2.59	1.73
Spain	9.88	7.96	1.92
Mean	6.76	4.89	2.68

Notes: † : Housing wealth for Denmark, Ireland and Sweden was calibrated at 0.6×net worth in 2002.

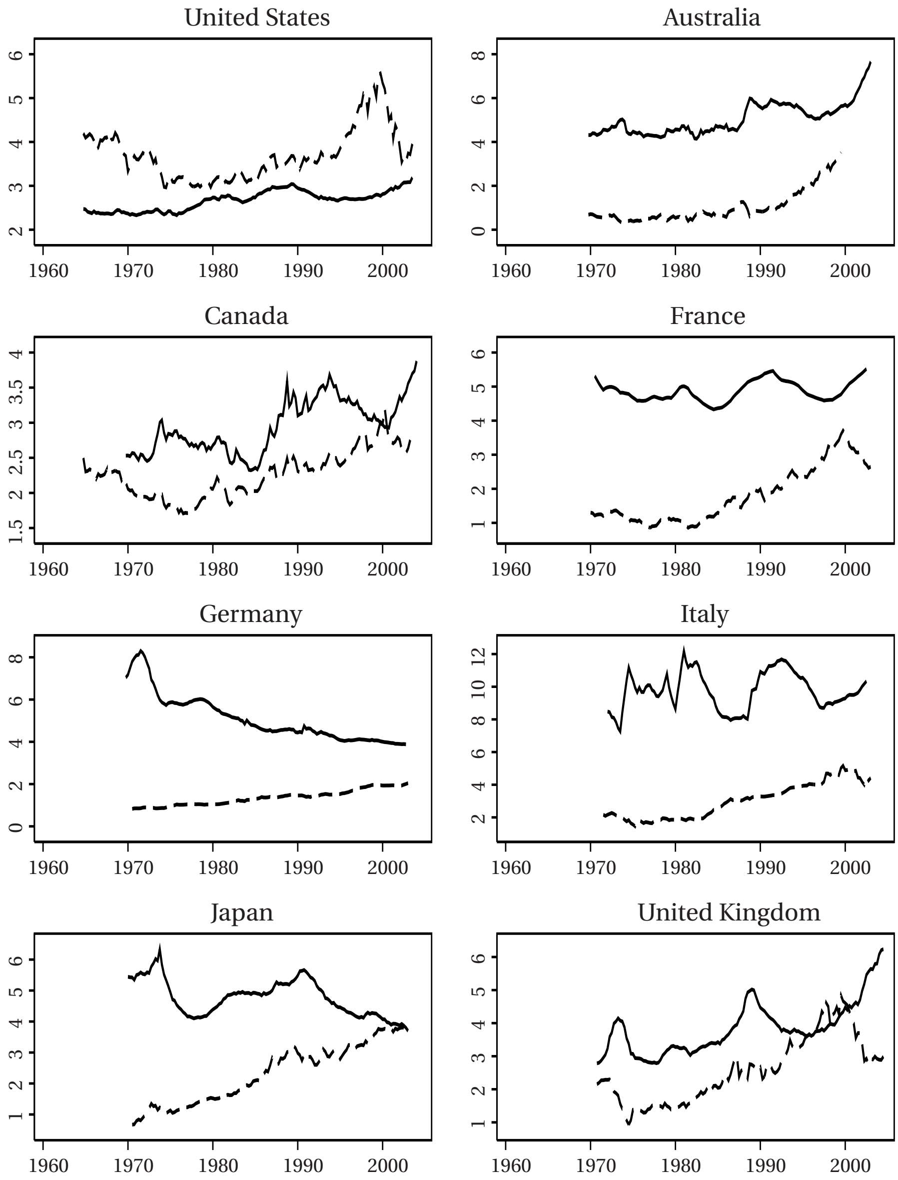
falls.[9] This is particularly true about the US where during the past thirty years nominal house prices have increased essentially monotonically (and their volatility was exceptionally low).[10] Decreases in nominal real-estate prices are somewhat more common in other countries (most prominently in Japan in the 1990s) but still infrequent compared to stock price busts: in contrast to stock prices, when housing prices fall they do so gradually over several quarters or years rather than days.

Figures 5 and 6 and table 2 summarize the evolution of ratios of financial and housing wealth to annualized income (compensations of employees). A typical

[9] Helbling and Terrones investigate post-1970 data from 14 industrial countries and report 20 housing price crashes and 25 equity price crashes in their sample. The difference is relatively small due to their identification procedure: to qualify for a bust stock prices must fall by at least 37 percent whereas housing prices only by 14 percent.

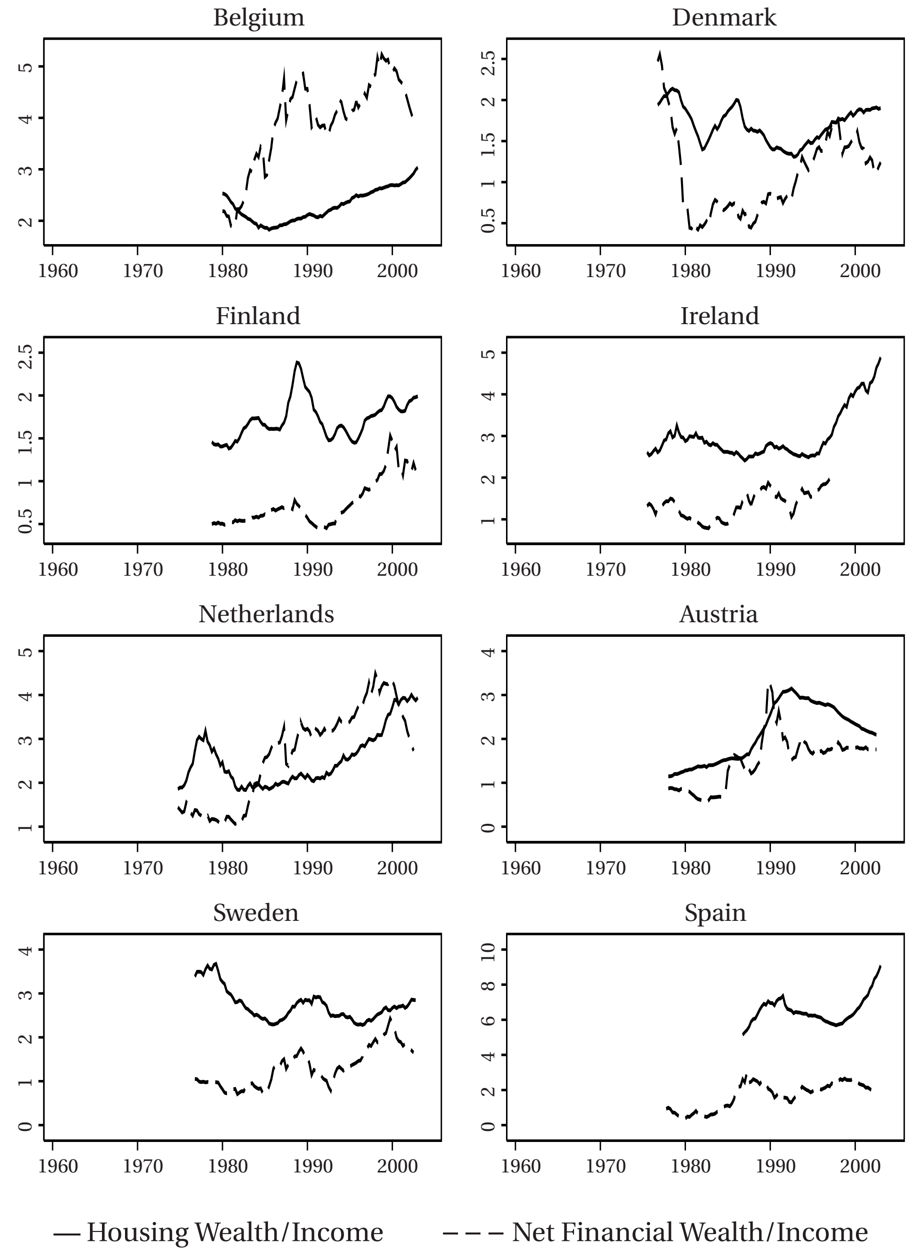
[10] Real US house prices fell before the Volcker disinflation and in the early 1990s.

Figure 5: Wealth–Income Ratios I.



— Housing Wealth/Income — — — Net Financial Wealth/Income

Figure 6: Wealth–Income Ratios II.



person in my dataset had in 2002 net worth of 6.8 times annual income. The US is fairly representative in this respect. Households in Italy, Spain, France and the UK hold considerably more wealth (8 times annual income or more).[11]

The proportion of wealth held in housing varies substantially among countries, between roughly 40 percent in the US and almost 70 percent in Germany, Italy and Spain.[12] The US together with Belgium and the Netherlands is the only country that has more financial wealth than housing wealth. Consequently, if the MPCs out of housing and financial wealth were the same, this would imply that the aggregate effect of housing wealth on consumption would in most countries be larger simply because they have more housing wealth.

As income is much smoother than wealth, the dynamics of wealth–income ratios in figures 5 and 6 are driven primarily by wealth. A high value of the wealth–income ratio may signal that equity or housing prices are above their equilibrium levels (as it was the case in several countries in the late 1990s during the internet bubble).[13] The housing wealth–income ratios are currently historically high in Australia, the UK, Spain and Ireland; in the US the ratio is just above its mean, about where it was in the late 1980s.

3 Estimation

My baseline estimation methodology consists in three steps: (i) estimate the persistence of consumption growth χ, (ii) estimate the short-run effect of wealth shocks on consumption (short-run MPC) and (iii) use the parameters from (i) and (ii) to back out the long-run marginal propensity to consume out of wealth.[14]

3.1 Sluggishness of Aggregate Consumption Growth

Hall (1978) showed that consumption expenditure of a household with time-separable quadratic utility follows a random walk. However, several researchers (including Flavin (1981) and Campbell and Mankiw (1989)) later argued that random walk is not an adequate approximation of the actual aggregate consumption. Their work documents a number of "excess sensitivity" puzzles: contrary to the Hall model, future consumption growth was shown to be significantly affected by past variables (lagged income, consumption growth or consumer sentiment).

[11] The high value of the wealth–income ratio in Italy is documented in Table 58 of Statistical Annex to OECD Economic Outlook 78, December 2005: ratio of net wealth to *disposable income* in 2002 was 9.0, compared to 5.1–5.4 for Canada, Germany and the US and 7–7.4 for Japan and the UK. (In addition, disposable income in Italy is substantially larger than compensations, which causes the wealth–income ratio in table 2 to be 13.8.)

[12] These numbers are based on data for 2000, from Statistical Annex to OECD Economic Outlook 78, December 2005, Table 58 and Arnold, van Els, and de Haan (2002), Table 1, p. 4.

[13] Case and Shiller (2003) investigate how the wealth–income ratio detects housing price bubbles in the US state-level data.

[14] The technique follows Carroll, Otsuka, and Slacalek (2006).

Sommer (2002) argues that much of the excess sensitivity puzzle can be explained by introducing habits. Assume that consumers maximize a utility function with additive habits,[15]

$$\max_{\{C_s\}} \mathbf{E}_t \sum_{s=t}^{\infty} \beta^{s-t} U(C_s - \chi C_{s-1})$$

subject to the standard intertemporal budget constraint and transversality condition. The parameter χ, which lies between 0 and 1, determines the strength of habits: $\chi = 0$ implies a time-separable utility, for $\chi = 1$ the utility depends only on consumption growth, not on its level. Dynan (2000) approximates the Euler equation for this objective function with the CRRA outer utility $U(C) \equiv C^{1-\rho}/(1-\rho)$ with

$$\Delta \log C_t = \varsigma + \chi \Delta \log C_{t-1} + \varepsilon_t. \tag{1}$$

Carroll and Slacalek (2006) show that essentially the same equation for aggregate consumption holds if one aggregates households which have time-separable CRRA utility but are inattentive to aggregate uncertainty. Carroll and Slacalek argue that equation (1) is a good approximation of the dynamics of *aggregate* consumption growth and estimate the persistence parameter χ to be about 0.75 in quarterly US data.[16]

3.2 Estimates of Sluggishness of Aggregate Consumption Growth χ

Estimation of consumption sluggishness χ in (1) is complicated by the presence of measurement error and transitory components not captured by the theory (e.g., expenditure caused by weather, such as floods or hurricanes). Several authors (Wilcox (1992), Sommer (2002), Bureau of Economic Analysis (2005)) document that a large fraction of consumption data (around 30 percent of the total personal consumption expenditure in the US, probably even more in other countries) is estimated, imputed or interpolated. Consequently, the OLS estimator of χ is biased toward zero. The standard solution, used by Sommer (2002) in the US data, is to estimate (1) with instrumental variables regression in which instruments are correlated with (future) consumption growth and unrelated to measurement error.

[15] This functional form imposes that the stock of habits is equal to the previous period's consumption C_{s-1}. Fuhrer (2000) argues (and estimates) that this is the case rather than a specification in which habits have longer "memory" in that they are a weighted average with large weights on consumptions of times $t-1, \ldots, t-\infty$.

[16] In particular, Carroll and Slacalek (2006) find that in aggregate US data on consumption of nondurables and services equation (1) with $\chi \approx 0.75$ beats its two competitors: the random walk model of Hall (1978) and the Campbell and Mankiw (1989) model with the rule-of-thumb consumers, which can account for the excess sensitivity to income. In contrast to aggregate data, in *micro data* researchers find little or no evidence of habits (Dynan (2000)) or $\chi \approx 0$. The model of Carroll and Slacalek (2006) can account for both findings.

Table 3: Consumption Sluggishness

$$\Delta \log C_t = \varsigma + \chi \Delta \log C_{t-1} + \varepsilon_t$$

				Moreira's CLR	Robust p val	
Country	Time Range	χ	se_χ	95% CI	$H_0: \chi = 0$	$\bar{R}_1^2$
United States	65Q1–03Q4	0.74	0.16	(0.51, 1.23)	0.000	0.29
Australia	70Q1–99Q4	0.84	0.36	(0.35, 4.05)	0.003	0.07
Canada	65Q1–03Q3	0.74	0.21	(0.43, 1.42)	0.000	0.23
France	70Q2–03Q2	0.22	0.19	(0.04, 1.30)	0.031	0.21
Germany	65Q1–02Q4	0.14	0.23	(−0.06, 1.66)	0.092	0.13
Italy	71Q4–99Q4	0.74	0.15	(0.46, 1.18)	0.000	0.31
Japan	65Q1–01Q1	0.20	0.17	(−0.10, 0.66)	0.199	0.30
United Kingdom	61Q2–03Q4	0.62	0.25	(0.29, 1.71)	0.001	0.17
Belgium	80Q2–02Q4	0.66	0.33	$(-\infty, +\infty)$	0.095	0.07
Denmark	77Q1–01Q4	0.55	0.37	(0.03, 4.30)	0.040	0.07
Finland	79Q1–03Q1	0.92	0.20	(0.59, 1.50)	0.000	0.28
Ireland	75Q4–96Q4	0.86	0.10	(0.68, 1.07)	0.000	0.57
Netherlands	75Q1–02Q4	0.51	0.27	(0.09, 1.65)	0.020	0.14
Austria	78Q2–02Q4	0.40	0.26	(−0.02, 1.69)	0.061	−0.01
Sweden	77Q1–02Q4	0.88	0.19	(0.63, 1.63)	0.000	0.24
Spain	78Q1–02Q4	0.84	0.16	(0.56, 1.28)	0.000	0.30
Mean	–	0.62	0.22	–	–	–

Instruments: `L(2/2).cGrowth L(2/2).dydel L(2/2).un L(2/2).dr3m L(2/2).irSpread L(2/2).sent`

Notes: Regressions estimated with instrumental variables. Moreira's CLR denote confidence interval for χ obtained by inverting the conditional likelihood ratio statistic of Moreira (2003). Robust p val denotes the p value testing $\chi = 0$ with Moreira's CLR test (robust to weak instruments). $\bar{R}_1^2$ is the adjusted R^2 from the first-stage regressions of $\Delta \log C_{t-1}$ on instruments. Regression for Germany includes a dummy for German reunification in 1991Q1.

Table 3 reports the IV estimates of χ from equation (1) in total personal consumption expenditure from major industrial countries.[17] The key finding is that χ *is very different from zero:* the average of χs across all countries is 0.62. This means that a typical household is about two thirds of distance away from time-separability in the direction of habits.

The first two columns show the point estimates of χ and their standard errors. Consumption sluggishness χ is typically larger than 0.5 (for 12 countries of 16). As the standard error of χ is about 0.22 the persistence of consumption growth (χ) is statistically significantly different from zero. The last column on the right ($\bar{R}_1^2$) displays the adjusted R^2s from the first-stage regressions, which indicate the strength of instruments. As in some countries $\bar{R}_1^2$ is quite low (below 0.1 for Australia, Belgium, Denmark and Austria),[18] I also report in column 3 confidence intervals for χ which are valid with weak instruments (as well as with strong). The intervals are calculated by inverting the conditional likelihood ratio statistic (CLR) of Moreira (2003).[19] If the instruments are weak, the confidence intervals are very wide (even infinitely as in case of Belgium), which reflects the fact that χ is not identified under weak instruments. Finally, column 4 displays the p value of the test $\chi = 0$ using the CLR statistic (robust to weak instruments).

The evidence in table 3 suggests that the persistence of consumption growth χ is substantially and statistically significantly different from zero. The null hypothesis ($\chi = 0$) is clearly not rejected only for Japan. Statistical significance (p values in column 4) is inconclusive for three countries (p values for Germany, Belgium and Austria range between 0.05 and 0.1) and the null is clearly rejected for the remaining twelve countries.

Finally, the confidence intervals in table 3 suggests that the countries in my sample are quite homogenous in terms of χ. The average consumption growth persistence $\chi = 0.62$ is (barely) rejected for only two countries (Ireland and Sweden).

3.3 Wealth Effects

The second step of my preferred estimation procedure consists in identifying the immediate effect of wealth shocks on consumption. Consumption shocks ε_t from (1) are in part driven by wealth shocks ∂W_t, in part by other (control)

[17] The instruments are standard and include lagged consumption growth, lagged income growth, unemployment, change in short-run interest rates, interest rate spread and where available consumer sentiment (G7 countries and Australia).

[18] The first-stage F statistics range between 2.3 and 10.7; in 8 countries they are higher than 8. Thus, the first-stage F statistics are in some cases below the rule-of-thumb value of 10 recommended by Stock, Wright, and Yogo (2002). If the instruments are weak the IV estimator is biased toward the OLS estimator. Consequently, if anything the IV estimates of χ in table 3 should be biased downward.

[19] Andrews, Moreira, and Stock (2006) show that the CLR test is more powerful than other available tests on endogenous variables in an IV model.

variables $\tilde{Z}_t$:

$$\varepsilon_t = \alpha_w \partial W_t + \alpha_{\tilde{z}}^\top \tilde{Z}_t, \tag{2}$$

where $\partial W_t = \frac{\Delta W_t}{C_{t-1}} = \frac{\Delta W_t}{W_{t-1}} \times \frac{W_{t-1}}{C_{t-1}}$ denotes the rescaled wealth growth. The wealth growth $\frac{\Delta W_t}{W_{t-1}}$ in ∂W_t is multiplied with the wealth–consumption ratio to ensure that the parameter α_w is the short-run marginal propensity to consume out of wealth.

As estimating (2) directly yielded rather imprecise estimates of α_w I use the restrictions implied by the theory of consumption dynamics (1) to identify α_w more accurately as follows. Using (1), consumption growth has the moving average representation

$$\Delta \log C_t = \alpha_0 + \sum_{i=1}^{\infty} \chi^i \varepsilon_{t-i} + \varepsilon_t \tag{3}$$

with $\alpha_0 = \varsigma/(1-\chi)$. Substituting (2) into (3) gives

$$\Delta \log C_t = \alpha_0 + \alpha_w \sum_{i=1}^{\infty} \chi^i \partial W_{t-i} + \alpha_z^\top Z_{t-1} + \varepsilon_t$$

or

$$\Delta \log C_t = \alpha_0 + \alpha_w \bar{\partial} W_{t-1} + \alpha_z^\top Z_{t-1} + \varepsilon_t \tag{4}$$

denoting $\bar{\partial} W_{t-1} \equiv \sum_{i=1}^{\infty} \chi^i \partial W_{t-i}$ and Z_{t-1} control variables.

To estimate equation (4) I approximate the infinite sum $\bar{\partial} W_{t-1}$ with a finite one, $\bar{\partial} W_{t-1} \approx (\Delta W_{t-1} + \chi \Delta W_{t-2} + \chi^2 \Delta W_{t-3} + \chi^3 \Delta W_{t-4})/C_{t-5}$.[20] To be able to interpret α_w as the marginal propensity to consume out of wealth it is necessary to consistently re-scale consumption and wealth with the same initial consumption level, C_{t-5} (because $\bar{\partial} W_{t-1}$ consists of differenced wealth lagged up to $t-4$). I thus estimate the equation in the following form:

$$\partial C_t = \alpha_0 + \alpha_w \bar{\partial} W_{t-1} + \alpha_z^\top Z_{t-1} + \varepsilon_t, \tag{5}$$

where $\partial C_t \equiv \Delta C_t / C_{t-5}$ and $\bar{\partial} W_{t-1} = (\Delta W_{t-1} + \chi \Delta W_{t-2} + \chi^2 \Delta W_{t-3} + \chi^3 \Delta W_{t-4})/C_{t-5}$.

Given the estimates of χ and α_w, the short-run marginal propensity to consume is α_w/χ. Finally, the long-run MPCW is the geometric sum $\sum_{i=0}^{\infty} \chi^i \alpha_w/\chi = \alpha_w/\big(\chi(1-\chi)\big)$.

In short, the whole estimation procedure consists of three steps:

1. Estimate consumption growth persistence χ in (1) by IV.

2. Given χ, estimate the sensitivity of consumption α_w in (5).

3. Given χ and α_w, back out the short-run and long-run marginal propensities to consume out of wealth as α_w/χ and $\alpha_w/\big(\chi(1-\chi)\big)$, respectively.

Table 4: Short-Run and Long-Run Effects of Total Wealth on Consumption (MPCs)

$$\partial C_t = \alpha_0 + \alpha_w \bar{\partial} W_{t-1} + \alpha_z^\top Z_{t-1} + \varepsilon_t$$

		χ Unrestricted			$\chi = 0.60$	
Country	Time Range	χ	MPC_w^{SR}	MPC_w^{LR}	MPC_w^{SR}	MPC_w^{LR}
United States	65Q1–03Q4	0.74	1.53^{***}	5.95^{***}	2.16^{***}	5.41^{***}
Australia	70Q1–99Q4	0.84	1.64^{***}	10.05^{***}	2.86^{***}	7.14^{***}
Canada	70Q1–03Q3	0.74	1.06^{**}	4.06^{**}	1.70^{***}	4.25^{***}
France	70Q2–03Q2	0.22	3.57	4.60	1.07	2.69
Germany	70Q1–02Q4	0.14	6.61	7.70	1.33^{*}	3.32^{*}
Italy	71Q4–99Q4	0.74	−0.25	−0.95	−0.33	−0.83
Japan	70Q1–01Q1	0.20	10.57^{**}	13.15^{**}	2.97^{***}	7.44^{***}
United Kingdom	70Q1–03Q4	0.62	2.00^{***}	5.31^{***}	2.12^{***}	5.31^{***}
Belgium	80Q2–02Q4	0.66	−0.05	−0.14	−0.01	−0.02
Denmark	77Q1–01Q4	0.55	4.33^{***}	9.68^{***}	3.72^{***}	9.29^{***}
Finland	79Q1–03Q1	0.92	1.95^{***}	24.08^{***}	4.03^{***}	10.08^{***}
Ireland	75Q4–96Q4	0.86	0.80	5.57	1.84^{*}	4.59^{*}
Netherlands	75Q1–02Q4	0.51	1.27^{**}	2.60^{**}	1.14^{**}	2.84^{**}
Austria	78Q2–02Q4	0.40	0.13	0.21	0.06	0.14
Sweden	77Q1–02Q4	0.88	0.83^{**}	6.91^{**}	1.84^{**}	4.61^{**}
Spain	87Q1–02Q4	0.84	1.29^{***}	8.32^{***}	2.38^{***}	5.96^{***}
Mean	–	0.62	2.33	6.69	1.81	4.51

Notes: Marginal propensities to consume in cents per dollar of additional wealth. $\{^{*}, ^{**}, ^{***}\}$ = Statistical significance at {10, 5, 1} percent.

Estimation Results

Table 4 compares two sets of estimates of the short-run and long-run marginal propensities to consume out of *total* wealth. The MPCs in the left panel are calculated using the (unrestricted) estimates of consumption persistence χ displayed in the first column. The right panel reports MPCs when the average consumption persistence $\chi = 0.6$ is imposed for all countries. Control variables Z include income growth, unemployment, change in short-term interest rate and interest rate spread.

The estimates in Table 4 imply that:

- The averages of short-run and long-run MPCs across all countries reported in the last row are about 2–2.5 cents and 4.5–7 cents, respectively.
- The variation in MPCs across countries is substantial. Typical long-run MPCs lie between 0 and 10 cents.
- The MPCs are large and significant in the US, Australia, UK, Japan and some small European countries and relatively modest or statistically insignificant in large countries of continental Europe (France, Germany and Italy).
- Imposing average $\chi = 0.6$ shrinks MPCs toward average. The shrinkage depends on how far the estimated χ is from 0.6. The estimates with restricted consumption growth persistence ($\chi = 0.6$) are arguably closer to conventional wisdom as imposing homogenous χ eliminates outliers (such as Finland).

3.4 Disaggregated Wealth Effects

One advantage of my dataset is that it makes it possible to identify the MPCs out of housing and financial wealth. This is done by estimating the following equation, in which financial (FW) and housing (HW) wealth are included separately:

$$\partial C_t = \alpha_0 + \alpha_{fw}\bar{\partial} FW_{t-1} + \alpha_{hw}\bar{\partial} HW_{t-1} + \alpha_z^\top Z_{t-1} + \varepsilon_t, \qquad (6)$$

instead of (5).

Table 5 summarizes the long-run MPCs out of housing and financial wealth. I find that:

- The cross-country averages of housing and financial wealth effect both lie in the neighborhood of 5 cents.
- While there is some evidence that housing wealth effect is smaller than financial wealth effect (in nine countries)…

[20]The results below are robust to the choice of the cutoff point for the cutoff point = 3, 4 and 5.

Table 5: Housing vs. Financial Wealth Effect—Long-Run MPCs

$$\partial C_t = \alpha_0 + \alpha_{fw} \bar{\partial} FW_{t-1} + \alpha_{hw} \bar{\partial} HW_{t-1} + \alpha_z^\top Z_{t-1} + \varepsilon_t$$

		Wealth	
Country	Time Range	Financial	Housing
United States	65Q1–03Q4	5.33***	7.04
Australia	70Q1–99Q4	7.26***	7.10***
Canada	70Q1–03Q3	8.05**	1.28
France†	70Q2–03Q2	2.89*	2.30
Germany†	70Q1–02Q4	14.24	2.86
Italy‡	71Q4–99Q4	10.30*	−1.07*
Japan‡	70Q1–01Q1	9.48**	6.30**
United Kingdom	70Q1–03Q4	3.71*	6.95***
Belgium†	80Q2–02Q4	0.63	−6.74
Denmark	77Q1–01Q4	5.95	17.33**
Finland	79Q1–03Q1	−3.58	18.15***
Ireland	75Q4–96Q4	2.09	9.15*
Netherlands	75Q1–02Q4	2.68*	3.17
Austria†	78Q2–02Q4	0.40	−2.17
Sweden	77Q1–02Q4	5.74**	2.56
Spain	87Q1–02Q4	5.33**	6.24***
Mean	–	5.03	5.03

Notes: Marginal propensities to consume in cents per dollar of additional wealth. {*, **, ***} = Statistical significance at {10, 5, 1} percent. $\chi = 0.60$ imposed. † : Housing prices for France, Germany, Belgium and Austria were interpolated from annual data. ‡ : Housing prices for Italy and Japan were interpolated from semiannual data.

- . . . countries like the UK and the US have substantially larger housing wealth effect. This last finding confirms similar results for the US of Case, Quigley, and Shiller (2005), Carroll, Otsuka, and Slacalek (2006) and others.

- Overall, the estimates in table 5 are rather imprecise. In seven countries is neither MPC out of financial nor housing wealth significantly different from zero (at the 95 percent significance level) despite the fact that the point estimates of MPCs are sometimes quite large (e.g., financial wealth in Germany and Italy).

3.5 Wealth Effects for Groups of Countries and over Time

While the MPCs in table 5 are often large and significant, the estimates are in many cases quite imprecise and statistically indistinguishable from zero. This is not surprising, Labhard, Sterne, and Young (2005) and others also find substantial uncertainty about the wealth effects in individual countries. Fortunately, I can take advantage of the cross-section dimension of my dataset and address the issue by imposing homogeneity restrictions on groups of similar countries.

The estimation is done using seemingly unrelated regressions (SUR). This method is useful for two reasons: (i) it increases efficiency when disturbances from individual country regressions are correlated and (ii) it makes it possible to impose cross-equation restrictions.

Table 6 presents the results for three groups of countries: Anglo–Saxon, market-based and euro area.[21] The following findings emerge:

- *The MPC out of total, financial and housing wealth restricted across all countries range from 1 to 3 cents.*

- *There are large, statistically significant differences in MPCs between countries.* The wealth effects in Anglo–Saxon countries are about 6 cents. MPCs for the market-based economies and countries outside the euro area are roughly 4. Non Anglo–Saxon countries, bank-based countries and members of the EMU have substantially smaller MPCs (0–2 cents). As indicated by the “p val . . . ” rows, these differences are statistically significant.

[21] Market-based economies are defined following Levine (2002) as countries where the stock market plays a more important role in financial transmission than banks. The definition of market- and bank-based economies is based on Levine’s aggregate structure index. The index is constructed as the three first principal component series which measure the activity, size and efficiency of stock market relative to the banking system. Countries with Levine’s “structure–aggregate” indicator greater than 0.3 are defined as market-based (ranked by the indicator): US, UK, Japan, Canada, Sweden, Australia, Ireland and the Netherlands. The bank-based countries are: Germany, Denmark, Belgium, France, Italy, Finland and Austria. Similar ordering is used in Borio (1996) and Beck and Levine (2002).

The definitions of all groups are given in the notes below table 6. Spain was excluded from estimation as the data are available only after 1986, which would considerably limit the estimation sample.

Table 6: Wealth Effects for Country Groups—Long-Run MPCs

	Wealth		
Country	Total	Financial	Housing
All Countries	1.97***	2.77***	1.19***
Anglo–Saxon	5.86***	6.40***	5.30***
Non Anglo–Saxon	0.84**	1.74**	0.16
p val: AS = Non AS	0.000	0.001	0.000
Market-Based	3.70***	3.79***	3.76***
Bank-Based	0.74*	2.02**	0.08
p val: MB = BB	0.000	0.101	0.000
Euro Area	0.78**	1.83**	0.12
Non Euro Area	4.21***	4.60***	3.88***
p val: EA = Non EA	0.000	0.014	0.000

Notes: Marginal propensities to consume in cents per dollar of additional wealth. SUR Estimates, {*, **, ***} = Statistical significance at {10, 5, 1} percent. $\chi = 0.60$ imposed. Time range: 1979Q1–1999Q4.
All Countries: US, Aus, Can, Fra, Ger, Ita, Jap, UK, Bel, Den, Fin, Ire, Ned, Aut, Swe.
Anglo–Saxon: US, Aus, Can, UK, Ire.
Market-based (following Levine (2002)): US, Aus, Can, Jap, UK, Ire, Ned, Swe.
Euro Area: Fra, Ger, Ita, Bel, Fin, Ire, Ned, Aut.

- *Differences between MPC out of housing and financial wealth are less pronounced.* I find some evidence that the housing wealth effect is somewhat smaller than the financial wealth effect in the euro area, bank-based and non Anglo–Saxon countries but the difference is relatively small (about 2 cents). Housing and financial wealth effects are about the same in other countries.

- *The group estimates are substantially more precise than the equation-by-equation estimates of table 4.* For example, the t statistic on the MPCW in the first cell of the table (restricted across all countries) is 5.53 (compared to the statistics in table 4, which are insignificant for six countries). This is for two reasons. Quantitatively more important is that I impose homogeneity restrictions across countries. The other efficiency gain is through the correlation of error terms across countries.[22]

Table 7 investigates how the wealth effect changes over time. The results from table 6 are reestimated for the full sample (1979Q1–1999Q4, left panel) and two subsamples: 1979Q1–1988Q4 and 1989Q1–1999Q4 (middle and right panels, respectively). I find a marked increase in housing and total wealth effects after 1988 from 0–1 up to 3 cents. This increase was stronger in countries where the effects are weaker (non Anglo–Saxon, bank-based and euro area): the wealth effect there rose from essentially zero to about 3 cents. The wealth effects in Anglo–Saxon, market-based and non euro area countries have been stable at roughly 4–6 cents or increased only mildly. Financial wealth effects in most groups have remained stable or fallen moderately.

A natural question is why the housing wealth effect recently grew stronger in continental Europe. One reason is that housing wealth has become more liquid in that it is now easier and less costly to borrow against it. It is well-documented (see e.g., Davey (2001), Debelle (2004) and Greenspan and Kennedy (2005)) that in Anglo–Saxon countries the amount of money households withdraw from their mortgages (mortgage equity withdrawal) is strongly correlated with housing wealth and housing prices. As argued by Catte, Girouard, Price, and André (2004) this has less been the case in continental Europe where financial markets are not as developed (in this respect). The results in table 7 suggest that the housing wealth effect in Anglo–Saxon, bank-based and non euro area countries between pre- and post-1989 periods increased from about 0 to 3 cents, about half the way toward the Anglo–Saxon countries. This finding presumably reflects the fact the European financial market infrastructure is catching up with its Anglo–Saxon counterparts.

[22] Given the relatively wide standard errors in table 4 (and their only moderately narrower counterparts from unrestricted SUR estimation) the cross-country homogeneity restrictions are not rejected.

Table 7: Wealth Effects for Country Groups over Time—Long-Run MPCs

Country Group	Full Sample			Pre-1989			1989 And Later		
	Total	Financial	Housing	Total	Financial	Housing	Total	Financial	Housing
All Countries	1.97***	2.77***	1.19***	1.36***	4.10***	−0.05	2.97***	3.08***	2.72***
Anglo–Saxon	5.86***	6.40***	5.30***	6.29***	8.66***	4.29**	6.18***	6.66***	5.75***
Non Anglo–Saxon	0.84**	1.74**	0.16	0.31	2.66***	−0.70	1.95***	1.96**	1.84***
Market-Based	3.70***	3.79***	3.76***	4.11***	5.23***	2.93***	4.28***	3.98***	4.68***
Bank-Based	0.74*	2.02**	0.08	−0.44	1.71	−1.09	2.20***	3.44***	1.63***
Euro Area	0.78**	1.83**	0.12	−0.74	1.04	−1.31	2.65***	3.80***	1.95***
Non Euro Area	4.21***	4.60***	3.88***	5.77***	7.62***	4.04***	3.94***	3.73***	4.20***

Notes: Marginal propensities to consume in cents per dollar of additional wealth. SUR Estimates, $\{^{*}, ^{**}, ^{***}\}$ = Statistical significance at $\{10, 5, 1\}$ percent. $\chi = 0.60$ imposed. Full sample time range: 1979Q1–1999Q4.
All Countries: US, Aus, Can, Fra, Ger, Ita, Jap, UK, Bel, Den, Fin, Ire, Ned, Aut, Swe.
Anglo–Saxon: US, Aus, Can, UK, Ire.
Market-based (following Levine (2002)): US, Aus, Can, Jap, UK, Ire, Ned, Swe.
Euro Area: Fra, Ger, Ita, Bel, Fin, Ire, Ned, Aut.

3.6 Other Estimation Methods: Levels and Differences

Most literature (e.g., most empirical papers cited in section 1) estimates the wealth effect using cointegrating regressions between consumption, income and wealth, what I call the levels model. To compare the results of this model with the above method I estimate the model in two variants: with total wealth,

$$\log C_t = \beta_0 + \beta_w \log W_t + \beta_y \log Y_t + \varepsilon_t, \tag{7}$$

(where Y_t denotes labor income) and with housing and financial wealth separately,

$$\log C_t = \beta_0 + \beta_{fw} \log FW_t + \beta_{hw} \log HW_t + \beta_y \log Y_t + \varepsilon_t. \tag{8}$$

Coefficients β_w, β_{fw} and β_{hw} are *elasticities* of consumption with respect to total, financial and housing wealth, respectively. To obtain *marginal propensities* these elasticities are commonly rescaled by dividing with a recent value of the wealth–consumption ratio (which is analogous to what I do e.g., in figure 1 and constructing ∂W in (2) above).

I estimate the levels model in the left panel of table 8. As the evidence on the existence of a stable cointegrating relationship is mixed (see table A.1 in the appendix and Rudd and Whelan (2006) for a detailed analysis of the US data), the right panel displays wealth effect estimates from the following model in differences

$$\frac{\Delta C_t}{C_{t-3}} = \beta_0 + \sum_{i=1}^{2} \beta_{c,i} \frac{\Delta C_{t-i}}{C_{t-3}} + \sum_{i=0}^{2} \beta_{w,i} \frac{\Delta W_{t-i}}{C_{t-3}} + \sum_{i=0}^{2} \beta_{y,i} \frac{\Delta Y_{t-i}}{C_{t-3}} + \varepsilon_t, \tag{9}$$

in which the long-run MPC to consume out of wealth is calculated as the sum of the wealth coefficients $\sum_{i=0}^{2} \beta_{w,i}$. Equation (9) can be thought of as an atheoretical version of my preferred model (5). The number of lags was set to two to keep the number of regressors manageable. This means that all variables are rescaled with initial consumption level C_{t-3} (rather than C_{t-5} as in section 3.3).

The findings in table 8 resemble the results of my baseline estimates of tables 4 and 5 in a number of ways:

- The estimates in levels and differences both pin down the average long-run MPC (MPC_w^{LR}) out of total wealth around 3 cents. The average financial and housing wealth effects ($\text{MPC}_{fw}^{\text{LR}}$ and $\text{MPC}_{hw}^{\text{LR}}$) lie around 3–5 cents and 0.3–3 cents, respectively. The levels method implies lower housing wealth MPCs but stronger financial wealth effect.

- There is quite a bit of heterogeneity across countries and uncertainty about the estimates, especially when I estimate housing and financial wealth separately.

- Using both methods I find some evidence that the total wealth effect in Anglo–Saxon countries (US, UK, Australia and Canada) is stronger than in continental Europe.

Table 8: Long-Run Wealth Effects: Levels vs. Differences

Levels: $\log C_t = \beta_0 + \beta_w \log W_t + \beta_y \log Y_t + \varepsilon_t$

Differences: $\frac{\Delta C_t}{C_{t-3}} = \beta_0 + \sum_{i=1}^{2} \beta_{c,i} \frac{\Delta C_{t-i}}{C_{t-3}} + \sum_{i=0}^{2} \beta_{w,i} \frac{\Delta W_{t-i}}{C_{t-3}} + \sum_{i=0}^{2} \beta_{y,i} \frac{\Delta Y_{t-i}}{C_{t-3}} + \varepsilon_t$

		Levels			Differences		
Country	Time Range	Total MPC_w^{LR}	Financial $\text{MPC}_{fw}^{\text{LR}}$	Housing $\text{MPC}_{hw}^{\text{LR}}$	Total MPC_w^{LR}	Financial $\text{MPC}_{fw}^{\text{LR}}$	Housing $\text{MPC}_{hw}^{\text{LR}}$
United States	65Q1–03Q4	5.21^{***}	1.34	−0.66	2.80^{***}	2.73^{***}	2.13
Australia	70Q1–99Q4	4.99^{***}	2.79^{**}	2.25^{**}	3.86^{***}	3.28^{**}	4.13^{***}
Canada	70Q1–03Q3	6.48^{***}	12.22^{***}	2.12	2.18^{**}	3.52^{**}	1.16
France†	70Q2–03Q2	3.15^{***}	2.64^{***}	1.99	2.09^{**}	2.49^{**}	1.55
Germany†	70Q1–02Q4	2.43	17.75^{***}	2.65	4.17^{***}	12.85^{*}	3.76^{***}
Italy‡	71Q4–99Q4	−0.16	7.80^{***}	−0.48	-0.53^{**}	2.20	-0.51^{**}
Japan‡	70Q1–01Q1	1.15	1.91	−0.84	1.43	−0.24	1.63
United Kingdom	70Q1–03Q4	4.37^{***}	6.86^{***}	1.34	3.48^{***}	1.91^{**}	4.85^{***}
Belgium†	80Q2–02Q4	2.22^{***}	2.45^{***}	−2.49	0.35	0.43	−3.11
Denmark	77Q1–01Q4	2.37^{*}	1.42	1.12	7.01^{***}	5.31^{***}	12.68^{***}
Finland	79Q1–03Q1	11.41	9.84^{***}	−2.26	5.36^{***}	2.48	6.86^{***}
Ireland	75Q4–96Q4	9.16^{**}	8.43^{***}	5.47	2.74^{**}	3.56^{**}	0.87
Netherlands	75Q1–02Q4	2.12^{***}	1.85^{***}	2.59	2.79^{***}	2.00^{**}	4.55^{***}
Austria†	78Q2–02Q4	−2.18	−3.05	−1.13	1.30	0.85	0.53
Sweden	77Q1–02Q4	−2.37	5.76^{***}	−4.75	2.07^{**}	2.43^{**}	1.30
Spain	87Q1–02Q4	0.76	3.96^{**}	0.44	2.13^{***}	3.14^{**}	1.71^{**}
Mean	–	3.19	5.25	0.46	2.70	3.06	2.76

Notes: Marginal propensities to consume in cents per dollar of additional wealth. $\{^{*}, ^{**}, ^{***}\}$ = Statistical significance at $\{10, 5, 1\}$ percent. † : Housing prices for France, Germany, Belgium and Austria were interpolated from annual data. ‡ : Housing prices for Italy and Japan were interpolated from semiannual data. The levels regression was estimated with dynamic least squares with 1 lag and lead. Statistical significance for the levels regression was calculated using the rescaled t statistics as described in Hayashi (2000), p. 656, for which the long-run variance of residuals from DLS regression was computed using the Newey–West window with 4 lags. Statistical significance for the regression in differences was calculated as the p value of the test: $\sum_{i=0}^{2} \beta_{w,i} = 0$.

4 Conclusion

This paper estimates the wealth effect on consumption in 16 countries. The wealth effects estimated using a novel methodology typically range between 1 and 5 cents. This result generally confirms the findings of other authors using different methods and less complete data.

Some of my results are relevant for policy-makers. My data suggest that the recent intense growth of housing prices in some countries (Australia, the UK, Spain and Ireland) may not be sustainable. Should this trend be reversed, the descriptive evidence on housing prices in section 2 implies that the decline or stagnation of housing wealth might be relatively mild but protracted. The aggregate impact of these developments on personal consumption is determined by the marginal propensity to consume out of housing wealth and the amount of housing wealth consumers hold. I find that the MPC to consume out of housing wealth is quite high in the Anglo–Saxon, market-based, non euro area economies and has probably recently increased in some countries. In addition, the amount of housing wealth (relative to consumption) is in some European countries (in particular France, Italy and the UK) and Australia substantially greater than in the US. This means that the aggregate effect of wealth on consumption is large there too.

For example, suppose the MPC out of housing wealth in Germany is 2.9 cents (in table 5) and the housing wealth–consumption ratio 3.6 (actual value in 2002).[23] A back-of-the-envelope calculation suggests that had the German housing prices over the past ten years grown by 64 percent—as much as the US ones did—rather than falling by 13 percent, (real) consumption growth would have been by about 8 percentage points or 0.8 percentage point per year stronger. These considerations imply that the dynamics of housing prices may have a sizable impact on the economy and are something policy-makers should carefully monitor.

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[23] Table A.2 in the appendix lists the wealth–consumption ratios in my data.

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Appendix: Data Construction and Additional Results

A.1 Data Sources

The estimation is done with quarterly data (unless otherwise noted); estimation samples are between 1965Q1 and 2003Q4 as indicated in the tables.

Most data were taken from the database of the NiGEM model of the NIESR Institute, London. Original sources for most of these data are OECD, Eurostat, national statistical offices and central banks. The consumption data are total private consumption expenditure from OECD's Main Economic Indicators database (as nondurables and services data are not available for all countries). The labor income data were approximated with total compensations of employees. The net financial wealth data come originally from the national central banks or Eurostat. Housing price data were obtained from the Bank for International Settlements (BIS).[24] All series were deflated with consumption deflators and expressed in per capita terms. The population series were taken from DRI International and interpolated (from annual data). The series were deseasonalized using the X-12 method where necessary. Housing prices for some countries (as indicated in the tables) were linearly interpolated from annual or semiannual data.

I thank BIS and Stephan Arthur for sending me their housing prices and Roberto Golinelli for consumer sentiment series for G7 countries and Australia used in Golinelli and Parigi (2004). I am grateful to Carol Bertaut, Nathalie Girouard and John Quigley for providing me with the data used in Bertaut (2002), Catte, Girouard, Price, and André (2004) and Case, Quigley, and Shiller (2005), respectively. Ray Barrell, Amanda Choy and Robert Metz answered my questions about the NiGEM's database.

A.2 Construction of Housing Wealth

I use the following procedure (in the spirit of Case, Quigley, and Shiller (2005)) to construct housing wealth. I calculate housing wealth HW as

$$HW_t = sf \times (HR_t \times N_t) \times HP_t,$$

where sf is a scaling factor, HR_t is the home ownership rate defined as the number of dwellings per capita,[25] N_t is population and HP_t is the housing price index. Housing wealth is thus approximated as a rescaled product of quantity of housing ($HR_t \times N_t$) and housing price HP_t. The scaling factor was computed as

$$sf = \frac{HW}{FW} \times FW,$$

[24] See Arthur (2005) for a description of the BIS dataset. The data originally come from national sources. Italian housing prices are from Nomisma. Japanese residential property prices originate from the following source: http://www.reinet.or.jp/e/jreidata/a_shi/index.htm.

[25] Home ownership rates in most countries in 2003 ranged between 0.4 and 0.5.

where HW/FW is the latest ratio of housing to financial wealth extracted using data from the Statistical Annex to OECD's Economic Outlook (Table 58), Arnold, van Els, and de Haan (2002), Table 1, p. 4, and Altissimo, Georgiou, Sastre, Valderrama, Sterne, Stocker, Weth, Whelan, and Willman (2005), Table 3.1, p. 13, and FW is the relevant value of financial wealth (obtained from the NiGEM's database).

Population is taken from the DRI database. Home ownership rates are calculated from data obtained from the online database of United Nations' Bulletin of Housing Statistics for Europe and North America,
http://www.unece.org/hlm/prgm/hsstat/welcome_hsstat.html.

A.3 Tests for Cointegration

Table A.1 reports the Phillips–Ouliaris and Johansen tests for cointegration for the two models in levels (7) and (8), described in section 3.6. The first model is shown in the left panel and consists of consumption, income and wealth, the second of consumption, income, financial wealth and housing wealth.

The Phillips–Ouliaris test applies the augmented Dickey–Fuller test on regression residuals to test whether they are I(1) with the statistic $t_{\hat{\alpha}_*}$. The test results imply little evidence of a stable cointegrating relationship in either model.

To complement these results I report the Johansen trace and max tests. To conserve space I only test for the existence of cointegration (not for the number of cointegrating vectors). The null hypothesis of both tests is that there is no cointegrating vector. The tests differ in their alternative hypotheses. While the max test takes as the alternative the existence of *one* cointegrating vector, the trace test's alternative is that there are *at most* p cointegrating vectors, where p is the number of endogenous variables in the system (3 or 4 in this case).

Johansen tests imply less clear-cut results than Phillips–Ouliaris. For the first model, in about half of the countries the null of no cointegration is rejected (at the 95 percent significance level). In the second model (with disaggregated wealth) cointegration is more likely: 22 of 32 tests in the table reject the null (at the 95 percent significance level).

A.4 Wealth–Consumption Ratios

Table A.2 shows wealth–consumption ratios in 2002.

Table A.1: Tests for Cointegration in the "Levels" Model

		Total Wealth			Financial and Housing Wealth		
		Phillips–Ouliaris	Johansen		Phillips–Ouliaris	Johansen	
Country	Time Range	$t_{\hat{\alpha}_*}$	$\lambda_{\max}$	λ_{trace}	$t_{\hat{\alpha}_*}$	$\lambda_{\max}$	λ_{trace}
United States	65Q1–03Q4	−2.90	28.49*	18.48	−2.55	32.52	13.53
Australia	70Q1–99Q4	−1.45	32.13**	18.05	−1.66	43.19	20.93
Canada	70Q1–03Q3	−2.26	48.58***	37.37***	−2.77	60.61***	39.78***
France†	70Q2–03Q2	−2.09	28.90*	24.18	−2.32	48.71**	26.13***
Germany†	70Q1–02Q4	−1.64	38.22***	29.57**	−2.66	78.85***	39.18***
Italy‡	71Q4–99Q4	−1.07	34.34**	24.13**	−2.87	49.28**	28.41**
Japan‡	70Q1–01Q1	−3.27	46.64***	29.83***	−4.22*	68.02***	37.48***
United Kingdom	70Q1–03Q4	−2.45	33.68**	19.80*	−3.94	44.62*	20.92
Belgium†	80Q2–02Q4	−4.53**	58.08***	40.91***	−3.73	72.89***	36.67***
Denmark	77Q1–01Q4	−1.88	33.17**	18.64*	−1.83	52.59**	24.54
Finland	79Q1–03Q1	−1.78	26.19	18.38	−1.72	57.54***	25.18*
Ireland	75Q4–96Q4	−3.33	23.37	14.55	−4.11	52.52**	24.13
Netherlands	75Q1–02Q4	−3.00	39.21***	23.77**	−3.04	70.04***	36.77***
Austria†	78Q2–02Q4	−2.30	18.25	13.56**	−2.30	45.27*	29.77**
Sweden	77Q1–02Q4	−2.06	16.87	11.37	−3.43	50.89**	28.70**
Spain	87Q1–02Q4	−2.19	22.77	18.87*	−2.57	72.53***	33.95***

Notes: $\{^{*}, ^{**}, ^{***}\}$ = Statistical significance at $\{10, 5, 1\}$ percent. †: Housing prices for France, Germany, Belgium and Austria were interpolated from annual data. ‡: Housing prices for Italy and Japan were interpolated from semiannual data. Statistical significance for the Phillips–Ouliaris test was calculated using the critical values from Phillips and Ouliaris (1990), Table IIc, p. 190. Statistical significance for the Johansen tests was calculated using the critical values from Osterwald–Lenum (1992). ADF and Johansen test statistics are calculated with 2 lags.

Table A.2: Wealth–Consumption Ratios in 2002

	Wealth		
Country	Total	Housing	Financial
United States	5.43	2.39	3.04
Australia	–	5.47	–
Canada	5.40	2.97	2.43
France	8.18	5.36	2.82
Germany	5.30	3.55	1.76
Italy	9.55	6.59	2.96
Japan	7.05	3.52	3.52
United Kingdom	7.01	4.29	2.72
Belgium	6.97	2.88	4.09
Denmark†	3.43	2.06	1.37
Finland	3.01	1.87	1.14
Ireland†	–	3.35	–
Netherlands	7.12	4.00	3.12
Austria	3.52	1.93	1.59
Sweden†	5.08	3.05	2.03
Spain	8.42	6.78	1.64
Mean	6.76	4.89	2.68

Notes: † : Housing wealth for Denmark, Ireland and Sweden was calibrated at 0.6×net worth in 2002.