INTERNATIONAL WEALTH EFFECTS

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Abstract. This paper presents a detailed investigation of the wealth effect for 16 industrial countries using the recently proposed technique that exploits the sluggishness of consumption growth. I argue that, compared to the widespread cointegration-based methodology, the approach I apply has better theoretical foundations and is more immune to parameter instability. Empirically, this new technique implies smaller magnitude of the wealth effect in the G-8 countries and larger size of the income effect. I also document that the wealth effect tends to be larger in countries with more developed financial markets and has decreased substantially in the last twenty years.

Keywords: wealth effect, income effect, consumption dynamics, sticky information.

1. Introduction

Household's wealth is a major determinant of consumption expenditure. The magnitude of the reaction of consumption to changes in wealth, the wealth effect, depends on a number of factors, including consumers' preferences, interest rate, and institutional setting of the financial markets (e.g. liquidity constraints and the costs of trading financial assets). This paper presents an analysis of the wealth effect and its determinants in major industrial countries.

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A number of recent papers (Bertaut, 2002; Byrne and Davis, 2003; Fernandez-Corugedo et al., 2003; Pichette and Tremblay, 2003; Catte et al., 2004; Lettau and Ludvigson, 2004, Hamburg et al., 2005 and others) attempt to analyze theoretically and estimate empirically the magnitude of the wealth effect. Research in this area was spurred by two principal factors. First, the stock market booms of 1990s stimulated policy-makers' and academics' interest in whether and how economic policies should respond to asset price movements. A necessary prerequisite for designing appropriate policies in presence of "excessive" stock and housing price movements and bubbles is the ability to evaluate the effects of these movements on the real economy. Two major channels were identified in the literature: the effect of stock prices on consumption—which is in the focus of this paper—and the effect on firms' investment expenditure. The quantitative estimation of these effects was made possible by the the second essential factor: the developments in time series econometrics methods that deal with unit roots and cointegration.

Almost all papers that estimate the wealth effect assume that there exist a stable, valid cointegrating relationship between consumption, income and wealth. However, as has recently been noticed, this cointegration methodology is vulnerable to serious theoretical and empirical attacks. The theoretical justification for the cointegration approach is based on the log-linear approximation of consumer's intertemporal budget constraint. Unfortunately, there is no reason to expect that the parameters that are required for the approximation to be valid (long-run productivity growth and interest rate) are actually stable over the long enough time frames necessary to identify the cointegrating relationship. It is exactly because the cointegration methodology has to pin down long-run relationships that structural instability (documented in Hahn and Lee, 2001; Rudd and Whelan, 2002; and Slacalek, 2004) presents a serious problem.

An alternative methodology for analyzing the wealth effect based on the sluggishness of consumption growth has recently been developed by Carroll and Otsuka (2004). An advantage of this new technique is that it is based on the first order conditions from consumer's optimization problem. The technique incorporates some features that recent literature (including Fuhrer, 2000 and Sommer, 2002) suggests are important for capturing the aggregate consumption dynamics, including inattentiveness/habit formation of consumers and measurement error in consumption data. Unlike the cointegration methodology, the Carroll–Otsuka approach does not require long spans of stable data.

This paper presents a detailed analysis of the effect of household wealth on consumption. I believe it is the most complete and systematic analysis of the issue so far for a large number of industrial countries. I compare the estimates of the wealth effects implied by the two methodologies: the traditional cointegration technique and a new approach based on the sluggishness of consumption growth. I also investigate the determinants of the wealth effect and the evolution of its size over time. My results indicate that the new technique implies somewhat smaller magnitude of the wealth effect in the G-8 countries: the long-run marginal propensity to consume from wealth varies from less than 0.5% in France to 4.5% in the US. In contrast, that methodology implies a larger size of the income effect. In addition, I document that the wealth effect tends to be larger in countries with more developed financial markets and has decreased substantially in the last twenty years.

The plan of the paper is as follows. Section 2 summarizes the traditional cointegration methodology for estimating the wealth effect and its weaknesses. Section 3 outlines the Euler equation-based approach recently proposed by Carroll and Otsuka (2004). Section 4 presents empirical estimates of the wealth effect and income effects. Section 5 attempts to track down some factors that influence the magnitude of the wealth effect. Finally, section 6 concludes and the Appendix presents some additional information on the dataset used in the paper.

2. Wealth Effects: Cointegration Methodology

The traditional, cointegration methodology for estimating the wealth effect is based on the assumption that there exists a valid and stable cointegrating relationship between consumption, labor income and wealth. If that is correct, an estimate of β_a in the regression

$$\log C_t = \beta_0 + \beta_a \log A_t + \beta_y \log Y_t + \varepsilon_t, \quad (1)$$

gives the percentage response of consumption to one percentage point change in wealth.[1] The marginal propensity to consume from wealth (MPCW), the dollar response of consumption to a one-dollar increase in wealth, is then obtained as $\text{MPC}_w = \beta_a \times C/A$, where C/A is a recent value of the consumption–wealth ratio.

2.1. Theoretical Justifications for the Cointegration Methodology.

Lettau and Ludvigson (2001) and Lettau and Ludvigson (2004)

[1] Equation (1) uses the following notation: C_t is consumption, A_t is net household wealth (net worth) and Y_t is labor income.

attempt to provide a theoretical justification for the cointegrating regressions (1) based on the log-linear approximation of consumer's intertemporal budget constraint.[2] Consumer's budget constraint is

$$W_{t+1} = R_{t+1}(W_t + Y_t - C_t), \tag{2}$$

where R_{t+1} is the rate of return on saving between time t and $t+1$ and W_t is total household wealth including human wealth. Campbell and Mankiw (1989) approximate the intertemporal budget constraint with

$$\log C_t - \log W_t = \mathbf{E}_t \sum_{i=1}^{\infty} \rho^i (r_{t+i} - \Delta \log C_{t+i}), \tag{3}$$

where $r_{t+i} = \log(1+R_{t+i})$, $\rho = 1-\exp(\overline{\log(C/W)})$ and $\overline{\log(C/W)}$ is the log of the steady state consumption–wealth ratio. The approximation (3) was obtained taking the Taylor series expansion of (2), imposing a transversality condition and taking expectations. A complication with the expression (3) is that the wealth W_t consists from financial wealth and unobservable human wealth $H_t = \mathbf{E}_t \sum_{j=0}^{\infty} Y_{t+j} \big/ \prod_{i=0}^{j} R^i_{t+i}$. This difficulty is overcome by postulating that human capital is proportional to current income. In other words, the following log-linear approximation to human wealth should hold, $\log H_t = \kappa + \log Y_t + v_t$, where κ is a constant and v_t is a zero mean, stationary variable. Finally, combining this expression with approximations (3) and $\log W_t \approx (1-\nu)\log A_t + \nu \log H_t$ (where $\nu = 1 - \overline{A/W}$) yields

$$\log C_t - \beta_a \log A_t + \beta_y \log Y_t \approx \mathbf{E}_t \sum_{i=1}^{\infty} \rho^i \big((1-\nu) r_{t+i} - \Delta \log C_{t+i} + \nu \Delta \log Y_{t+i+1}\big). \tag{4}$$

If the right-hand side of equation (4) is stationary, this approximation provides rationale for estimating cointegrating regressions such as (1).

2.2. Shortcomings of the Cointegration Methodology.

There are some serious problems with the cointegration methodology. These fall into two broad areas: (i) the above theoretical derivations and (ii) the empirical implementation of the cointegrating regression.

As pointed out by Carroll and Otsuka (2004), there is no reason for the approximation (4) to provide a satisfactory approximation to the budget constraint if some of the variables assumed to be stationary are not. In particular, the approximations in LL, such as (4), are not valid if there are permanent changes in the productivity growth rate, and their validity is doubtful even if productivity growth is highly serially correlated. Empirically, there is strong evidence for the persistent

[2]This section follows Lettau and Ludvigson (2004).

changes in the mean of productivity growth in the US. The average US productivity growth was almost twice as high before 1973 and after 1995 compared to the 1973–1995 period.[3]

The empirical evidence for the existence of a stable cointegrating relationship is mixed. Hahn and Lee (2001) find evidence for structural instability; Lettau and Ludvigson (2004) on the other hand argue that the cointegration is stable. Rudd and Whelan (2002) argue that when the series are constructed appropriately there is no evidence for cointegration in the US data. Slacalek (2004) finds little evidence for the stable cointegration between consumption, income and wealth in international data.

Rudd and Whelan point out that there are two problems with the way Lettau and Ludvigson (2004), LL, construct data. First, LL deflate the consumption series with a different deflator from labor income and wealth. The consumption series is deflated with the nondurables and services (NDS) deflator. The wealth and labor income series, in contrast, are deflated using the deflator for total personal consumption expenditure (PCE). This appears to be an error in LL's treatment of the data, since economic theory provides no reason to deflate the dependent and independent variables by different price indexes. Second, Rudd and Whelan claim that the consumption series LL use, consumption of nondurables and services excluding expenditure on shoes and clothing, is not consistent with the wealth series. Rudd and Whelan argue that the right measure of consumption to use in this application the total personal consumption expenditure.

3. Wealth Effects Reloaded: Euler Equation Methodology

Considering these issues, given the amount of data available and, plausibly, the presence of structural instability in the series, it is dubious whether the cointegration methodology provides us with the right tools to detect the marginal propensity to consume from wealth. Carroll (2004) and Carroll and Otsuka (2004) propose an alternative method, based on the consumption Euler equation, that is independent of the cointegration assumptions. This technique is, arguably, more robust to the existence of structural instability because it does not seek to identify a long-run relationship between consumption, income and wealth.

[3]The average productivity growth in the non-farm business sector was 2.7% in 1955–1972, 1.3% in 1973–1994 and 2.4% in 1995–2002.

3.1. **Intermezzo: A Brief History of Aggregate Consumption Dynamics.** Before summarizing the Carroll–Otsuka methodology I will outline some recent developments in the theory of aggregate consumption dynamics.

Robert Hall (1978) showed that consumption chosen by an agent with time separable utility and no precautionary motive will follow random walk. However, several researchers (including Flavin, 1981; Campbell and Mankiw, 1989; and Carroll et al., 1994) have argued since that random walk is not an adequate approximation of the aggregate household consumption. Their work documents a number of "excess sensitivity" puzzles: contrary to the Hall theory, future consumption was shown to be significantly affected by past variables (including lagged income, consumption and consumer sentiment).

A number of economists suggested possible solution to the excess sensitivity puzzles. Campbell and Mankiw (1989) propose a model with a fraction of income going to the "rule of thumb" consumers who consume all their current incomes. Bacchetta and Gerlach (1997) suggest that consumption of liquidity constrained agents will be predicted with past fluctuations in various credit aggregates (such as mortgage and consumer credits).

Excess sensitivity of consumption growth to its lags can be explained if consumers are habit forming, with their current utility depending on past consumption, rather than being time-separable (see e.g. Muellbauer, 1988). Sommer (2002) advances this argument and reports that the US aggregate consumption dynamics is adequately captured with two ingredients: habits and measurement errors. Sommer's (2002) consumers maximize a utility function with additive habits,

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

subject to the standard budget constraint. Dynan (2000) showed that the Euler equation for this objective function with a CRRA outer utility can be approximated by

$$\Delta \log C_t = \mu_0 + \lambda \Delta \log C_{t-1} + \varepsilon_t. \tag{5}$$

Sommer (2002) proposes an econometric technique to estimate this equation based on instrumental variables. Sommer's (2002) method is robust to the existence of measurement error in observed consumption data and wipes out most of the excess sensitivity in the US consumption.

While there is much evidence for the existence of positive autocorrelation in consumption growth in macro data (both in the US and elsewhere; see Fuhrer, 2000; Sommer, 2002; and Carroll et al., 2005), the results for micro data are rather mixed (for example Dynan, 2000 finds no evidence of habit formation in the PSID micro data on food consumption). This is not consistent with the habit-formation model, which predicts positive autocorrelation in consumption growth in micro, as well as in macro data.

To reconcile this, Carroll et al. (2005) offer an alternative interpretation of the Euler equation (5). Carroll et al. show that aggregating consumers with time separable utility who update their information sporadically rather than instantaneously results in equation identical to (5) on the aggregate level.[4] The consumption path of individual consumers, however, follows random walk and consequently the consumption growth observed in micro data lacks autocorrelation.

The empirical estimation of the Euler equation (5) is complicated by some issues that require further discussion. First, several authors (Wilcox, 1992; Bureau of Economic Analysis, 2002; Sommer, 2002) document that a large component in consumption data (around 30% of the PCE in the US, likely even more abroad) is estimated, imputed or interpolated. Consequently, the published consumption data differ from the (unobservable) "true" ones due to a sizable measurement error.

The presence of this measurement error complicates the estimation and inference about the consumption Euler equations. It is well known that if a regressor is measured with iid error, the OLS estimate of its coefficient is biased toward zero. In our case it turns out that the measurement error occurs in the *level* of consumption but the Euler equations actually relate consumption *changes*. As shown by Sommer (2002), in such a situation, the measurement error in the Euler equation (5) will have a possibly quite complicated structure with substantial negative serial correlation,

$$\Delta \log C_t = \mu_0 + \lambda \Delta \log C_{t-1} + v_t + \theta_1 v_{t-1} + \theta_2 v_{t-2}.$$

Sommer and Carroll et al. (2005) propose that a consistent estimator of λ can be obtained from the instrumental variables regression if instruments are lagged the appropriate number of periods (to mitigate the correlation between the measured consumption growth and disturbances).

3.2. **The New Methodology Based on the Sluggishness of Consumption Growth.** To alleviate the problems with the cointegration methodology, Carroll and Otsuka (2004) propose a new, alternative

[4]Similar argument is suggested by Reis (2004).

method to estimate the magnitude of the wealth effect. The starting point for the Carroll–Otsuka technique is the Euler equation (5),

$$\Delta \log C_t = \mu_0 + \lambda \Delta \log C_{t-1} + \varepsilon_t.$$

The two most important shocks to consumption growth are probably due to unexpected changes in income and wealth. Suppose the disturbance term is decomposed into a part due to the current changes in household income, wealth and the rest, $\varepsilon_t = \alpha_y \Delta \log Y_t + \alpha_w \Delta \log W_t + \eta_t$. The coefficients α_y and α_w are the immediate responses of consumption growth to (unexpected) income and wealth growth, respectively. Analogously, the effect of one percentage point increase in wealth growth at time $t-s$ on consumption growth is $\alpha_w \lambda^s$. Finally, the long-run (cumulative) effects of income and wealth are the sums of these partial effects, $\alpha_y \sum_{i=0}^{\infty} \lambda^i = \alpha_y/(1-\lambda)$ and $\alpha_w/(1-\lambda)$, respectively. To identify the magnitudes of the income and wealth effects, Carroll and Otsuka iterate on the Euler equation backward,

$$\Delta \log C_t - \lambda^k \Delta \log C_{t-k} = \tilde{\mu}_k + \varepsilon_t + \lambda^2 \varepsilon_{t-2} + \cdots + \lambda^{k-1} \varepsilon_{t-k+1},$$

where $\tilde{\mu}_k = \mu_0 \times (1-\lambda^k)/(1-\lambda)$. This equation can be rewritten (for $k > 2$) as

$$\Delta \log C_t - \lambda^k \Delta \log C_{t-k} = \hat{\mu}_k + \sum_{i=2}^{k-1} \lambda^i \big(\alpha_y \Delta \log Y_{t-i} + \alpha_w \Delta \log W_{t-i}\big) + \tilde{\eta}_{k,t}, \tag{6}$$

where $\tilde{\eta}_{k,t} = \varepsilon_t + \lambda \varepsilon_{t-1} + \sum_{i=2}^{k-1} \lambda^i \eta_{t-i}$.

Carroll and Otsuka (2004) propose the following procedure to estimate the impact of wealth on consumption.

- Estimate λ in equation (5) using IV (with appropriately lagged instruments).
- Estimate α_w and α_y in equations (6) for $k = 3, 4$ and 5 after imposing λ from step 1.
- Transform αs to obtain estimates of the short-run and long-run MPCWs, MPC_w^{SR} and MPC_w^{LR}, and marginal propensities to consume from income (MPCY), MPC_y^{SR} and MPC_y^{LR}.

Due to measurement error that causes the regressors and error terms to be correlated for $k = 1$ and 2 equations (6) are estimated only for $k > 2$.

The Euler equation approach adopts a two-step estimation procedure to identify the consumption growth persistence parameter λ and the immediate propensities to consume from wealth and income α_w and α_y. The technique is justified once λ in the first step can be reliably identified (which we manage for almost all countries). Second, to increase the efficiency of the estimates of αs, equation (6) is estimated as a system for $k = 3, 4$ and 5 rather than a single regression. This results in more precise estimates of the MPCs and seems to be justified by the diagnostics tests in which αs in the individual equations (for $k = 3, 4$ and 5) turn out to be very similar. These issues are discussed further in the next section.

4. Empirical Results

This section presents the estimates of the wealth effects in 16 industrial countries.[5] The data for G-8 countries, defined as Australia, Canada, France, Germany, Italy, Japan, the UK and the US, are shown in Figure 1; those for the remaining ("small") countries, Austria, Belgium, Denmark, Finland, Ireland, the Netherlands, Spain and Sweden, are displayed in Figure 2.

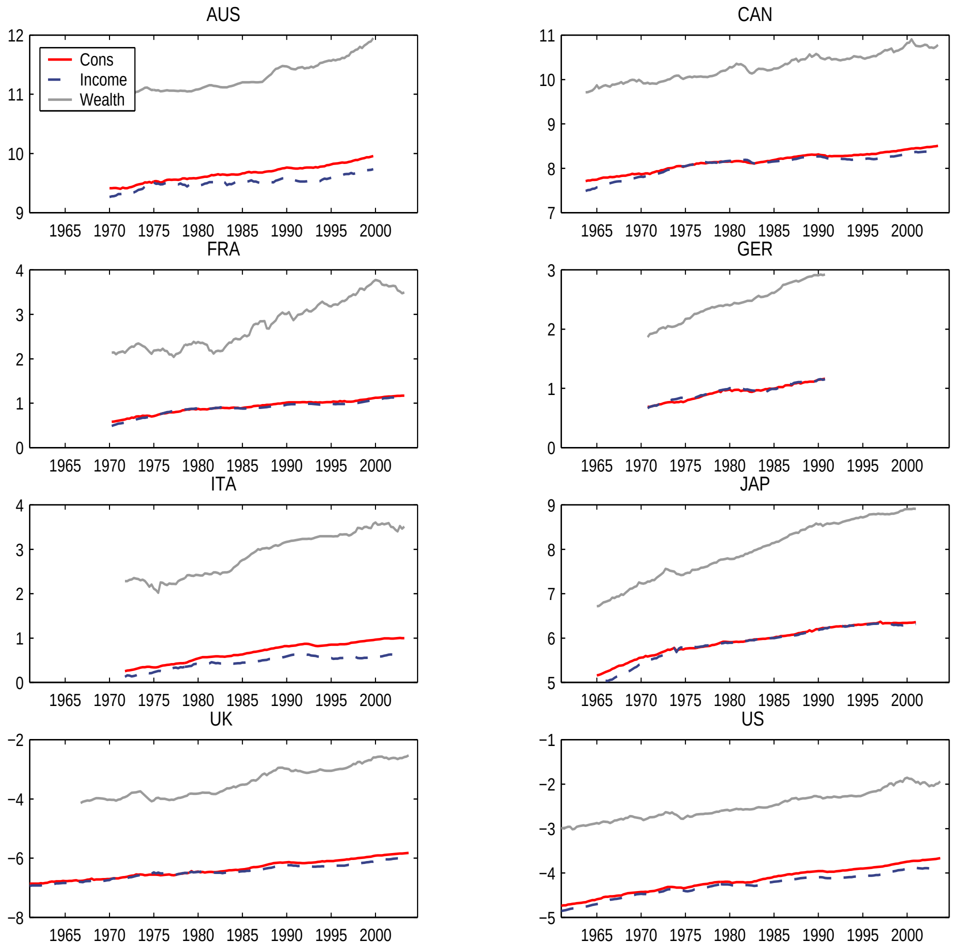
The data indicate that the low-frequency movements in consumption closely track down the movements in income. The wealth series, in contrast, tends to be more volatile than both income and consumption. As expected, income is somewhat more volatile than consumption—an intuitive and well-known finding that documents that agents smooth their consumption paths. The wealth–consumption ratios are in the range of 5–13 for G-8 countries, except for the UK where the W–C ratio recently reached about 25. Similarly, in small countries the wealth–consumption ratios are about 5–10, except for Belgium and the Netherlands with the W–C ratios of roughly 15.

The following technology was adopted for the baseline estimation results, shown in Table 1 and Figure 3. First, for each country, consumption growth persistence λ was estimated using the IV regressions with the following instruments: real three-month interest rate, wealth growth, unemployment and lagged consumption. In countries where the instruments were not strong enough to warrant reliable estimation of consumption growth persistence—Australia, Belgium, Finland and Austria—λ was imposed to be 0.75. A number of studies (Carroll, 2003; Reis, 2004; Carroll et al., 2005) find this is a reasonable value of the speed at which consumers update their information. The adequate quality of instruments was measured with the first stage F statistics greater than 5.

Second, given λ, following Carroll and Otsuka (2004), three alternative models of equation (6) were estimated for each country.

[5]See the Appendix for a description of data.

FIGURE 1. Consumption, Wealth and Income: G8 Countries

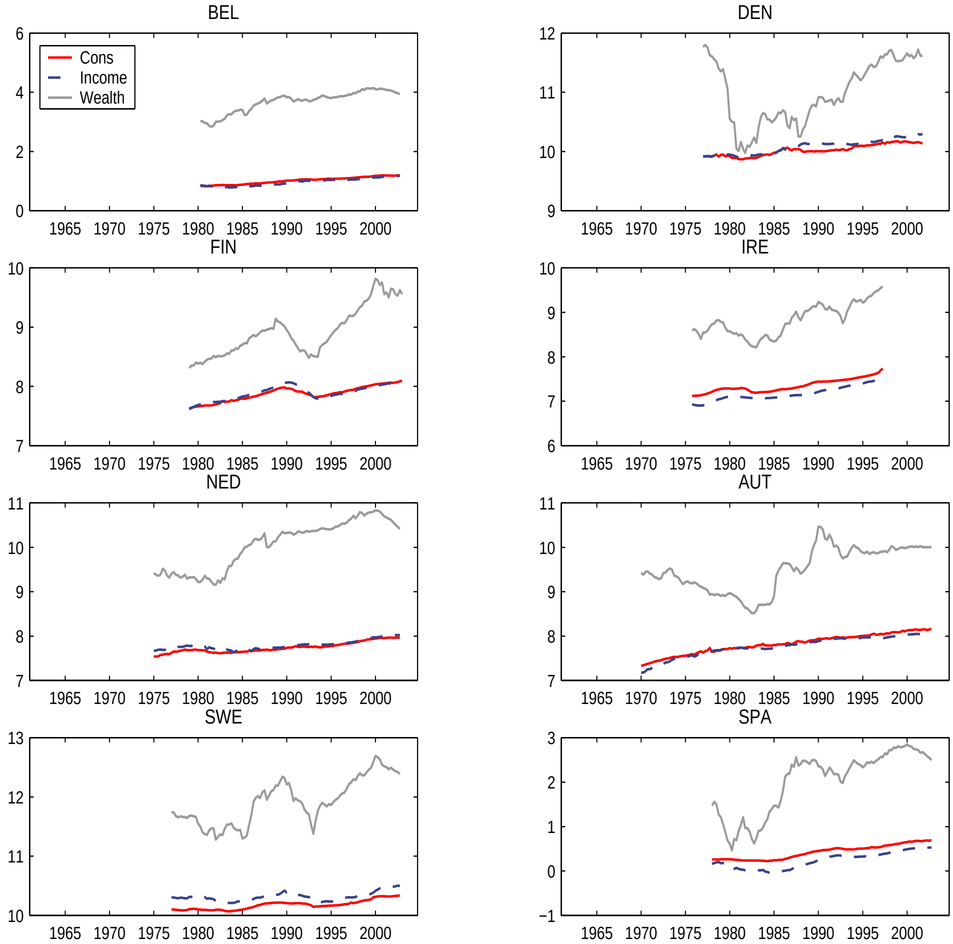


Note: The figure shows logs of real per capita consumption, income and wealth.

(1) Model 1 (M1): Equation (6) is estimated with $\Delta \log C_t$, $\Delta \log W_t$ and $\Delta \log Y_t$.
(2) Model 2 (M2): Equation (6) is estimated with dC_t, dW_t and dY_t (defined below) in place of $\Delta \log C_t$, $\Delta \log W_t$ and $\Delta \log Y_t$.
(3) Model 3 (M3): Equation (6) is estimated with dC_t and unexpected parts of dW_t and dY_t, $dW_t - \mathbf{E}_{t-1} dW_t$ and $dY_t - \mathbf{E}_{t-1} dY_t$. The expectations $\mathbf{E}_{t-1} dY_t$ and $\mathbf{E}_{t-1} dY_t$ are approximated as one-period ahead forecasts of dW_t and dY_t from the regressions of these variables on a constant, dW_{t-1} and dY_{t-1}.

The rationale for the three models is as follows. The parameters α_y and α_w in equation (6) are by themselves *not* measures of the marginal propensities to consume from income and wealth. To obtain the

FIGURE 2. Consumption, Wealth and Income: Small Countries



Note: The figure shows logs of real per capita consumption, income and wealth.

MPCYs and the MPCWs one has to do one of the following. Either multiply αs with the most recent consumption–wealth (consumption–income) ratio, or estimate equation (6) with $dC_t = (C_t - C_{t-1})/C_{t-6}$, $dY_t = (Y_t - Y_{t-1})/C_{t-6}$ and $dW_t = (W_t - W_{t-1})/C_{t-6}$ rather than $\Delta \log C_t$, $\Delta \log Y_t$ and $\Delta \log W_t$, respectively. The estimates of αs and $\alpha/(1-\rho)$s from these "transformed" regressions are then the appropriate estimates of short- and long-run MPCs. The former method was adopted in model M1, the latter in model M2. Model M3 attempts to capture the idea that the correct measure of income shocks to look at is the *unexpected* shocks, rather than the actual changes in income and wealth.

Some comments on the estimation strategy are in order. First, the number of regressions, $k = 3, 4, 5$ was chosen somewhat arbitrarily. I experimented with adding additional regressions ($k = 7$ and 8); the results are not sensitive to this. Second, all three models were estimated for $k = 3, 4, 5$ using seemingly unrelated regression (SUR) with αs being restricted to be the same across the three equations. Statistically, the data seem to like this restriction in that the p values of the test of this restriction are always very high (around 0.3). Third, the consumption at time $t-6$ in the denominator of the transformed regressors serves as the initial consumption level since the earliest consumption level among the regressors is 6.

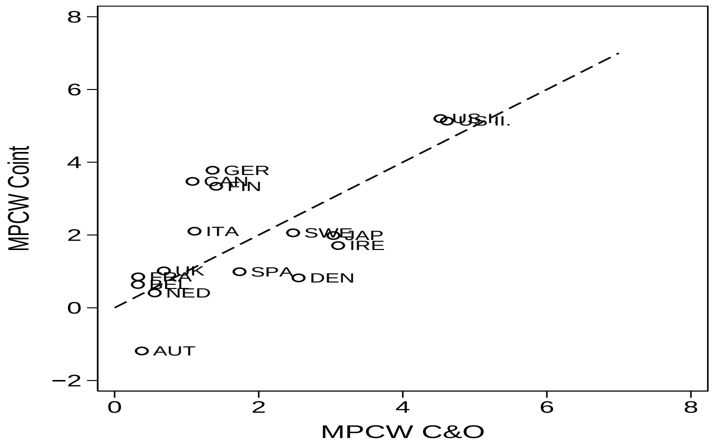
The estimation results with the MPCWs implied by the baseline specification are shown in Table 1. The third column displays the estimated consumption growth persistence, λ. These are taken from Carroll et al. (2005); see their paper for a more detailed analysis of consumption Euler equations (5). The consumption persistence parameter tends to be close to 0.7 (the average of λs across all countries is 0.66). Obviously, the precision of the estimates of λ varies across countries; λ can be pinned down very well for the US, less well for some other countries. A typical HAC robust standard error for λ is about 0.15–0.20. The precision of λ depends on (at least two factors): the quality of instruments and the amount of measurement error in consumption data. The first stage F statistics, measuring the quality of instruments are overwhelmingly significant for most countries (Australia, Austria, Belgium and Finland being the exceptions).

The fourth column shows the estimates of α_w in (6) for model M1. Columns 5–9 display the implied short- and long-run wealth effects for models M1–M3. Finally, the last column shows for comparison the estimate of the (long-run) wealth effect implied by the cointegration methodology. The first two lines in Table 1 compare the results for two alternative measures of household wealth in the US, net worth (consisting of net financial wealth and net tangible assets) and net financial wealth.[6] The estimates of MPC_w^{LR} for the US for the two measures of wealth are almost identical; they indicate the long-run MPCW of 4–4.5%.

The Euler approach estimates of MPCW for other countries range between 0.3 and 4.5%. Compared to other countries, the MPCWs are substantially bigger in the US and particularly in Australia. Surprisingly, the estimates imply relatively low values of MPCW for the UK

[6]The results in the first line with the net worth measure of wealth are replications of more detailed results of Carroll and Otsuka (2004).

FIGURE 3. Alternative Estimates of the MPC_w^{LR}: Carroll and Otsuka (2004) vs. Cointegration Methodology



Note: Comparison of estimates of MPC_w^{LR} of Table 1, models M3 and CI. The dashed line is the 45 degree line.

and the Netherlands. This may be caused by relatively high wealth–consumption ratios in these two countries.

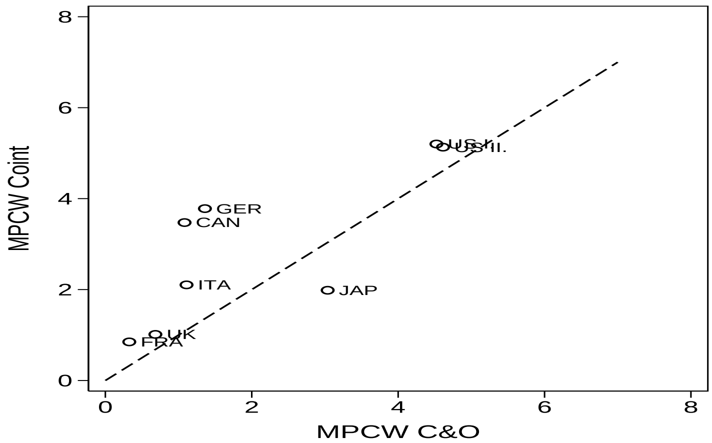
The Euler approach estimates of MPCW for the three models tend to be similar across countries. As expected, the MPC_w^{LR} in a number of countries is a bit higher than that for M2, reflecting the fact that consumers should react to unexpected shocks to income more than when certain portion of shocks is expected.

Figures 3 and 4 present scatter plots of estimates of MPC_w^{LR} from the Euler equation (model M3) and cointegration methodologies together with the 45 degree line. The points in the scatter plot tend to lie relatively close to the 45 degree line, implying that the two estimation methods often produce similar values of MPC_w^{LR}. However, as shown in Figure 4, the cointegration methodology tends to overstate the MPCW for the G-8 countries.

Table 2 presents estimates of the wealth effect for an alternative specification, in which λ was imposed to be 0.75 for all countries, rather than estimated. This seems to change the results a bit, in particular for the countries where the estimated λ is different from 0.75, such as Germany and France. Overall, for most countries it however, does not substantially affect the findings.

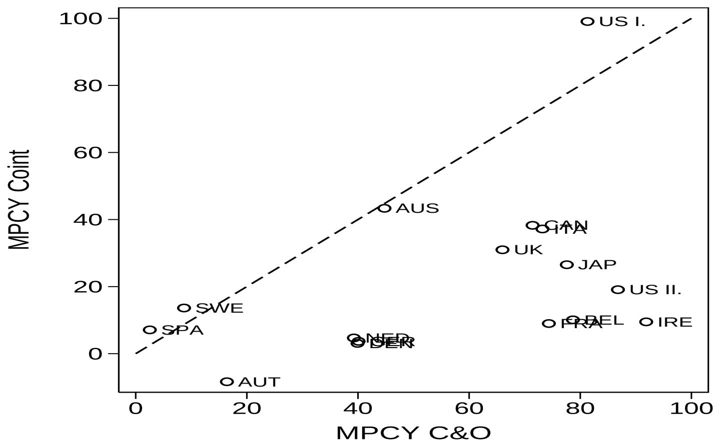
Table 3 summarizes the estimates of the marginal propensities to consume from income, MPCY. Judging by the spread in alternative model

FIGURE 4. Alternative Estimates of the MPC_w^{LR}: Carroll and Otsuka (2004) vs. Cointegration Methodology, G8 Countries



Note: Comparison of estimates of MPC_w^{LR} of Table 1, models M3 and CI. The dashed line is the 45 degree line.

FIGURE 5. Alternative Estimates of the MPC_y^{LR}: Carroll and Otsuka (2004) vs. Cointegration Methodology



Note: Comparison of estimates of MPC_y^{LR} of Table 3, models M3 and CI. The dashed line is the 45 degree line.

FIGURE 6. MPCW vs. Enforcement of Contracts, Number of Procedures

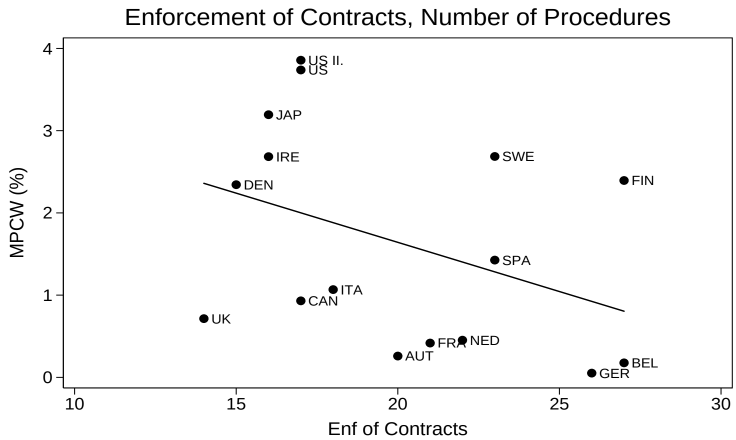
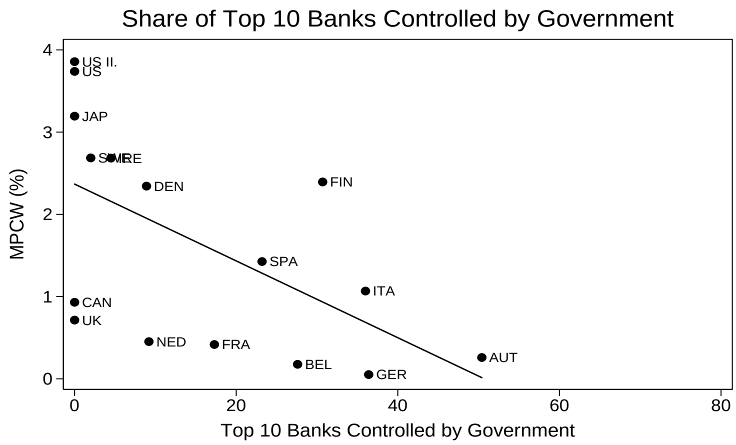


FIGURE 7. MPCW vs. Share of Top 10 Banks Controlled by Government



estimates (M1–M3) these are harder to pin down than the MPCWs. Overall, the cointegration-based MPCY tend to be smaller than the Euler-based MPCY, as documented in Figure 5. A typical value of the long-run MPCY implied by the cointegration methodology is around 30%, while the Euler methodology generates estimates of MPC_y^{LR} of about 75%.

5. What Determines the Wealth Effect?

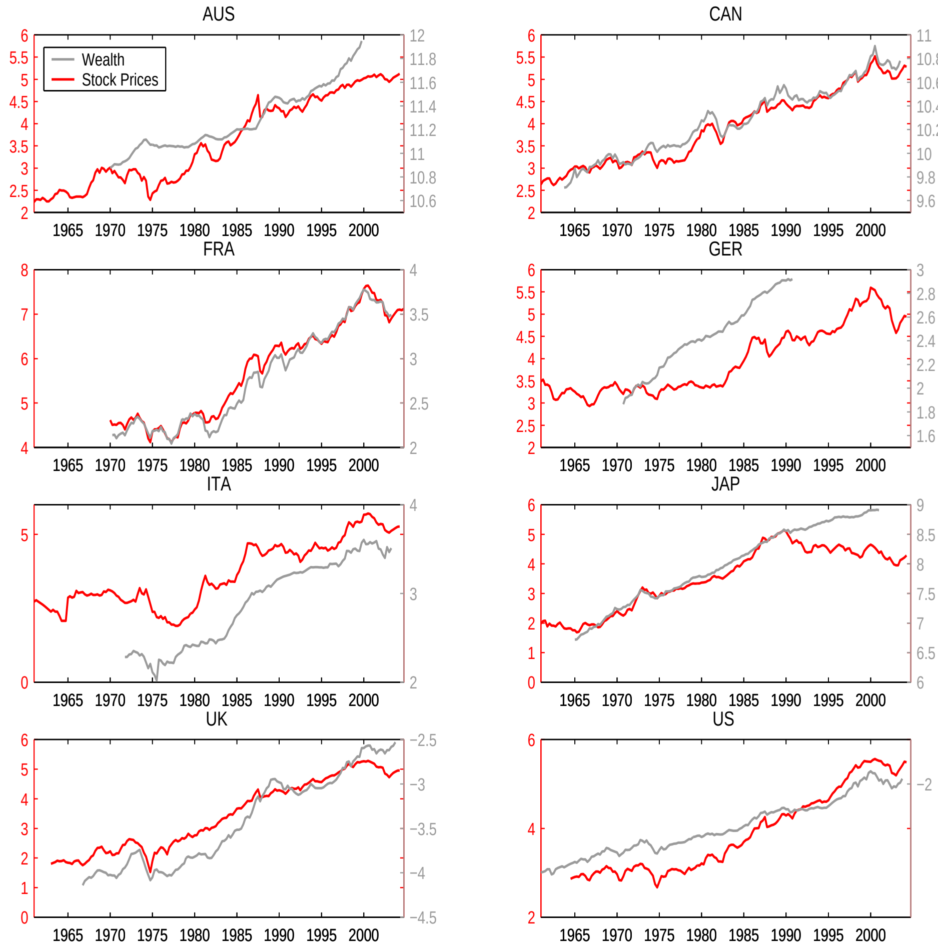
5.1. **Institutional Determinants.** Figures 6 and 7 show some evidence that the wealth effects tend to be stronger in countries with better functioning financial market infrastructure and overall institutional setting. Figure 6 displays a negative relationship between the size of the wealth effect and number of procedures necessary to enforce contracts (a measure of quality of country's legal system). Figure 7 documents that the wealth effects are typically smaller in countries with high share government-owned banks. This can in turn be related to the quality of country's banking and financial system.

5.2. **Has the Wealth Effect Changed Recently?** Table 4 compares the estimates of the wealth effect for pre- and post-1985 periods (for a subset of countries, G-6). The long-run marginal propensity to consume from wealth has fallen substantially in most countries after 1985. It is now on average almost three times smaller than it was in the pre-1985 period. One explanation for this finding may be that the global financial markets have recently become more interdependent and in particular more volatile. At the same time, financial markets are now, arguably, also more efficient, which makes it possible for the households to smooth consumption more efficiently. Consequently, consumption is now less responsive to a unit fluctuation in wealth than they were in the past.

5.3. **What is the Relevant Measure of Wealth?** The right measure of household wealth to be used in estimating the wealth effect is the net household wealth. However, due to difficulties in obtaining long enough household wealth data, some authors proxy household wealth with stock prices. Intuitively, stock prices will not be a very good proxy of household wealth in countries with low stock market capitalization and in countries where households hold only a small fraction of their wealth in stocks.

Figures 8 and 9 compare the movements in household wealth and stock prices in G-8 and small countries. Correlation between stock price growth and wealth growth is positive but not extremely strong, 0.63 averaging across countries. Figure 10 shows a scatter plot of this correlation and stock market capitalization. Interestingly, the relationship, if anything, is negative—correlation tends to be weaker for countries with high stock market capitalization.

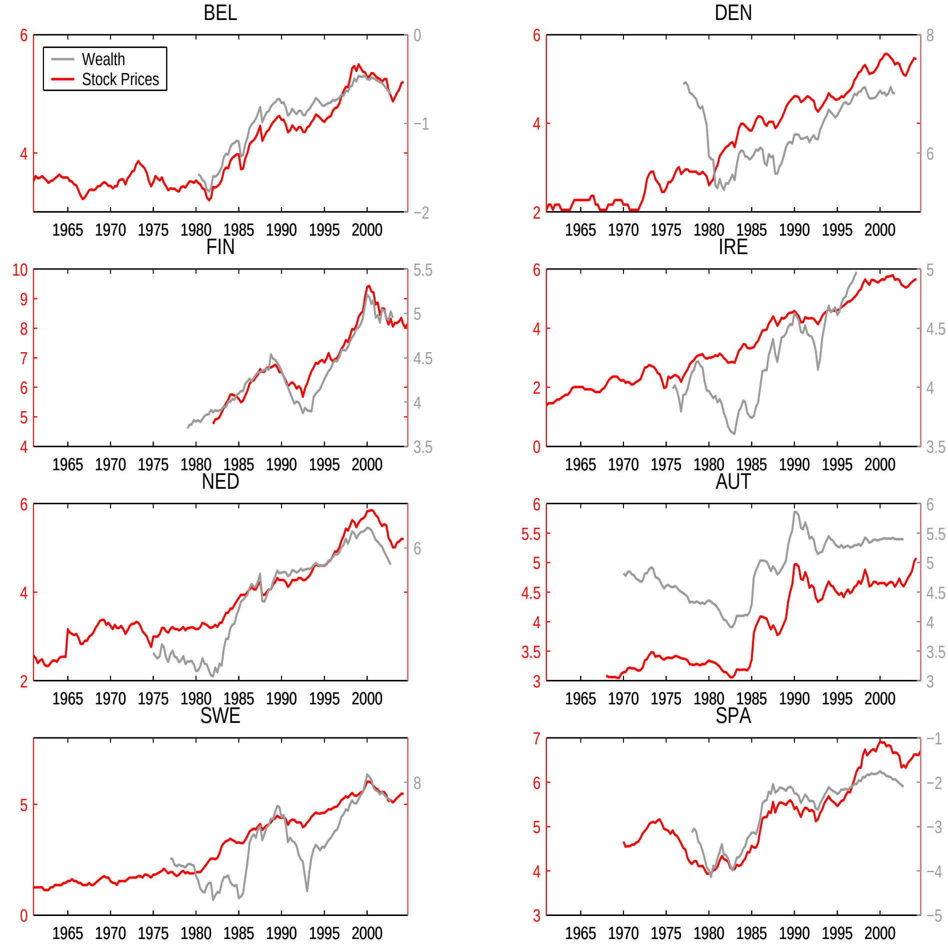
FIGURE 8. Wealth and Stock Prices: G8 Countries



Note: Comparison of log real per capita wealth and log stock prices.

Relatively low correlation between stock returns and wealth growth suggest that the regressions that use stock prices as a proxy for household wealth are subject to substantial measurement error. Correspondingly, in such regressions the estimates of the wealth effect are biased toward zero. This in fact turn to be the case in cointegrating regressions of consumption on stock prices and income (not reported here), in which the estimates of $\mathrm{MPC}_w^{\mathrm{LR}}$ tend to be smaller by 1-2% than when the appropriate wealth series is used. The estimates of MPCW from

FIGURE 9. Wealth and Stock Prices: G8 Countries



Note: Comparison of log real per capita wealth and log stock prices.

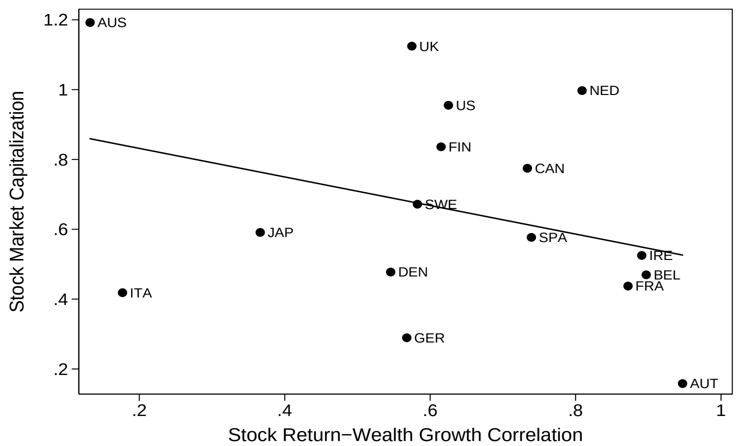
these regressions are substantially smaller than the estimates of cointegrating regressions of consumption on wealth and income.[7] The caveat from this exercise is that it is important to use the appropriate measure of household wealth when estimating the marginal propensities to consume.

6. Conclusion

This paper compares two alternative methods to estimate the marginal propensities to consume from wealth and income for a panel of

[7]While the measurement error bias in cointegrating regressions is asymptotically negligible (because the estimates are super-consistent), it may still be relevant in the relatively small samples available for analysis.

FIGURE 10. Correlation between Stock Returns and Wealth Growth vs. Stock Market Capitalization



Note: Stock market capitalization is measured as a fraction of GDP in 2003.

industrial countries. The traditional cointegration methodology estimates the MPCs based on the coefficients from cointegrating regressions of consumption on income and wealth. We present a critique of the cointegration methodology based on the lack of stability both in the theoretical approximations used to derive the empirical model and the empirical estimation. The alternative Euler equation methodology is based on the first-order conditions of an inattentive (or habit-forming) consumer. This makes it possible to derive an estimation technique that appears to be more robust to structural instability than the cointegration methodology. In addition, this new technique identifies separately the short- and long-run MPCs. The long-run marginal propensities to consumes from wealth range from 0.3% to 4.5%; the short-run MPCWs are about four times lower. The (long-run) marginal propensities to consume from income are about 60%. The MPCWs tend to be greater for countries with better functioning institutional setting and appear to have fallen substantially in the last twenty years.

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Appendix: Data Construction and Sources

Most data were taken from the database of the NiGEM model of the NIESR Institute, London. The original sources for most of these data are national statistical offices, central banks or the Eurostat. The consumption data are the private consumption expenditure and were cross-checked with the OECD's Main Economic Indicators database and DRI International. The labor income data were approximated with compensation series (except for the US where the labor income series was constructed following Lettau and Ludvigson, 2004). The wealth data are net financial wealth data and come originally from the national central banks or Eurostat. For the G-8 countries the wealth series were cross-checked with series from alternative sources, including the series used in Bertaut (2002), Pichette and Tremblay (2003), Tan and Voss (2003), Catte et al. (2004), and the Bank of Japan. All series were deflated with consumption deflators and expressed in per capita terms. The population series were taken from OECD's Main Economic Indicators and interpolated (from annual data). National stock price data come from the NiGEM's database and were cross-checked with series from the Morgan Stanley Capital International (http://www.msci.com/). Stock market capitalization come originally from Datastream database and GDP data from the Main Economic Indicators. The series were deseasonalized using the X-12 method where necessary. The time frames were chosen based on the availability of reliable data for each country. The various measures of institutional quality were taken from the Database for Institutional Comparisons in Europe (DICE), available online on the web page of the CESifo research institute, http://www.cesifo.de/.

Table 1. Short- and Long-run Wealth Effects—Estimated Consumption Persistence (λ)

Model			M1	M2	M3	M1	M2	M3	CI
	Time	λ	α_w	$\mathbf{MPC}_w^{\mathbf{SR}}$	$\mathbf{MPC}_w^{\mathbf{SR}}$	$\mathbf{MPC}_w^{\mathbf{LR}}$	$\mathbf{MPC}_w^{\mathbf{LR}}$	$\mathbf{MPC}_w^{\mathbf{LR}}$	$\mathbf{MPC}_w^{\mathbf{LR}}$
US NW	61Q2–03Q4	0.77	0.05	0.89	1.02	4.07	3.96	4.52	5.20
US NFW	61Q2–03Q5	0.77	0.03	1.00	1.04	5.05	4.41	4.61	5.13
AUS	70Q1–99Q4	0.75	0.14	2.58	3.61	7.43	10.33	14.45	4.74
CAN	65Q1–03Q3	0.60	0.05	0.47	0.43	1.16	1.18	1.08	3.47
FRA	70Q2–03Q2	0.22	0.02	0.29	0.26	0.30	0.36	0.33	0.85
GER	65Q1–90Q4	0.38	0.01	1.19	0.85	0.36	1.91	1.36	3.78
ITA	71Q4–03Q4	0.74	0.03	0.29	0.29	0.88	1.13	1.11	2.10
JAP	65Q1–01Q1	0.54	0.12	1.33	1.39	2.01	2.90	3.04	1.99
UK	61Q2–03Q4	0.44	0.07	0.36	0.38	0.51	0.63	0.68	1.01
BEL	80Q2–02Q4	0.75	0.02	0.07	0.08	0.40	0.28	0.32	0.64
DEN	77Q1–01Q4	0.66	0.02	0.95	0.88	1.46	2.76	2.55	0.82
FIN	79Q1–03Q1	0.75	0.02	0.40	0.35	2.22	1.61	1.41	3.34
IRE	75Q4–96Q4	0.86	0.01	0.17	0.43	1.14	1.24	3.10	1.71
NED	77Q1–02Q4	0.46	0.04	0.30	0.30	0.56	0.56	0.56	0.41
AUT	78Q2–02Q4	0.75	0.01	0.08	0.09	0.39	0.34	0.38	–1.19
SWE	77Q1–02Q4	0.83	0.01	0.35	0.43	1.01	1.99	2.48	2.06
SPA	78Q1–02Q4	0.87	0.01	0.22	0.23	1.36	1.67	1.73	0.99

Notes: λ, estimated consumption growth persistence, equation (5), α_w, immediate consumption response to shock to wealth, equation (6). Models M1–M3 are described on page 10. Model CI: cointegrating regression (1) estimated using dynamic least squares with one lag and lead. Figures in columns 5–10 are in percentage points.

Table 2. International Wealth Effects—Imposed Consumption Persistence ($\lambda = 0.75$)

Model			M1	M2	M3	M1	M2	M3	CI
	Time	λ	α_w	$\mathbf{MPC}_w^{\mathbf{SR}}$	$\mathbf{MPC}_w^{\mathbf{SR}}$	$\mathbf{MPC}_w^{\mathbf{LR}}$	$\mathbf{MPC}_w^{\mathbf{LR}}$	$\mathbf{MPC}_w^{\mathbf{LR}}$	$\mathbf{MPC}_w^{\mathbf{LR}}$
US NW	61Q2–03Q4	0.75	0.05	0.91	1.05	3.73	3.64	4.18	5.20
US NFW	61Q2–03Q5	0.75	0.03	1.01	1.06	4.60	4.03	4.26	5.13
AUS	70Q1–99Q4	0.75	0.14	2.58	3.61	7.43	10.33	14.45	4.74
CAN	65Q1–03Q3	0.75	0.04	0.41	0.33	1.61	1.63	1.31	3.47
FRA	70Q2–03Q2	0.75	0.02	0.21	0.24	0.72	0.85	0.96	0.85
GER	65Q1–90Q4	0.75	0.01	1.94	1.55	0.58	7.76	6.19	3.78
ITA	71Q4–03Q4	0.75	0.03	0.29	0.28	0.89	1.14	1.12	2.10
JAP	65Q1–01Q1	0.75	0.07	0.86	0.91	2.21	3.46	3.63	1.99
UK	61Q2–03Q4	0.75	0.04	0.20	0.29	0.67	0.81	1.15	1.01
BEL	80Q2–02Q4	0.75	0.02	0.07	0.08	0.40	0.28	0.32	0.64
DEN	77Q1–01Q4	0.75	0.02	0.88	0.87	1.83	3.50	3.46	0.82
FIN	79Q1–03Q1	0.75	0.02	0.40	0.35	2.22	1.61	1.41	3.34
IRE	75Q4–96Q4	0.75	0.01	0.26	0.53	0.89	1.05	2.11	1.71
NED	77Q1–02Q4	0.75	0.03	0.27	0.27	0.97	1.10	1.09	0.41
AUT	78Q2–02Q4	0.75	0.01	0.08	0.09	0.39	0.34	0.38	–1.19
SWE	77Q1–02Q4	0.75	0.01	0.38	0.49	0.73	1.53	1.96	2.06
SPA	78Q1–02Q4	0.75	0.01	0.24	0.25	0.76	0.97	1.00	0.99

Notes: λ, consumption growth persistence, equation (5) imposed to 0.75; α_w, immediate consumption response to shock to wealth, equation (6). Models M1–M3 are described on page 10. Model CI: cointegrating regression (1) estimated using dynamic least squares with one lag and lead. Figures in columns 5–10 are in percentage points.

Table 3. Short- and Long-run Income Effects—Estimated Consumption Persistence (λ)

Model			M1	M2	M3	M1	M2	M3	CI
	Time	λ	α_y	$\mathbf{MPC}_y^{\mathbf{SR}}$	$\mathbf{MPC}_y^{\mathbf{SR}}$	$\mathbf{MPC}_y^{\mathbf{LR}}$	$\mathbf{MPC}_y^{\mathbf{LR}}$	$\mathbf{MPC}_y^{\mathbf{LR}}$	$\mathbf{MPC}_y^{\mathbf{LR}}$
US NW	61Q2–03Q4	0.77	0.16	17.59	18.36	88.19	77.88	81.31	99.06
US NFW	61Q2–03Q5	0.77	0.17	18.44	19.60	93.02	81.63	86.78	19.09
AUS	70Q1–99Q4	0.75	0.06	7.05	11.19	29.30	28.22	44.77	43.35
CAN	65Q1–03Q3	0.60	0.16	17.72	28.68	44.77	44.12	71.42	38.28
FRA	70Q2–03Q2	0.22	0.54	53.57	58.24	71.48	68.39	74.35	8.99
GER	65Q1–90Q4	0.38	0.45	26.53	24.95	13.05	42.64	40.11	3.68
ITA	71Q4–03Q4	0.74	0.15	17.75	18.82	81.31	69.03	73.20	37.19
JAP	65Q1–01Q1	0.54	0.35	38.87	35.58	78.83	84.76	77.58	26.53
UK	61Q2–03Q4	0.44	0.29	30.81	36.97	60.61	54.99	66.00	30.98
BEL	80Q2–02Q4	0.75	0.04	16.48	19.67	16.99	65.91	78.68	10.09
DEN	77Q1–01Q4	0.66	0.11	14.28	13.72	28.23	41.54	39.92	3.06
FIN	79Q1–03Q1	0.75	0.11	11.93	50.62	47.31	47.70	202.48	15.07
IRE	75Q4–96Q4	0.86	0.15	10.67	12.66	95.78	77.47	91.87	9.49
NED	77Q1–02Q4	0.46	0.26	23.43	21.25	45.84	43.29	39.26	4.70
AUT	78Q2–02Q4	0.75	0.05	4.30	4.10	20.08	17.20	16.42	–8.37
SWE	77Q1–02Q4	0.83	0.00	0.43	1.52	–0.72	2.48	8.70	13.62
SPA	78Q1–02Q4	0.87	0.02	1.66	0.33	15.26	12.80	2.53	7.10

Notes: λ, estimated consumption growth persistence, equation (5), α_y, immediate consumption response to shock to income, equation (6). Models M1–M3 are described on page 10. Model CI: cointegrating regression (1) estimated using dynamic least squares with one lag and lead. Figures in columns 5–10 are in percentage points.

Table 4. International Wealth Effects—Time Stability

Model	λ	M1 α_w	M2 $\mathbf{MPC}_w^{\mathbf{SR}}$	M3 $\mathbf{MPC}_w^{\mathbf{SR}}$	M1 $\mathbf{MPC}_w^{\mathbf{LR}}$	M2 $\mathbf{MPC}_w^{\mathbf{LR}}$	M3 $\mathbf{MPC}_w^{\mathbf{LR}}$	CI $\mathbf{MPC}_w^{\mathbf{LR}}$
Pre 1985								
US NW	0.75	0.05	1.52	1.75	3.73	6.08	6.98	5.63
CAN	0.75	0.04	0.62	0.45	1.61	2.46	1.78	1.57
FRA	0.75	0.02	0.59	0.89	0.72	2.36	3.58	0.87
ITA	0.75	0.03	0.29	0.28	0.89	1.14	1.12	2.10
JAP	0.75	0.07	1.42	1.42	2.21	5.69	5.67	1.86
UK	0.75	0.04	0.34	0.45	0.67	1.37	1.80	1.04
Mean	0.75	0.04	0.80	0.87	1.64	3.19	3.49	2.18
Post 1985								
US NW	0.75	0.05	0.61	0.66	3.73	2.43	2.65	1.92
CAN	0.75	0.04	0.31	0.31	1.61	1.22	1.26	3.62
FRA	0.75	0.02	0.15	0.14	0.72	0.60	0.58	0.35
ITA	0.75	0.03	0.29	0.28	0.89	1.14	1.12	2.10
JAP	0.75	0.07	0.49	0.84	2.21	1.95	3.35	1.54
UK	0.75	0.04	0.17	0.20	0.67	0.68	0.80	1.14
Mean	0.75	0.04	0.28	0.36	1.22	1.12	1.42	1.75

Notes: λ, consumption growth persistence, equation (5) imposed to 0.75; α_w, immediate consumption response to shock to wealth, equation (6). Models M1–M3 are described on page 10. Model CI: cointegrating regression (1) estimated using dynamic least squares with one lag and lead. Figures in columns 5–10 are in percentage points.