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How do banking crises affect aggregate consumption? Evidence from international crisis episodes

Petra Gerlach-Kristen, Brian O'Connell and Conor O'Toole

Abstract: This paper considers the effect of systemic financial crises on aggregate consumption. Using a sample of 23 countries over 32 years, we find that consumption growth seems lower during banking crises, crises following credit booms and crises following house price booms. Moreover, the response to income growth seems to change, which may be due to credit constraints. In the long run, consumption appears to be linked to income, housing and other financial wealth.

Corresponding Author: petra.gerlach@esri.ie

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1. Introduction

In most countries, consumption accounts for more than half of GDP. Normally, it evolves smoothly and attracts little policy attention, even though it directly reflects households' living standards and thus is an important measure of wealth.

Since the financial crisis began in the late summer of 2007, the slump in consumption in many economies has moved it into focus. One central question in formulating policies to revive consumption is whether something fundamental has changed in households' expenditure patterns or if the decline in consumption represents the normal reaction to an unusually large shock.

One fundamental change that might have occurred is that credit constraints have started to bind. The permanent income hypothesis (Friedman, 1957) predicts that consumption should mirror an individual's life-time income. It should evolve over time only as permanent income expectations are adjusted. Since actual income is more volatile than permanent income, actual income generally displays more variability than consumption.

However, the literature suggests that the permanent income hypothesis can fail to hold in the presence of credit constraints (the first references in this field are Leland, 1968, and Tobin and Dolde, 1971). If actual income falls and households have neither accumulated savings nor access to credit, their consumption has to adjust downwards. Credit constraints thus imply a stronger response to income reductions than in normal times. The dynamics of consumption therefore may change during financial crises.

In this paper, we estimate consumption functions using a quarterly panel dataset of 23 countries over 32 years. We choose this cross-country approach in order to obtain sufficient crisis observations – in any single country, financial crises are too rare and samples too short to pin down any special crisis dynamics.

We report three main findings. First, consumption seems in the long run related to income, housing and other financial wealth. This finding is robust in the data if a mean-group estimator is used. Standard panel techniques, which impose equality of coefficients across countries, do by contrast not yield intuitive long-run relationships. Second, consumption growth appears lower during financial crises. Thus, the short-run dynamics seem changed; no change in the long-run relationship or in the reaction to disequilibria in it is detected. Third, income growth, for which we observe a negative response in the overall sample, seems to have a slight positive impact on consumption growth during crises. These two latter findings suggest that consumption smoothing is more difficult during crises and can be interpreted as evidence of credit constraints.

The rest of this paper is structured as follows: Section 2 reviews the relevant literature. Section 3 discusses the data, Section 4 outlines our methodological approach, Section 5 presents our empirical findings and Section 6 concludes.

2. Literature and background

There exists an extensive literature on financial crises, considering the causes of such episodes e.g. asset price bubbles, high credit growth and current account deficits as well as the relative success or impact of containment and resolution strategies (Kaminsky and Reinhart, 1999, Summers, 2000, Honohan and Klingebiel, 2003, Barajas et al., 2007, Caprio and Honohan, 2008, Laeven and Valencia, 2008 and 2012, and Claessens et al., 2010). However, there is less research quantifying the effect of financial crises on economic outcomes, especially relating to expenditure aggregates such as consumption and investment.

Of the research that estimates the cost of financial crises, the majority focuses on the net output losses as well as the fiscal costs of banking sector resolution strategies. Using a sample of 39 systemic crises, Caprio and Honohan (2008) state that average fiscal costs amounted to 12.5 percent of GDP with the wider costs estimated at 14.6 percent of GDP on average. Hoggarth et al. (2002) find similar output impacts with cumulative losses of roughly 15-20 percent of GDP. Honohan and Klingebiel (2003) show that the total fiscal outlays from financial crisis are highly dependent on the choice of resolution strategy employed. They also find no evidence that accommodation measures (such as liquidity support and state guarantees) reduce the output losses associated with crises. Reinhart and Rogoff (2009) provide a summary overview of the aftermath of financial crisis noting that three characteristics are often shared by post crisis economies. First, falls in asset prices are deep and prolonged, second, output and employment decline significantly and thirdly, the real value of government debt tends to increase markedly. A number of studies find that financial crises lead to permanently lower potential output. Cerra and Saxena (2008) use panel data for a large set of high-income, emerging market, developing, and transition countries, and find robust evidence that the large output loss from financial crises and some types of political crises is highly persistent. Barrell et al. (2010) test the effect of financial crises on potential output for 13 OECD economies. They find a step down in output per worker around crises periods.

In an emerging market context, Fallon and Lucas (2002) test the effect of financial crises on labour markets, household incomes and poverty. They find that aggregate production fell considerably more than employment but with much intra-industry heterogeneity. Cuts in real wages were strongest in countries with considerable currency depreciation with households responding to lower wages by increasing labour force participation and using private transfers.

There are relatively fewer papers that deal with the effect of financial crisis on specific macroeconomic expenditure aggregates such as consumption and investment. A number of

studies have focused on the linkages between financial shocks and macroeconomic aggregates including consumption since the current financial crisis. Hubrich et al. (2013) analyse the transmission of financial shocks to the macroeconomies of 36 European and OECD economies. Financial shocks are measured through asset prices (stocks market and house prices), the term spread, loans to private residents and banks loans-to-deposit ratios. Macroeconomic outcomes are GDP growth, consumption and investment. They find considerable heterogeneity of macro-financial effects across countries and find that financial variables affect investment more than private consumption. Mendoza and Terrones (2012) focus on the dynamics of macro-economic aggregates during credit booms. They link credit booms to public consumption, private consumption, investment, nontradables output and the real exchange rate. However, neither of these studies specifically focuses on consumption patterns across a historical panel of financial crises. [1]

Focusing on the effect of financial crises on consumption, to our knowledge, there is only one paper which directly deals with this issue. Barrell et al. (2006) estimate the effects of banking and currency crisis on aggregate consumption across advanced OECD economies. They find that while crises impact consumption through standard income and wealth channels, time varying confidence, uncertainty, and credit rationing also play a role. The effects are aggravated by high debt-to-income ratios (reflecting household leverage) mitigated in countries where higher levels of financial liberalisation ease credit constraints.

The second body of research that we contribute to relates to the estimation of the consumption function in a cross-country panel setting with wealth effects. The main literature on consumption follows the life-cycle hypothesis (Modigliani and Brumberg, 1954, and Ando and Modigliani, 1963). The majority of macroeconomic studies of consumption express the value of contemporaneous consumption as a function of the level of income and the wealth available to consumers.[2] Typically, it is assumed that these variables are cointegrated and have a stable long-run relationship. In the short-run, consumption growth is modelled as depending on deviations from the equilibrium and movements in the growth rates of income and wealth.

The existing empirical work on testing for financial wealth effects on consumption is extensive and includes both single-country, multi-country and cross-country panel evaluations. For the US, Ludvigson and Steindel (1999) establish the presence of a wealth

[1] Dell'Aricca et al. (2008) consider the real effect of banking crises on investment by firms through the financing constraints channel and find that sectors that are more dependent on external finance do relatively worse during banking crises controlling for bank dependence, recessions and currency crisis. Davis and Stone (2004) examine the effect of financial crises on the corporate investment and flow of funds. They find that inventory and investment contractions are the main contributors to GDP falls and the effect is greater in emerging markets than developed economies.

[2] Some studies, e.g. Aron et al. (2012) also include the real interest rate. We originally tried constructing this variable, but found it difficult to construct comparable measures over our broad set of countries and years.

effect using dynamic OLS. This finding is supported by Poterba (2000) and Davis and Palumbo (2001). Lettau and Ludvigson (2004) note that, while permanent changes in wealth do affect consumption, most changes in wealth are transitory and are uncorrelated with consumption. In a cross-country setting, Byrne and David (2003) test the affect of financial wealth on consumption across the G7 countries using a panel approach. They find that illiquid wealth plays a bigger role in determining consumption than liquid wealth. Barrell and Davis (2007) find a considerable increase in short-run wealth elasticities following financial liberalisation across G7 countries.

While the above studies have solely focused on financial wealth, much research has been completed on the existence and magnitude of housing wealth effects, about which there is considerable debate. The majority of empirical studies find a small positive effect of housing wealth. For instance, Aron et al (2012) estimate a marginal propensity to consume out of housing for the US and UK of circa 0.04 to 0.06, which is in line with estimates such as Engelhardt (1996). Aron and Muellbauer (2012) investigate wealth channels for South Africa and find that housing wealth enters through a collateral channel. On a cross-country basis, Ludwig and Slok (2004) use a pooled mean-group estimator across 16 countries to test the affect of stock prices and house prices on consumption. They find positive wealth affects in both cases. Slacalek (2009) and Carroll et al. (2011) also test for housing and wealth affects and estimate a marginal propensity to consume of between 2 and 9 per cent.

By contrast, Duca et al (2010), Muellbauer (2007) and Buiter (2010) find little support for a housing wealth effect. They argue that depending on the degree of capital market imperfections, and substitution between purchases of housing and non-housing goods by households, the positive wealth effect due to house price increases can be offset by a reduced income effect caused by higher housing costs. Given this ambiguity, the existence and magnitude of wealth effects is very much an empirical question.

One final aspect of the debate on consumption and wealth effects relates to the role of credit markets for household consumption. The permanent income hypothesis assumes perfect capital markets provide the credit for households to smooth consumption. With the existence of financial market imperfections/credit constraints, such smoothing may not be optimal or at all possible.[3] This affect may be even more acute in times of financial crisis where financial intermediation is impaired.

There is an extensive literature in this area, starting with Leland (1968) and Tobin and Dolde (1971), and a number of papers are of particular relevance to ours.[4] Bacchetta and Gerlach (1997) test the role of credit aggregates in driving consumption in the US, UK, Japan, France and Canada. They find that credit aggregates have a considerable effect on consumption indicating the presence of liquidity constraints. They also find that consumption displays an excess sensitivity to income further suggesting access to finance difficulties. Muellbauer

[3] This debate is formalised by Lattimore and Muellbauer (1995) who provides the theoretical basis for both permanent income and credit channels.
[4] Please see Davis (2010) or Slacalek (2009) for a survey of related research.

(2007) finds that the housing wealth effect only occurs with financial market liberalisation which provides a collateral channel in response to information asymmetries between borrowers and lenders. He finds that the housing wealth affect is twice as large in the US as the UK. Aron et al. (2012) test the impact of credit conditions on consumption in three countries individually and find that the credit channel exists and differs over time and across countries. Other work in this area by Jappelli and Pagano (1994) and Engelhardt (1996) also highlights a role for credit access in reducing the down-payment requirement for households in purchasing housing. In terms of testing credit market effects during crises, as noted, Barrell et al. (2006) find that consumption declines following crises are mitigated in countries with higher levels of financial liberalisation but increased where household leverage is higher.

3. Data

3.1 Defining crises

We distinguish between banking crises, crises following credit boom and crises following house price booms. We draw on the IMF database developed by Laeven and Valencia (2008, 2012) to identify crises. This database includes all systemic banking, currency, and sovereign debt crises during the period 1970–2011. Laeven and Valencia define systemic banking crises as those in which the following conditions are met:

- Significant signs of financial distress in the banking system (as indicated by significant bank runs, losses in the banking system, and/or bank liquidations)
- Significant banking policy intervention measures in response to major losses in the banking system.

Additional data on banking crises are taken from Barrell et al (2006), who construct their database using information from Caprio and Klingebiel (1996) and Bordo et al (2001). Though there is considerable overlap between the Laeven and Valencia and Barrell et al datasets, using a combination does widen our coverage substantially. Barrell et al classify banking crises as episodes which "involve bank runs, widespread bank failures and the suspension of convertibility of deposits into currency, or significant banking sector problems that result in the erosion of most or all of banking system capital." One potential limitation to using the Laeven and Valencia (2012) definitions of banking crises is that a number of crises in small open economies are missed if there is a high degree of foreign bank ownership and the banking sector losses from credit booms are felt in the country of ownership[5]. However, as our analysis requires quarterly data for a number of

[5] For example no banking crisis is identified in Estonia in 2008 as the banks are majority Nordic owned and the losses were capitalised by parent banks in these countries. More detail on housing booms in a sample of such countries are presented in Vandenbussche et al (2012).

macroeconomic aggregates as well as house and stock prices, we would have been unable to include such countries in this analysis.

In addition to financial crises as defined by the above conditions, we also focus more specifically on crises that were preceded by credit booms and housing booms respectively. We split out these subgroups of crises to test whether the post-crisis consumption dynamics are dependent on the degree of asset price movement prior to the crisis.[6] For example, a large equity or house price boom in the domestic economy may support consumption pre crisis through wealth effects and potentially easier access to credit. If the post-crisis fall in asset prices is considerable, then it may be the case that the consumption reaction differs to crises which assets prices were not so adversely affected. Extending the analysis to study specifically the affect of banking crises after asset price booms is a further addition to existing work in this area.

To identify crises which were accompanied by credit booms, we take the definition from Laeven and Valencia (2008, 2012). They define a credit boom as:

"three-year pre-crisis average growth in private credit to GDP in excess of 10 percent per annum, computed over the period (t-4, t-1] where t denotes the starting year of the banking crisis" (p.9, 2008)

To identify crises preceded by a housing boom, we use a similar definition, namely:

"three-year pre-crisis average growth in house prices in excess of 10 percent per annum, computed over the period (t-4, t-1] where t denotes the starting year of the banking crisis"

Coupling these definitions together, the countries and crises included in the analysis are outlined in Table 1.

[6] While there is, of course, a high degree of correlation between credit booms and housing booms, we believe that isolating the housing element provides additional insight and is appropriate when estimating the consumption wealth effects following crises.

Table 1: Overview of Country Coverage and Crises Years				
Country	Coverage	Banking Crises	Credit Boom	Housing Boom
Australia	1980Q1-2011Q4	1989	-	Yes
Austria	1988Q1-2011Q4	2008- 2011	-	-
Belgium	1995Q1-2011Q4	2008- 2011	Yes	Yes
Canada	1980Q1-2011Q4	1983	-	Yes
Denmark	1996Q1-2011Q4	2008-2011	-	Yes
Finland	1990Q1-2011Q4	1991-1995	Yes	-
France	1980Q1-2011Q4	1994, 2008- 2011	-	-
Germany	1991Q1-2011Q4	2008-2011	-	-
Greece	2000Q1-2011Q4	2008-2011	Yes	Yes
Hong Kong	1999Q1-2011Q4	-	-	-
Ireland	1998Q1-2011Q4	2008-2011	Yes	Yes
Italy	1990Q1-2011Q4	1990, 2008-2011	-	-
Japan	1994Q1-2011Q4	1997, 1998, 1999, 2000, 2001	-	-
Korea	1980Q1-2011Q4	1997, 1998	Yes	-
Netherlands	1987Q1-2011Q4	2008-2011	-	-
New Zealand	1987Q2-2011Q4	-	-	-
Norway	1980Q1-2011Q4	1986, 1987, 1988	Yes	Yes
Portugal	1995Q1-2011Q4	2008-2011	-	-
Spain	2000Q1-2011Q4	2008-2011	Yes	Yes
Sweden	1993Q1-2011Q4	1993, 1994, 1995	Yes	Yes
Switzerland	1990Q1-2011Q4	2008-2011	-	-
United Kingdom	1988Q1-2011Q4	2007- 2011	Yes	Yes
United States	1980Q1-2011Q4	1984, 1988, 2007-2011	-	-

Source: Data from Laeven and Valencia (2012) and Caprio and Klingebiel (2003).

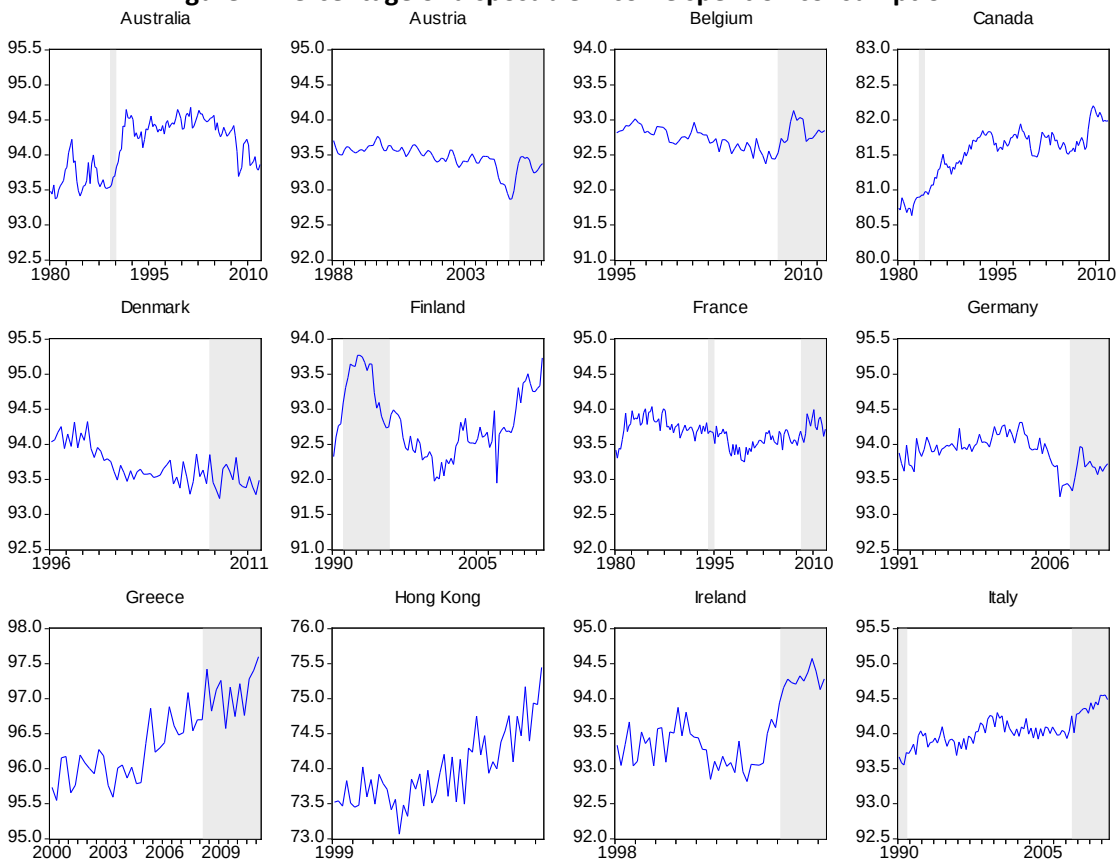
3.2 Consumption and income

We use seasonally adjusted data from a number of different sources in our analysis. To estimate the aggregate consumption function, quarterly data for consumption are taken from the OECD, except the data for Hong Kong, which are taken from the IMF International Financial Statistics Database (IFS). Personal disposable income data are taken from Eurostat for EEA members, the IMF IFS for Australia, Hong Kong, Korea and Canada and the national statistical office for New Zealand.[7] Disposable income is adjusted for taxes. We correct consumption and income for inflation using consumer price indices and divide by population to express our main variables on a per capita basis. CPI inflation is taken from the IMF IFS, and annual population data were taken from the United Nations database and linearly interpolated to provide quarterly figures as in Ludvig and Slok (2004).

[7] Exact data sources for each variable by country are available on request from the authors.

Figures 1 and 2 present the fraction of income spent on consumption for all countries in our analysis. Generally, this fraction is very stable over time: in all plots but that for Korea, the scale spans only three percentage points.

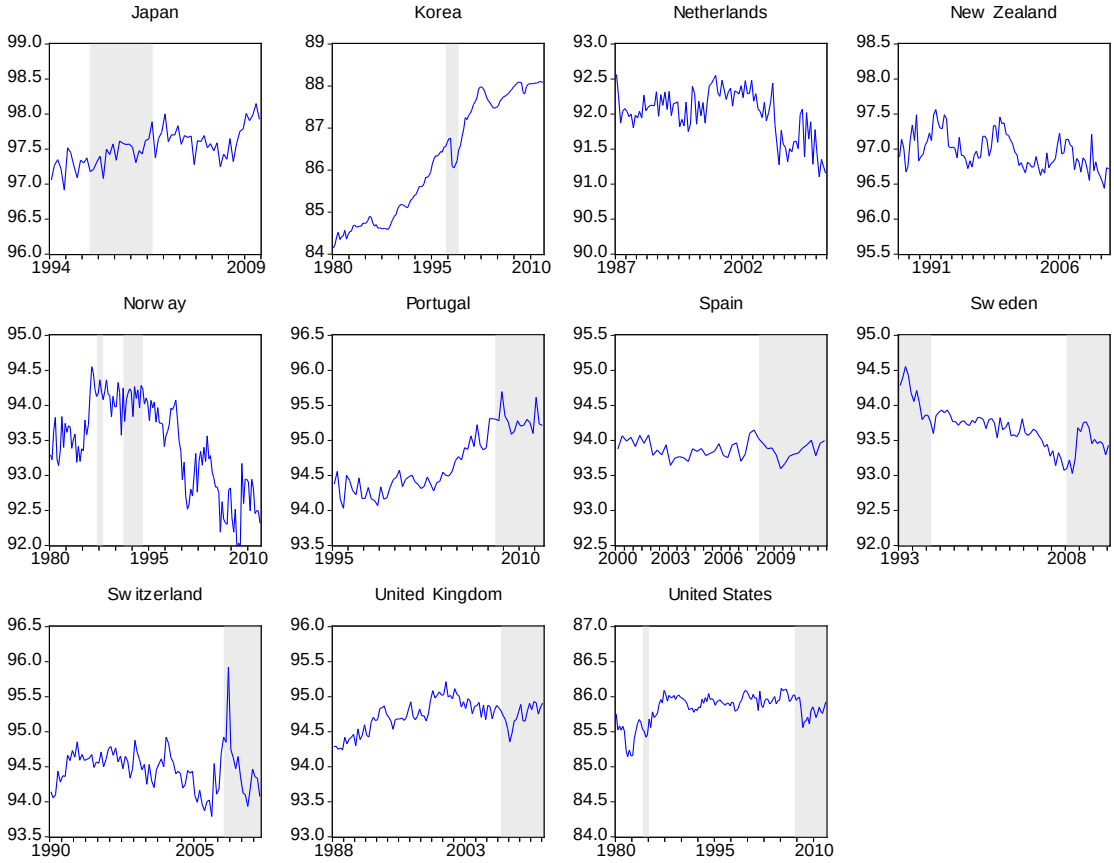
Figure 1: Percentage of disposable income spent on consumption



Note: Areas marked in grey indicate banking crises. In the regression, we control for the effect of banking crises, crises after credit booms and crises after house price booms.

In the figures, the periods of banking crises are marked in grey (the regressions below also consider crises after credit and house price booms; these are not marked separately in the graphs). It can be seen that in many instances, the consumption share of income rose during crises. To the extent that income declines during crises, this suggests consumption smoothing. Declines in consumption relative to income, which would suggest binding credit constraints, are rare. Only in Korea do we observe a clear drop, and there are slight declines after 2007 in Spain, the United Kingdom and the United States.

Figure 2: Percentage of disposable income spent on consumption (continued)



Note: Areas marked in grey indicate banking crises. In the regression, we control for the effect of banking crises, crises after credit booms and crises after house price booms.

3.3 Wealth

In our baseline regressions, we proxy housing wealth by using national house price data from the Bank for International Settlements (BIS) and supplemented by data from the Federal Reserve Bank of Dallas where unavailable through the BIS. This approach is not ideal, since housing wealth depends both on house prices and the housing stock. By using price indices, we implicitly assume constant quantities, but are able to cover a wide range of countries. As a robustness check we use housing wealth data compiled by NISER for a smaller set of countries, which accounts for changes in the stock of houses. The broad results turn out not to depend on the exact series used.[8]

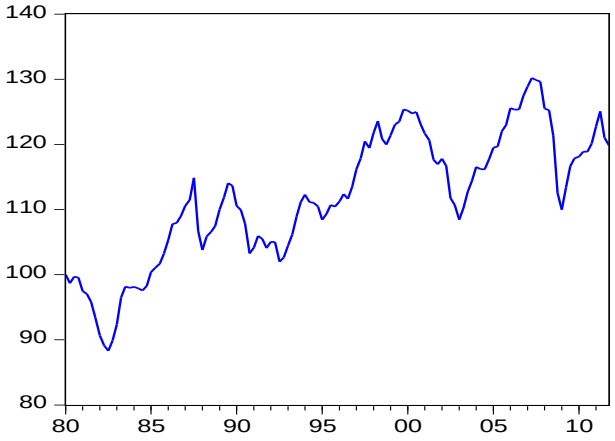
Non-housing wealth ("financial wealth") is captured in our baseline regressions using stock price indices, which are taken from the IMF's IFS. However, portfolio diversification means

[8] In the NiGEM database 2013, consumption and personal disposable income are in real terms. Financial wealth is measured as net wealth in the personal sector and housing wealth is the value of the housing stock. See NISER (2013) for more details.

that most investors do not only hold domestic assets, but also invest abroad, and our first regression in Table 2 below indeed shows no wealth effect from domestic financial wealth. We therefore construct a global measure of stock prices.

This measure of global financial wealth, shown in Figure 3, is the first principal component of the logarithm of national stock price indices. It is derived from an analysis based on the correlations of the national stock price indices, since these are of different scales. The first principal component, computed over the full sample, explains 69.9% of the common variation in the national series.[9] The global wealth series shown in Figure 3 is adjusted to take into account that the data coverage varies between countries. In particular, we adjust the country weights obtained from the full sample analysis so that they sum to 100 for each year in the sample.[10]

Figure 3: Measure of global financial wealth (1980Q1 = 100)



Note: First principal component (based on correlations) from national stock price indices.

Our robustness check using NISER data uses an alternative financial wealth variable that takes international portfolio composition into account. The results are robust to this change in data.

Appendix 1 shows the national data on consumption, income, financial wealth and housing wealth. As discussed in Section 4 below, we estimate the consumption function using a mean-group estimator, not a panel, because preliminary regressions suggested that a panel

[9] The cumulative explanatory power increases to 91.2% for the second principal component and to 96.8% for the third. To keep the cointegrating relationship estimated below compact, we concentrate on the first component only.

[10] Thus, in 1980Q1, where we only have financial wealth data for Australia, Canada, France, Korea, Norway and the United States, the weights of which in the first principal component sum to 1.17, the original weight for Australia, which is 0.21, is scaled up to 100*0.21/1.17=17.9. Proceeding in the same way for the other five countries, we obtain adjusted weights that sum to 100. When the Dutch data become available, in 1987Q1, the weight adjustment is redone. This procedure ensures that the global wealth series does not jump each time a new country enters the sample.

imposes too much structure on the data. We therefore do not present panel unit root and cointegration tests. Instead, we perform this analysis country by country, again in Appendix 1. The hypothesis of a unit root is not rejected in most cases.

Country-by-country Johansen tests using a lag length determined by the Schwarz criterion and assuming a deterministic trend in the data indicate evidence of no cointegrating relationship in the majority of cases (seven times). This may be due to the relatively short sample periods available. In those cases where there is a rejection, most frequently it is for the hypothesis of no cointegrating relationship (six times). This can be interpreted as suggesting the presence of one cointegrating vector, particularly since the hypothesis of at most one cointegrating relationship is rejected only twice.[11] Finally, since the Schwarz information criterion for a VAR consisting of the variables in equation (1) most frequently suggests a lag length of one, we use one lag in our regressions below.

3.4 Debt variables

Given that financial crises by their nature cause considerable difficulties for financial intermediation, an interesting aspect that we wish to explore is how credit markets interact with consumption decisions during financial crises. To capture these effects, we include a number of debt variables that might impact on consumption dynamics. The first of these is credit growth. Bacchetta and Gerlach (1998) find that high credit growth seems to raise consumption growth. It is possible that during financial crises, subdued credit growth, which may result from credit rationing, may have a particularly strong impact on consumption. We test for this possible impact of credit constraints by interacting the growth in private sector credit with a crisis dummy. Quarterly private sector credit data are taken from the IMF IFS database.

While credit growth as in Bacchetta and Gerlach (1998) may alleviate credit constraints, a high level of household leverage might act as a drag on consumption, as noted by Barrell et al (2006). We therefore initially examined whether the debt-to-income ratio is particularly important during crises. However, this variable was never significant, and we therefore do not report the results here.

Finally, we follow Aron et al (2012), who argue that a high interest-rate burden of debt relative to income may depress consumption. This may be particularly true during crises. The interest burden is computed as the product of the debt-to-income ratio and the main discount rate.[12] Concerns about multicollinearity make us use the interest burden ratio only in regressions that exclude credit growth.

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[11] We reject the hypothesis of at most two cointegrating relationships three times. There is one rejection for at most three cointegrating vectors, and four for at most four.

[12] We use the discount rate in this calculation as money market rates, lending rates and longer-term rates were unavailable for the broad and varied sample that we use.

4. Methodological approach

4.1 Error-correction formulation

Following standard treatment in the literature (Ludwig and Slok, 2004; Carroll et al., 2011), our empirical strategy assumes that consumption in the long run depends on income and wealth as follows:

$$c_t = \alpha + \beta_y y_t + \beta_f fw_t + \beta_h hw_t + \varepsilon_t \qquad (1)$$

where c_t is the logarithm of per capita aggregate consumption, y_t the log of personal disposable income per capita, fw_t the log of non-housing financial wealth and hw_t the log of housing wealth.

The permanent income hypothesis would lead us to expect a long-term parameter value for the marginal propensity to consume out of income (β_y) of close to unity. However, the inclusion of wealth variables that also grow over time leads in the literature to estimates of β_y that are lower. The marginal propensity to consume out of financial wealth (β_f) is expected to be positive and significant. Regarding the marginal propensity to consume out of housing wealth (β_h), there is ambiguity in the literature as noted.

In the short run, all of the variables in equation (1) may in principle respond to disequilibria in the long-run relationship. We account for this by estimating the long-run relationship in a first step using fully modified ordinary least squares (and dynamic ordinary least squares as a robustness check). This approach allows for a response of all variables. In a second step, we concentrate on the short-run response of consumption to disequilibria in the long-run relationship and to changes in the other variables.[13] We also include the lagged change in consumption. Denoting the error-correction term resulting from the long-run relationship by $ec_{t-1} = c_{t-1} - \beta_y y_{t-1} - \beta_f fw_{t-1} - \beta_h hw_{t-1}$, we estimate

$$\Delta c_t = constant + a\, ec_{t-1} + b_c \Delta c_{t-1} + b_y \Delta y_{t-1} + b_{fw} \Delta fw_{t-1} + b_{hw} \Delta hw_{t-1} + e_t \qquad (2)$$

It should be noted that we lag the changes in the other variables in this equation. We do this to account for potential simultaneity. If for instance income also responds to disequilibria, including the current change in income would bias our estimates. Ideally, we would include the current change in income and instrument it, but the panel considerations discussed next make this approach impossible.

[13] This approach is also chosen by Kumar and Rao (2012).

4.2 Panel considerations

We use a panel of 23 countries over 32 years to work with a dataset that contains enough observations during financial crises to answer the question of whether or not crises change consumption dynamics.

One of the main issues that requires attention in a cross-country panel data setting is how much similarity to assume across countries. We initially estimated our model using a fixed-effect panel to capture time-invariant country-specific heterogeneity, but it turns out that the results obtained from this method are often implausible and sensitive to small changes in the specification. This is also the case when using a pooled mean-group estimator as in Pesaran et al (1997), which assumes identical long-run coefficients across countries but allows short-run dynamics to differ. We therefore impose as few coefficient restrictions across countries as possible. We use a mean-group estimator (Swamy, 1971), which allows coefficients differ between countries, but assumes that they are drawn from the same distribution.

Allowing for such variation between countries is not standard in the literature on consumption panels, where authors typically impose cross-country coefficient restrictions. For instance, Barrell et al. (2006) use panel GLS with fixed effects and thus impose common coefficients across countries. Ludwig and Slok (2004) use the pooled mean-group estimator of Pesaran et al. (1999), which pools long-run relationships between countries, while short-run dynamics are allowed to vary by country.

Appendix 2 presents consumption function estimates obtained using a fixed-effects panel and a pooled mean-group estimator. It appears that forcing the long-run coefficients across countries to be the same leads to estimates that attribute the effect of financial crises to the long rather than the short run. Arguably as a result, we obtain coefficients which are not intuitive. More disturbingly, we find no response in normal times to disequilibria in the long-run relationship in the pooled mean-group estimates, and an explosive behaviour of consumption growth if the fixed-effect panel approach is chosen. Given those results, we prefer the more general mean-group approach.

4.3 The impact of financial crises

To test whether financial crises depress consumption by more than the crisis-specific drop in income would suggest we include a dummy for financial crises, both on its own and interacted with all variables capturing the dynamics of consumption. There are four hypotheses to test.

> **Hypothesis 1:** The long-run relationship between consumption, income and wealth is unchanged during financial crises. Since crises are by definition temporary, we do not expect to see a change here.
>
> **Hypothesis 2:** The speed with which deviations from the long-run equilibrium disappear decreases during financial crises. If financial disruptions make

consumption smoothing more difficult, the adjustment to disequilibria may become slower.

Hypothesis 3: The short-run dynamics of consumption change during financial crises. Consumption growth may be generally lower, or it may respond differently to income and wealth changes than in normal times. If income growth falls, consumption growth might decline by more than normal during the crisis. A similarly stronger response is possible for changes in wealth. One particular channel we would like to examine regards the housing collateral effect. If house prices decline during a crisis, households have less collateral. Thus, a significant impact of housing wealth during crisis periods could be seen as evidence of credit constraints.

Hypothesis 4: Debt dynamics matter more during crises. Low credit growth, which we use in the baseline configuration, may depress consumption growth. High debt levels and a high interest-rate burden could have the same effect.

To preview the results presented next, we find evidence for Hypotheses 1 and 3, and the main results detected for Hypothesis 3 is a generally lower growth rate of consumption. There is some evidence that income growth affects consumption growth differently during crises, but no significantly different impact of wealth. We now present these results in detail.

5. Empirical results

5.1 Results

We now turn to estimating consumption functions. Based on the single-country cointegration tests, we assume one cointegrating vector and include one lag. To take into account that consumption, income and wealth may respond to disequilibria in the long-run relationship, we first estimate a cointegrating vector alone, without considering the short-run dynamics, using a fully modified OLS (FMOLS) and a dynamic OLS (DOLS) approach for panel data. The long-run relationship established in this way does not assume that only consumption responds to disequilibria, but allows all variables to react. We then use the residual from this relationship as error-correction term in an evaluation of the short-term dynamics of consumption.[14]

Table 2 shows the estimates of the long-run relationship

$$c_{it} = \beta_y y_{it} + \beta_f fw_{it} + \beta_h hw_{it} + \varepsilon_{it} \qquad (3)$$

[14] We also computed short-run responses for income and wealth. It appears that income responds to disequilibria in the long-run relationship, while wealth does not. The results are available from the authors on request.

fitted using a fully modified OLS mean-group estimator. Table 3 shows the dynamic OLS estimates. In both estimations, we choose the number of leads and lags optimally using the Schwarz criterion.

We estimate a long-run income elasticity of consumption of 0.69 both using FMOLS and DOLS. We clearly reject that this coefficient equals unity, as implied by the permanent income hypothesis. However, this finding is common in the literature and due to the inclusion of over trending variables. If we only include consumption and income, the income elasticity rises to 0.81 using FMOLS and to 0.88 using DOLS.

There is no significant financial wealth effect if we use domestic stock prices as our proxy for financial wealth. The housing wealth effect is estimated to be 0.05 in both panels, but it is significant only in the FOMLS approach. This implies that if stock prices increase by one percentage point, consumption rises by 0.05 basis points. This effect is close to standard estimates in the literature.

The second column includes our measure of global financial wealth. We find this to be significant with the expected positive sign, suggesting a wealth effect also from non-housing assets. Since the principal components approach used to compute this measure of global wealth involves normalisations at different stages, it is difficult to interpret the size of this coefficient.

In the third column, we drop domestic financial wealth and interact the other variables with the banking crisis dummy. Significant coefficient estimates would suggest that the long-run relationship between consumption and the other variables changes in times of crisis. However, none of the interactions are significant, suggesting that Hypothesis 1 is not rejected. In what follows, we therefore use the same long-term relationship between consumption, income, global financial wealth and housing wealth both for crisis and non-crisis times. The estimates of this relationship are given in the last column of Tables 2 and 3.

Table 2: Long-run relationship (fully modified OLS estimates)				
Variable	Baseline	Two types of wealth	Banking crises	Reduced model
Long-run coefficients				
Income	0.693***	0.693***	0.693***	0.661***
Domestic financial wealth	0.003	-0.008		
Global financial wealth		6.04 x10-4**	7.45 x10-4***	5.04x10-4***
Housing wealth	0.048***	0.075***	0.012	0.043***
Additional long-run effects during banking crises				
Banking crisis			-1.511	
Income			-0.207	
Global financial wealth			0.002	
Housing wealth			0.720	

Note: Mean-group estimates of equation (3), using an unbalanced panel of 1841 observations with 23 cross-sections, covering 1981Q2 to 2011Q4, choosing the number of leads and lags in the dynamic OLS procedure using the Schwarz criterion.

Table 3: Long-run relationship (dynamic OLS estimates)				
Long-run coefficients				
Income	0.694***	0.723***	0.713***	0.682***
Domestic financial wealth	0.006	-0.003		
Global financial wealth		5.26 x10-4*	5.35 x10-4***	4.98 x10-4**
Housing wealth	0.046	0.060***	-1.41 x10-4	0.038**
Additional long-run effects during banking crises				
Banking crisis			-1.859	
Income			0.071	
Global financial wealth			1.09 x10-4	
Housing wealth			0.031	

Note: Mean-group estimates of equation (3), using an unbalanced panel of 1841 observations with 23 cross-sections, covering 1981Q2 to 2011Q4, choosing the number of leads and lags in the dynamic OLS procedure using the Schwarz criterion.

From this long-term relationship, we construct an error-correction term, $ec_{it} = \varepsilon_{it}$, that captures the deviations of consumption from the long-run equilibrium.[15] In what follows, we concentrate on the FMOLS specification. However, the results are very similar if we use an

[15] If we use the crisis dummy for credit or house price booms, we also do not identify a long-run impact on consumption. The error-correction term constructed from Table 2 thus is appropriate for all three cases.

error-correction term constructed from the DOLS estimates instead (the two series have a correlation of 0.99).

To estimate the short-run adjustments to disequilibria, we augment equation (2) by including lagged credit growth to capture potential credit market disruptions. We also interact all variables with a dummy variable capturing banking crisis, to assess if there are changed dynamics during those times. Thus, we fit

$$\Delta c_{it} = constant + a\, ec_{it-1} + B\Delta X_{it-1} + bc + a_{bc} bc \times ec_{it-1} + B_{bc} bc \times \Delta X_{it-1} + e_{it} \quad (4)$$

where $\Delta X_{it} = [\Delta c_{it} \quad \Delta y_{it} \quad \Delta f w^*_{it} \quad \Delta h w_{it} \quad \Delta credit_{it}]$ and bc is the dummy variable for banking crises.

Table 4 shows the results obtained using a mean-group estimator. The first column presents the unrestricted estimation. It can be seen that consumption growth seems to respond to disequilibria in the long-run relationship. Thus, if consumption last period was high relative to income and wealth, it grows more slowly next period. Consumption growth tends to be lower if it was high the previous quarter, and if income growth was high. By contrast, higher wealth growth seems to raise consumption growth the following quarter.

It is worthwhile dwelling on the negative sign on income growth. In normal times, if income growth was high in one quarter, consumption growth does not only not respond, which would be optimal if short-run movements in income were seen as temporary, but it seems to decrease. This is somewhat puzzling. One potential interpretation is cautious behaviour on part of households, perhaps fed by the idea that periods of high growth tend to be followed by declines. If households are concerned about credit constraints arising during downturns, accumulating buffer-stock savings (see e.g. Deaton, 1991, and Carroll, 1992) is an optimal response.

Turning to the question of whether or not consumption evolves differently during banking crises, the findings in the first column suggest no change. In the second column, we have shrunk the system by successively dropping the most insignificant variable. We do not find a significant coefficient on the interaction between the error-correction term and the crisis dummy. This means that we reject Hypothesis 2.

We do find that consumption growth tends to be lower than normal during banking crises, as evidenced by the significant crisis dummy. This can be taken as evidence in favour of Hypothesis 3. Moreover, while lagged income growth seems to have a negative impact on consumption growth in normal times, the sign reverses. Compared with normal times, consumption growth thus moves with income growth during banking crises. While this may suggest the emergence of credit constraints, this effect is not strong: a formal Wald test does not reject the hypothesis that the sum of the coefficients on income growth in the normal case and during crises equals zero (p-value of 0.24).

Finally, as regards Hypothesis 4, there is no evidence of a changed role of credit growth during crises in Table 4.

The last two columns replace credit growth with our measure of interest-rate burden. In contrast to credit growth, this variable is significant (though it does not seem to have any additional impact during crisis times). We find that consumption growth tends to be low in countries with a high interest-rate burden. Using this specification, we identify only a significant impact of the dummy during crisis times.

Table 4: Consumption function estimates controlling for banking crises

	Unrestricted (using credit growth)	Restricted (using credit growth)	Unrestricted (using interest-rate burden)	Restricted (using interest-rate burden)
Short-run coefficients				
Constant	-0.143	-0.069	-0.088	-0.052
ec_{it-1}	-0.082***	-0.070***	-0.115***	-0.097***
Δc_{it-1}	-0.207***	-0.171***	-0.222***	-0.182***
Δy_{it-1}	-0.034*	-0.040*	-0.053***	-0.043**
Δfw^{*}_{it-1}	6.8x10^{-4}*	0.001***	0.000	0.001***
Δhw_{it-1}	0.060**	0.078***	0.054**	0.050**
$\Delta credit_{it-1}$	0.014			
$interest\ burden_{t-1}$			-0.054**	-0.042*
Additional short-run effects during banking crises				
Banking crisis	1.172	-0.005***	1.301	-0.005***
ec_{it-1}	-0.043		0.025	
Δc_{it-1}	0.040		0.188	
Δy_{it-1}	-0.246	0.096*	-0.288	
Δfw^{*}_{it-1}	0.001		0.002	
Δhw_{it-1}	0.270		0.005	
$\Delta credit_{it-1}$	-0.029		-0.591	
$interest\ burden_{t-1}$			-0.088	

Note: Mean-group estimates of equation (4), using an unbalanced panel of 1732 (1833 if interest-rate burden is used) observations with 23 cross-sections, covering 1981Q1 to 2011Q4.

Tables 5 and 6 present results that concentrate on crises that follow credit and house price booms, respectively. We find very similar patterns: the short-run coefficients suggest no role for credit growth but a significant reduction in consumption growth in response to a high interest-rate burden. During crises, consumption growth is lower, and income growth has a significant positive impact on consumption growth.[16] It is notable that the impact of the

[16] In Table 5, in the regression using credit growth, income growth does not appear to impact on consumption growth during normal times, so that the significant positive coefficient estimate for crisis periods is unambiguous. If we use the interest burden, income growth has a significant negative sign during normal times and a significant negative sign during crises. The Wald test for the sum of

crisis dummy is largest for banking crises, followed by crises after credit booms and crises after house price booms. This may indicate that households' ability to smooth consumption is most affected if the banking system is in difficulties.

Table 5: Consumption function estimates controlling for credit boom crises				
	Unrestricted (using credit growth)	Restricted (using credit growth)	Unrestricted (using interest-rate burden)	Restricted (using interest-rate burden)
Short-run coefficients				
Constant	-0.102	-0.030	-0.489	-0.022
ec_{it-1}	-0.071***	-0.060***	-0.101***	-0.099***
Δc_{it-1}	-0.189***	-0.203***	-0.199***	-0.182***
Δy_{it-1}	-0.028		-0.047***	-0.050**
Δfw^{*}_{it-1}	0.001***	0.001***	0.001**	0.001***
Δhw_{it-1}	0.074***	0.076***	0.054**	0.062***
$\Delta credit_{it-1}$	0.001			
$interest\ burden_{t-1}$			-0.049**	-0.043*
Additional short-run effects during credit crises				
Credit crisis	1.154	-0.004***	0.958	-0.003**
ec_{it-1}	-0.065		-0.012	
Δc_{it-1}	0.105		0.103	
Δy_{it-1}	-0.245	0.061*	-0.289	0.076*
Δfw^{*}_{it-1}	0.001		0.002	
Δhw_{it-1}	0.202		0.134	
$\Delta credit_{it-1}$	-0.015			
$interest\ burden_{t-1}$			-0.554	

Note: Mean-group estimates of equation (4), using an unbalanced panel of 1732 (1833 if interest-rate burden is used) observations with 23 cross-sections, covering 1981Q1 to 2011Q4.

these two coefficients equalling zero yields a p-value of 0.50. In Table 6, the same test yields a p-value of 0.28.

Table 6: Consumption function estimates controlling for housing boom crises				
	Unrestricted (using credit growth)	Restricted (using credit growth)	Unrestricted (using interest-rate burden)	Restricted (using interest-rate burden)
Short-run coefficients				
Constant	-0.119	-0.035	-0.060	-0.024
ec_{it-1}	-0.077***	-0.058***	-0.102***	-0.097***
Δc_{it-1}	-0.189***	-0.188***	-0.199***	-0.175***
Δy_{it-1}	-0.022		-0.043**	-0.050**
Δfw^{*}_{it-1}	0.001**	0.001***	0.001*	0.001***
Δhw_{it-1}	0.070***	0.076***	0.051**	0.062***
$\Delta credit_{it-1}$	-2.6x10^{-4}			
$interest\ burden_{t-1}$			-0.045**	-0.038*
Additional short-run effects during housing crises				
Housing crisis	0.142	-0.003**	0.443	-0.003***
ec_{it-1}	0.094*		0.076	
Δc_{it-1}	-0.128		0.145	
Δy_{it-1}	0.040		0.073	0.129*
Δfw^{*}_{it-1}	-2.2x10^{-5}		-0.000	
Δhw_{it-1}	0.019		-0.207	
$\Delta credit_{it-1}$	0.058			
$interest\ burden_{t-1}$			-0.031	

Note: Mean-group estimates of equation (4), using an unbalanced panel of 1732 (1833 if interest-rate burden is used) observations with 23 cross-sections, covering 1981Q1 to 2011Q4.

5.2 Robustness checks

This section presents three robustness checks. The first considers the role of house ownership. It is possible that the house prices have a larger effect on consumption in economies with high ownership rates, and we test if our findings are robust to taking this into account. The second robustness check addresses the problem that we proxied housing wealth using house prices and financial wealth using stock price indices and uses alternative data available for a smaller set of countries. The third robustness check examines the possibility that our binary crisis indicator may not capture the severity or duration of each episode well enough.

Table 7 presents consumption function estimates in which we have multiplied the housing variable by the ownership rate in each country.[17] This means that we attach less weight to housing wealth in economies with low ownership. The table reports the restricted estimates for the three types of crises.

[17] These data are taken from the European Mortgage Federation, the Swiss Bundesamt für Wohnungswesen and, for the remaining countries, which are Australia, Denmark, Japan, Korea and New Zealnd, Wikipedia.

We again find the largest impact for the banking crisis dummy, while the impact of crises after credit booms and after house price booms now seems equally large. There again is a sign reversal for income growth. However, and also as before, we do not reject that the sum of the two coefficients on income growth equals zero (p-values of 0.40, 0.63 and 0.32, respectively). It thus appears that controlling for house ownership does not change our main findings.

Table 7: Controlling for house ownership			
Long-run coefficients (fully modified OLS estimates)			
Income	0.654***		
Financial wealth	5.8 x10^{-4}***		
Housing wealth	4.1x10^{-4}*		
	Banking crises	Credit crises	Housing crises
Short-run coefficients			
Constant	-0.042	-0.014	-0.017
ec_{it-1}	-0.110***	-0.106***	-0.104***
Δc_{it-1}	-0.132***	-0.157***	-0.149***
Δy_{it-1}	-0.069***	-0.061***	-0.059***
Δfw_{it-1}		0.001***	0.0001***
Δhw_{it-1}	0.001*	0.001***	0.001***
$interest\ burden_{t-1}$	-0.059*	-0.046*	-0.041*
Additional short-run effects during crises			
Crisis	-0.005***	-0.003**	-0.003***
ec_{it-1}			
Δc_{it-1}			
Δy_{it-1}	0.101**	0.080*	0.134*
Δfw_{it-1}			
Δhw_{it-1}			

Note: Restricted mean-group estimates of equation (4), but excluding credit growth, using an unbalanced panel of 1061 observations with 14 cross-sections, covering 1981Q1 to 2012Q3.

Turning to alternative wealth data, we present in Table 8 consumption function estimates based on wealth data from NISER that take quantities and portfolio composition properly into account. The drawback of these data is that they are available for only 14, rather than 23 countries.[18] Moreover, we drop credit growth from the regression, since it is available only for three of our countries in the NiGEM database. We use the same starting year as before, 1981, and include all available data, which in some cases run until 2012Q3. The table presents the restricted estimates, obtained by successively dropping the most insignificant variable.

[18] The countries include from the NiGEM dataset are: Australia, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Netherlands, Sweden, Spain, UK, US.

As before, income, financial and housing wealth appear to matter for consumption in the long run. In the short-run, there is adjustment to disequilibria in the long-run relation, and a clear impact of changes in housing and non-housing wealth. We only find consumption growth to be lower during credit crises; banking crises and crises after house price booms do not appear to have a significant impact. This may be due to the smaller size of the data set used in Table 8, which by construction contains fewer crisis episodes.

Table 8: Using NISER data			
Long-run coefficients (fully modified OLS estimates)			
Income	0.840***		
Financial wealth	0.028***		
Housing wealth	0.062***		
	Banking crises	Credit crises	Housing crises
Short-run coefficients			
Constant	0.004***	0.006***	0.004***
ec_{it-1}	-0.055**	-0.060*	-0.055**
Δc_{it-1}			
Δy_{it-1}			
Δfw_{it-1}	0.029***	0.047***	0.029***
Δhw_{it-1}	0.092***		0.092***
Additional short-run effects during crises			
Crisis		-0.001*	
ec_{it-1}			
Δc_{it-1}			
Δy_{it-1}			
Δfw_{it-1}			
Δhw_{it-1}			

Note: Mean-group estimates of equation (4), but excluding credit growth, using an unbalanced panel of 1061 observations with 14 cross-sections, covering 1981Q1 to 2012Q3.

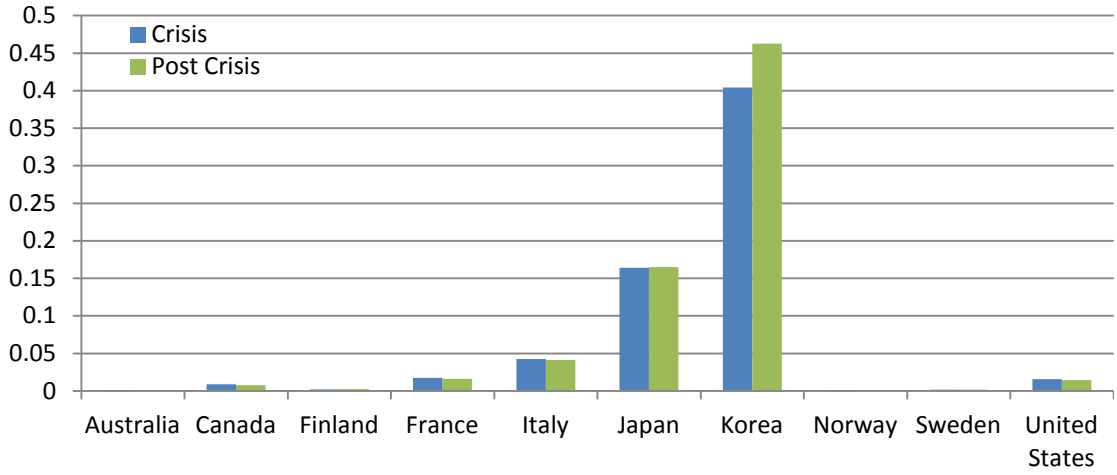
We now turn to our last concern, namely that our binary indicator for a crisis may not appropriately capture the severity or duration of each episode. Since it is possible that consumption dynamics during crises depend on the crisis severity and duration, our model may not provide enough insight into crisis-specific effects. Moreover, credit constraints might matter more during the recovery than in the actual crisis.

To try and evaluate whether or not these concerns are valid, we compute for each country the mean residual during crises and the mean residual in the first three years after the end of each crisis. These are presented in Figure 4.[19] There does not appear to be any systematic increase in the residuals in post-crisis periods. This suggests that our main model does not

[19] It should be noted that the residuals presented in Figure 4 do not include data on the 2007 crisis, which was still ongoing in many countries when our data end.

neglect any important effect, as might for instance arise from credit constraints, during the recovery phase after financial crises.

Figure 4: Mean values of squared residuals for crisis and post-crisis periods



Note: Based on residuals of the main system presented in Table 4.

6. Conclusions

This paper uses a panel of 23 countries of 32 years to examine aggregate consumption behaviour during financial crises. We find that consumption growth is lower during banking crises and crises following credit and house price booms. There is some evidence that income growth has a stronger impact on consumption in the short run during crises. This may represent credit constraints. Credit growth itself is not found to matter, while a high interest-rate burden of debt depresses consumption growth both in normal and crisis times.

In the long run, the evidence supports the notion that consumption evolves in line with income and financial wealth. These results are robust as long as a mean-group estimator is chosen. Standard panel techniques, which enforce equal coefficients across countries, seem too restrictive and yield counterintuitive results.

Overall, it appears that financial crises reduce consumption growth temporarily. The dynamic response of consumption to wealth appears unchanged, while income tends to matter slightly more. This suggests a weak role of credit constraints, while in non-crisis periods households successfully smooth consumption. To the extent that consumption declines during crises, this seems due to the unusually large size of the shock, rather than to changed consumption dynamics.

Appendix

Appendix 1: Country results

This appendix first presents the data by country (Figure A1 and A2). Table A1 presents unit roots tests by country, tests for the optimal lag length and results from Johansen cointegration tests. The results of these are discussed in the main text.

Figure A1: Consumption and income, real and per capita (first observation = 100)

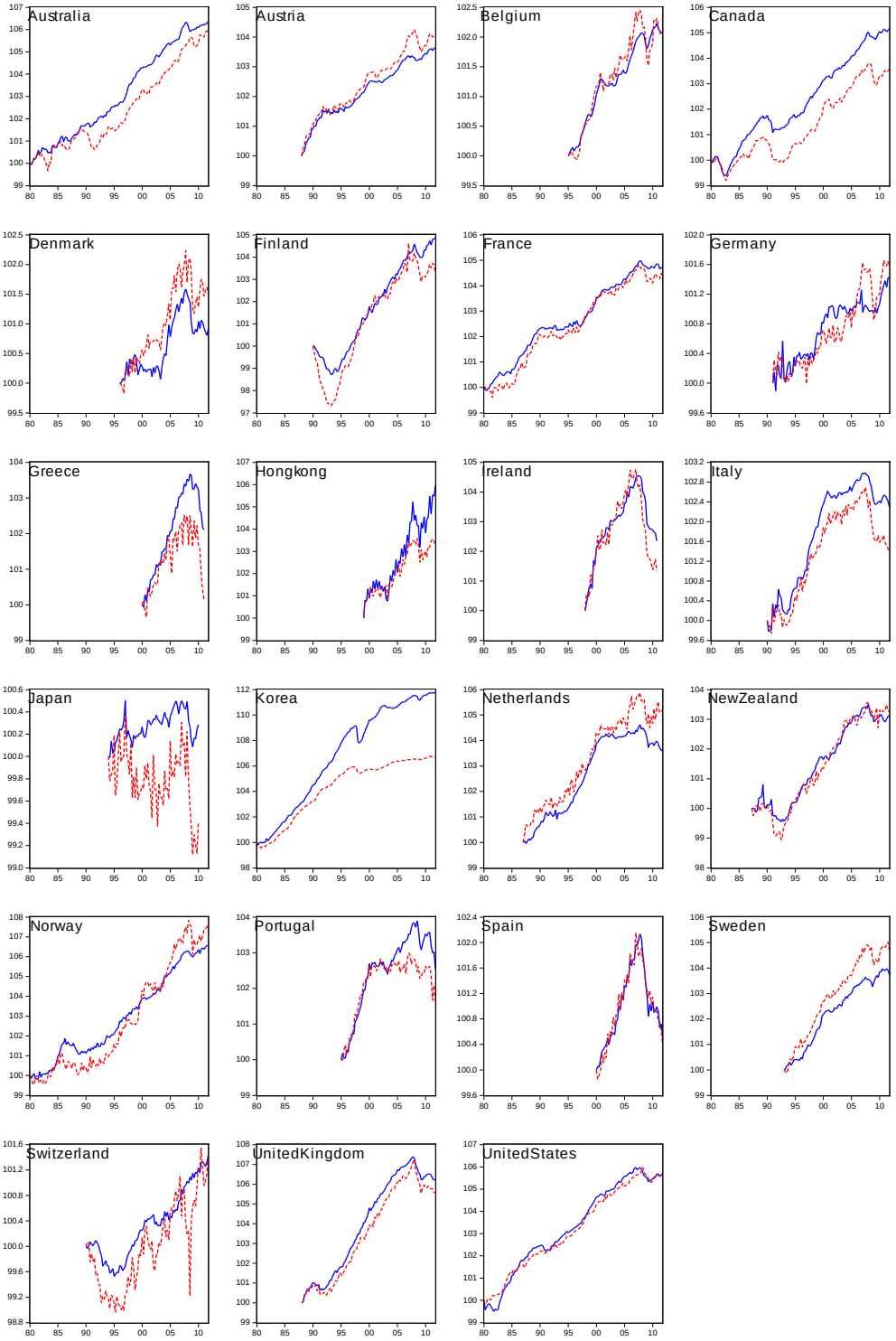
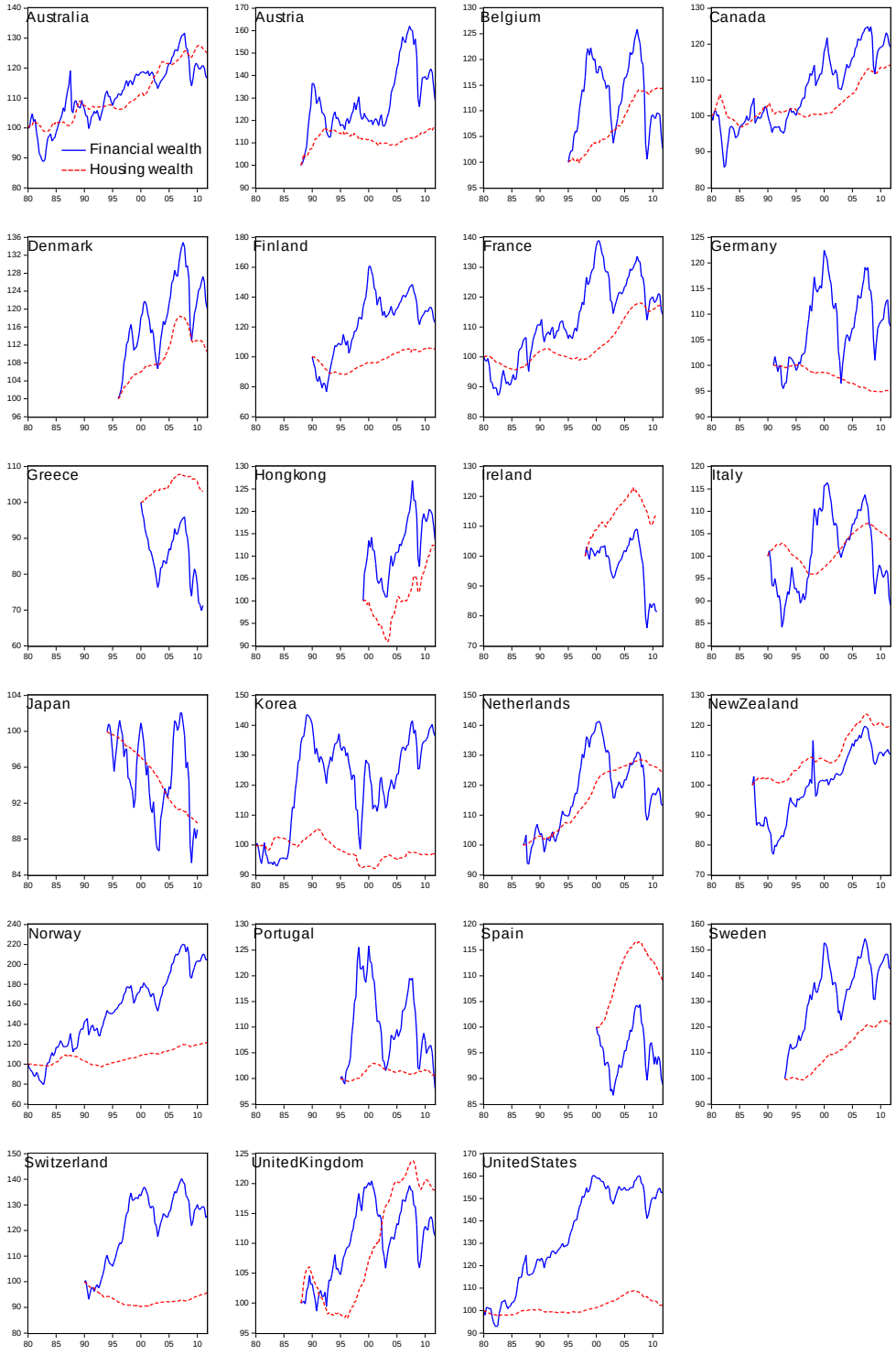


Figure A2: Domestic financial wealth and housing wealth, first observation normalised to 100



Note: Domestic financial wealth as proxied by the domestic stock market index, housing wealth as proxied by the national house price index.

Table A1: Individual country tests						
	Unit root tests (augmented Dickey Fuller test, p-value on null of a unit root)				Lag length	Johansen test Rejected number of hypothesised cointegrating relations
	Consumption	Income	Financial wealth	Housing wealth	SIC criterion	Trace statistic/maximum eigenvalue
Australia	0.938	0.989	0.522	0.920	1	No rejection
Austria	0.729	0.469	0.107	0.408	2	One
Belgium	0.543	0.514	0.135	0.870	1	No rejection
Canada	0.984	0.934	0.591	0.928	2	No rejection
Denmark	0.544	0.518	0.063	0.243	2	No rejection
Finland	0.994	0.915	0.446	0.691	1	One
France	0.518	0.558	0.478	0.794	2	One
Germany	0.805	0.724	0.222	0.954	1	No rejection
Greece	0.151	0.284	0.402	0.358	1	None
Hong Kong	0.942	0.646	0.245	0.872	1	None
Ireland	0.034	0.292	0.583	0.366	1	One
Italy	0.132	0.567	0.482	0.105	2	No rejection
Japan	0.046	0.021	0.111	0.890	1	One
Korea	0.319	0.020	0.300	0.530	2	Three
Netherlands	0.197	0.486	0.417	0.425	1	None
New Zealand	0.896	0.910	0.725	0.834	2	None
Norway	0.975	0.992	0.724	0.922	2	No rejection
Portugal	0.068	0.021	0.301	0.042	1	Three
Spain	0.348	0.588	0.388	0.003	1	Three
Sweden	0.406	0.261	0.131	0.596	1	No rejection
Switzerland	0.994	0.867	0.423	0.231	1	Two
United Kingdom	0.654	0.562	0.254	0.878	1	Three
United States	0.135	0.464	0.522	0.149	2	None

Note: Johansen tests with lags determined by the Schwarz criterion, assuming a deterministic trend in the data.

Appendix 2: Alternative panel estimation methods

Table A2 compares the consumption function estimates obtained under different panel assumptions. We show in the first column the output obtained using the mean-group estimator, reported in the main text. As mentioned there, allowing for cross-country differences in the coefficients seems important. The second column shows the output enforcing equal coefficients throughout, the last column the pooled mean-group estimator proposed by Pesaran et al (1999), which assumes equal coefficients only in the long run.

It should be noted that the pooled mean-group estimator does not allow the estimation of two long-run relationships in standard econometric packages. We therefore cannot establish under this procedure if the long-run relationship between consumption, income and wealth is different in crisis times and if there is a different response to disequilibria. For the mean-group and the standard panel regressions, we are able to estimate a separate long-run relationship during crisis times and a separate adjustment coefficient.

Table A2: Alternative estimation methods

	Mean-group estimator	Panel estimator, fixed effects	Pooled mean-group estimator
Long-run coefficients			
y_{it-1}	0.661**	1.170***	
fw^*_{it-1}	5.04x10^{-4}***		
hw_{it-1}	0.043***	-0.157***	
Additional long-run effects during banking crises			
Banking crisis		0.505***	
y_{it-1}		-0.009***	
fw^*_{it-1}		-0.003***	
hw_{it-1}			
Short-run coefficients			
Constant	-0.069	-0.097***	-0.083***
ec_{it-1}	-0.070***	0.045*	
Δc_{it-1}	-0.171***	-0.368***	-0.202***
Δy_{it-1}	-0.040*		-0.053**
Δfw^*_{it-1}	0.001***	0.001***	0.001***
Δhw_{it-1}	0.078***	0.093***	0.061***
$\Delta credit_{it-1}$		0.015**	0.038**
Additional short-run effects during banking crises			
Banking crisis	-0.005***	-0.005***	
ec_{it-1}		-0.100***	-0.057***
Δc_{it-1}		0.434***	
Δy_{it-1}	0.096*		0.132*
Δfw^*_{it-1}			
Δhw_{it-1}			0.171***
$\Delta credit_{it-1}$		-0.063***	-0.135**

Note: Estimates of equation (4), using an unbalanced panel of 1732 observations with 23 cross-sections, covering 1981Q1 to 2011Q4.

The results obtained from a fixed-effect panel generally seem implausible. The income elasticity of consumption is estimated to be larger than unity, there is no long-run impact of wealth, and the adjustment coefficient of consumption to disequilibria is extremely small. Enforcing identical parameters across countries thus seems to impose too much structure.

The pooled mean-group estimator yields results similar to those obtained from the standard mean-group estimator. Again, we do not find a long-run impact of housing wealth, which stands in contrast to the system estimates presented in the main text. Also again, this single-equation approach finds a role for house prices during financial crises, which is not detected in the more general system approach.

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