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Household Consumption and the Housing Net Worth Channel in Ireland

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Abstract:

The performance of the Irish economy over the period 2002-2019 varied considerably, with a credit-led boom up to 2007 being followed by a sharp fall in economic activity and house prices in the following five years. This provides a valuable sample for investigating the relevance of the housing net worth channel to consumption developments. The evidence presented here indicates the channel being active during the 2007-2012 downturn with a fall in house prices causing a decline in consumption. It does not have an impact outside that downturn. Consequently, the results add to the international evidence of how an accumulation of household debt and a downturn in house prices has a substantial adverse impact on consumption.

Keywords: housing net worth channel; consumption; household debt

JEL codes: C22, E21, R21

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1. Introduction

Since the Great Recession, a focus of macroeconomic research has been on the role that credit developments play in the economic cycle. This is particularly the case for the relationship between consumption and household wealth. Prior to the sharp downturn in economic activity in the late 2000s, studies, such as Carroll and Kimball (1996), Case *et al.* (2005), Muellbauer (2007), and Campbell and Cocco (2007), had established that the marginal propensity to consume out of household wealth, and in particular housing wealth, had a positive value.

The post-Great Recession literature has placed more emphasis on the role household debt played in the effect that changes in wealth had on consumption. In particular, the credit-driven housing net worth (HNW) channel has been shown to have a significant impact on such expenditure, as well as on other macroeconomic variables such as employment (Mian *et al.* (2013), Mian and Sufi (2014), Mian and Sufi (2017), and Mian and Sufi (2018)). It recognises that when housing is the dominant source of household wealth then mortgage credit availability can influence how that form of wealth affects economic activity and in particular how a fall in house price effects a decline in consumption. Mian *et al.* (2013) estimate the elasticity of consumption with respect to shocks in housing net worth to be between 0.6 and 0.8 during the 2006-9 downturn in the US economy. They also note that more levered households have a higher marginal propensity to consume and that "elevated private debt burdens are associated with economic downturns" (2013, p. 1688). Moreover, the marginal propensity to consume out of housing wealth is highest for durable goods and lowest for necessities such as food.

Mian *et al.* (2013), and other recent studies, such as Dynan (2012), Christelis *et al.* (2015), Le Blanc and Lydon (2019), and Baker (2018), have a cross-sectional focus and observe that differences in indebtedness across households or regions can affect the relationship between consumption and wealth shocks. Whether the relationship varies over time in response to the prevailing credit environment and whether positive or negative housing wealth shocks have differing effects has also been considered of late. Guerrieri and Iacoviello (2017), Hviid and Kuchler (2017) and de Roiste *et al.* (2021) show an asymmetrical impact on consumption depending on whether a positive or negative housing wealth shocks arises. De Roiste *et al.* (2021) emphasise how household indebtedness plays a critical role in this asymmetrical effect occurring. A precautionary savings effect or the credit collateral effect will determine how consumption responds to wealth effects with each dominating at different stages of the housing cycle. In the rising-prices phase of the cycle, the precautionary motive leads households to

retain equity gains and consumption does not respond. In contrast, during a downturn in the housing market, the credit collateral effect is prevalent and indebted households reduce their consumption. Jones *et al.* (2018) note that the precautionary savings motive will be stronger when households are uncertain about their liquidity needs, and thus consumption will be more sensitive to credit developments.

This perspective on the relationship between housing wealth, credit developments and consumption points to the experience of the Irish economy over the past twenty years or so as a case study that may corroborate, or contest, the validity of the HNW channel and the related literature outlined above. As discussed in detail in the next section, Ireland stands out internationally for the variation in credit provision, house prices and housing wealth that it has experienced since the early 2000s. As one of the initial adopters of the euro in 1999, there was a substantial increase in credit provided to Irish households during the first half of the 2000s.[1] This coincided with a sharp rise in house prices and high output growth rates. This persisted until 2007/2008 when economic conditions deteriorated and Ireland experienced a deep recession that lasted until 2012. A feature of that recession was a close-to-50 per cent fall in the level of house prices between mid-2007 and end-2012. After 2012, the Irish economy saw a sustained improvement through 2019 with a recovery in house prices also occurring.

The rise, subsequent fall and then recovery in Irish house prices over the early 2000s to late 2010s period has occurred alongside a somewhat different sequence in credit developments. Rising house prices from 2000 through 2007 were accompanied by an increasing amount of household debt outstanding. The subsequent drop in house prices from 2008 to 2012 took place at the same time as a major interruption to bank lending was occurring. The recovery in house prices and broader economic activity since 2012 has taken place against a backdrop of household deleveraging and prudent lending practices. Housing wealth has had a large share (an average of 75 per cent) of Irish household wealth over the 2002-2019 sample period considered here and household net wealth is more reliant on households' ownership of residential property compared to other western economies (Central Statistics Office, 2020). Housing wealth has also been subject to much fluctuation since the early 2000s, reflecting house price and credit developments. These features suggest that Ireland can shed further light

[1] The introduction of the euro had a significant impact on credit provision to EU households with Mian *et al.* (2017) noting that it caused a positive credit supply shock in Europe.

on how housing wealth effects and changing borrowing constraints tied to changes in the underlying collateral of the household affect personal consumption.[2]

In this paper, we then consider the impact of the HNW channel on personal consumption. In the next section, we review housing market, credit and economic developments in Ireland since the early 2000s. We highlight how at the time that a sharp downturn in the Irish housing market took effect in 2007, household debt was at a historical high and above prudential norms. Consequently, we would expect *a priori* that changes in housing net wealth during this downturn could have had an impact on household consumption at that time, in line with the findings of Mian *et al.* (2013) for that late-2000s US recession. In sections 3 and 4, we then assess the impact of the housing net worth channel on consumption and its components (durables, non-durables, and services) in Ireland during the period 2002Q2 to 2019Q4. We find that the channel has a significant impact on total consumption during the 2007-2012 downturn. The channel's impact on durables is pronounced, while it has no effect on non-durables consumption. The channel has no influence on total consumption or its components outside of the downturn. Section 5 concludes.

2. Background

House prices in Ireland began to rise steeply in the early 2000s (Figure 1, panel i) in tandem with a substantial increase in credit provided to households for house purchase (Figure 1, panel ii).[3] This sharp rise in credit reflected both deregulation and liberalisation in Ireland (see Kelly and Everett, 2004) and the Irish retail banks being able to access additional funds from abroad following the adoption of the euro. These developments were a feature of European intermediation more generally with less regulation, financial innovation and cross-border lending occurring at that time (Le Leslé, 2012; McCarthy and McQuinn, 2017). These changes allowed European financial institutions with a surplus of funds to lend to those in deficit. A consequence of the reliance on overseas funding in Ireland was a rise in the ratio of private sector credit to the domestic retail deposit base, to close to 240 percent by 2008Q3 (Figure 2, panel i). Using household disposable income as a proxy for overall output (given the well-known issues of using Irish GDP for that purpose – (see Lane (2017), FitzGerald (2018, 2020) and Honohan (2021) for more on this), the right-hand-side panel of Figure 2 shows the credit-

[2] The impact of the HNW channel on labour market developments in Ireland is considered in Cronin and McQuinn (2021).

[3] The sources of all data are outlined in Appendix 1.

to-output ratio experiencing a sharp increase through the mid-2000s, reaching a value of 10.2 in 2008Q4. Both the increase in this ratio and the gap that emerged between retail loans and retail deposits left the Irish economy vulnerable to a change in international financial conditions. When such a change occurred in 2007/8, the vulnerabilities in the Irish financial system led to a steep downturn in economic and housing market performance.[4] As Figures 1 and 2 show, both house prices and credit outstanding to households for house purchase declined sharply in the late 2000s. This continued through until about 2012. At the same time, there was a substantial deleveraging by the Irish retail banks with the ratio of total private sector credit to domestic retail deposits falling.

Figure 1. Housing and Mortgage Variables: 2002Q2 – 2019Q4

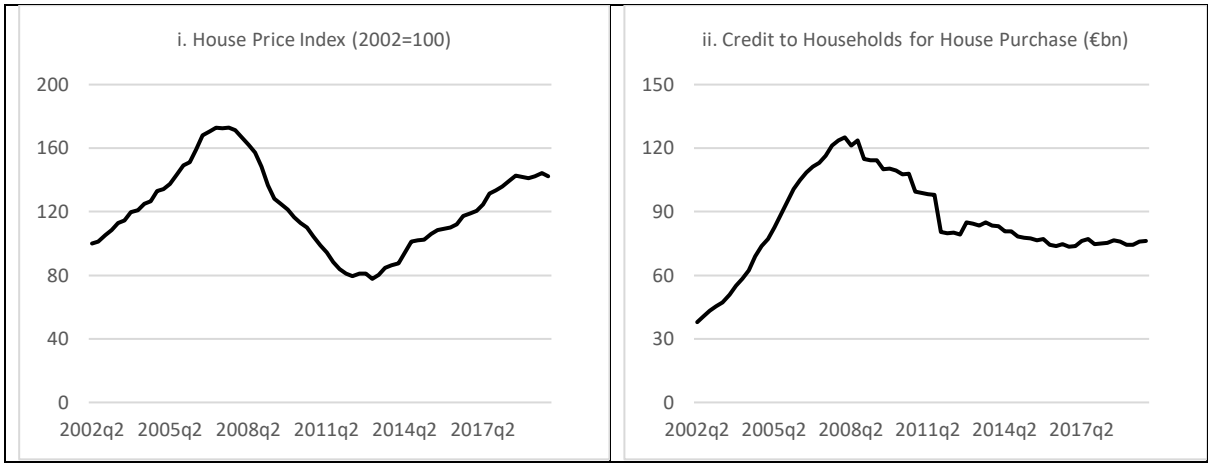
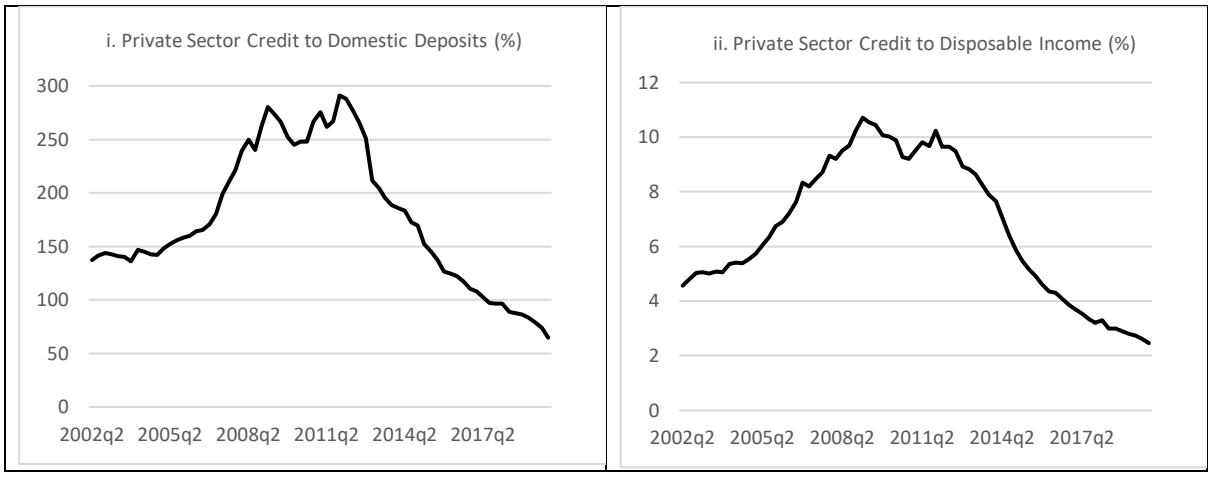


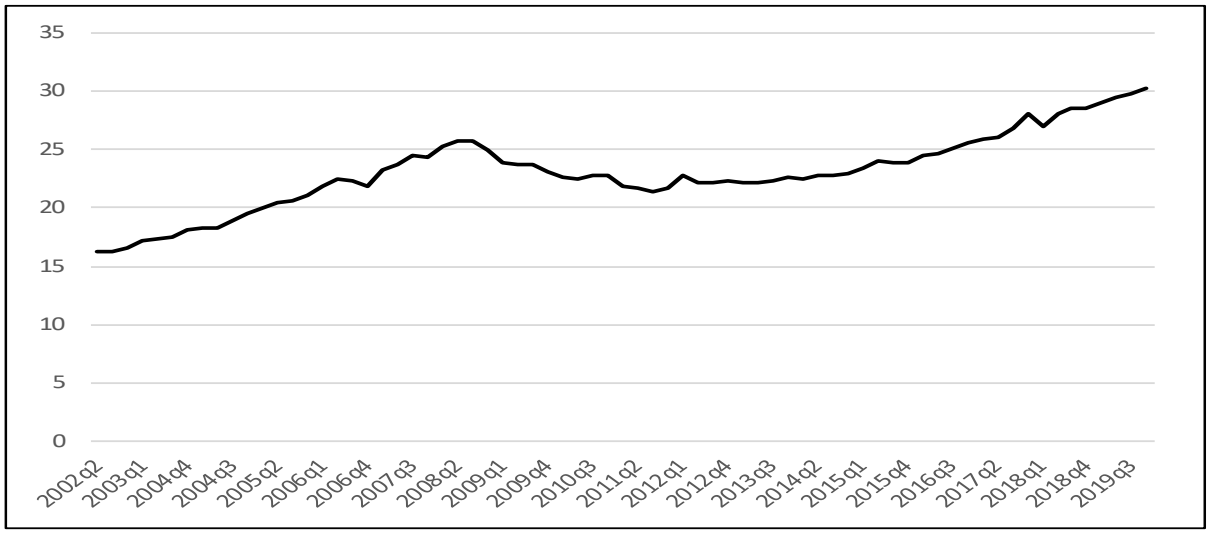
Figure 2. Credit Market Variables: 2002Q2 – 2019Q4



[4] Honohan (2010) takes the view that the scale of the Irish banking crisis that took hold in 2008 was principally owing to domestic determinants with policy failures on the part of the Irish retail banks and government contributing strongly.

Figure 3 plots household disposable income during these years. It rose steadily through the 2000s before reaching a high value in 2008Q2. Thereafter, in line with the broader performance of the Irish economy, it declined by some 15 per cent to 2011Q3. Irish economic performance started to improve after 2012 with household disposable income rising steadily. House prices also began an upward trajectory but remained below mid-2000s levels. This recovery in the Irish economy occurred alongside little change in the value of mortgages outstanding and an ongoing reduction in the Irish retail banks' loans-to-deposits ratio. The ratio of private sector credit to total household disposable income also continued to decline through to end-2019.

Figure 3. Total Household Disposable Income (€ bn.): 2002Q2 – 2019Q4

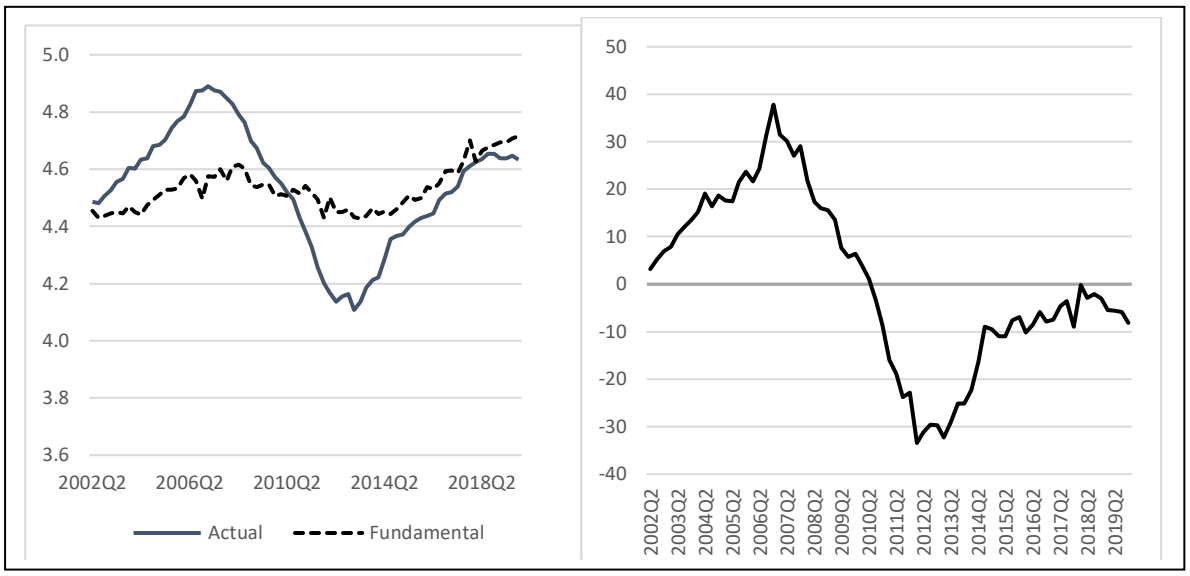


These three phases of the Irish economic performance from 2002 to 2019 broadly coincide with Antoshin *et al.*'s (2017) chronicle of the relationship between credit growth and economic developments in Europe since the introduction of the euro. They argue that during this period there was a gradual acceleration and boom (1999–08), bust (2009–11), and a sluggish recovery (2012–17), with the earlier boom-bust episodes leading to restricted credit flows from 2012 onwards. Positive economic growth and housing market recovery in recent years coinciding with little new credit arising contrasts with the situation in the 2000s boom. In those earlier years, there was a link between credit growth and house price inflation internationally (Tsatsaronis and Zhu, 2004; Goodhart and Hofmann, 2008) and credit and house price booms were closely tied to one another (Cerutti *et al.*, 2017).

The link between credit growth and house price developments in Ireland's boom-bust experience between 2002 and 2012 was particularly acute. Using an inverted housing demand

equation owing to Kelly and McQuinn (2014), Cronin and McQuinn (2021) provide measures of both actual and fundamental house prices, and the gap between them, in Ireland for the same sample period as is considered here, 2002Q1-2019Q4. Those series are plotted in Figure 4. While both were rising, the chart shows an increasing deviation between actual and fundamental prices during the 2000s. By 2007q4, actual prices were almost 40 percent above the estimated fundamental price. Subsequently, the drop in observed house prices was much larger than that in the fundamental price. Since then, both have moved broadly in line with one another. This sequence supports the development of a bubble in house prices occurring at time when excessive credit growth was happening in Ireland. House price developments have been more closely tied to fundamentals in recent years, a period marked by a lack of growth in household credit.

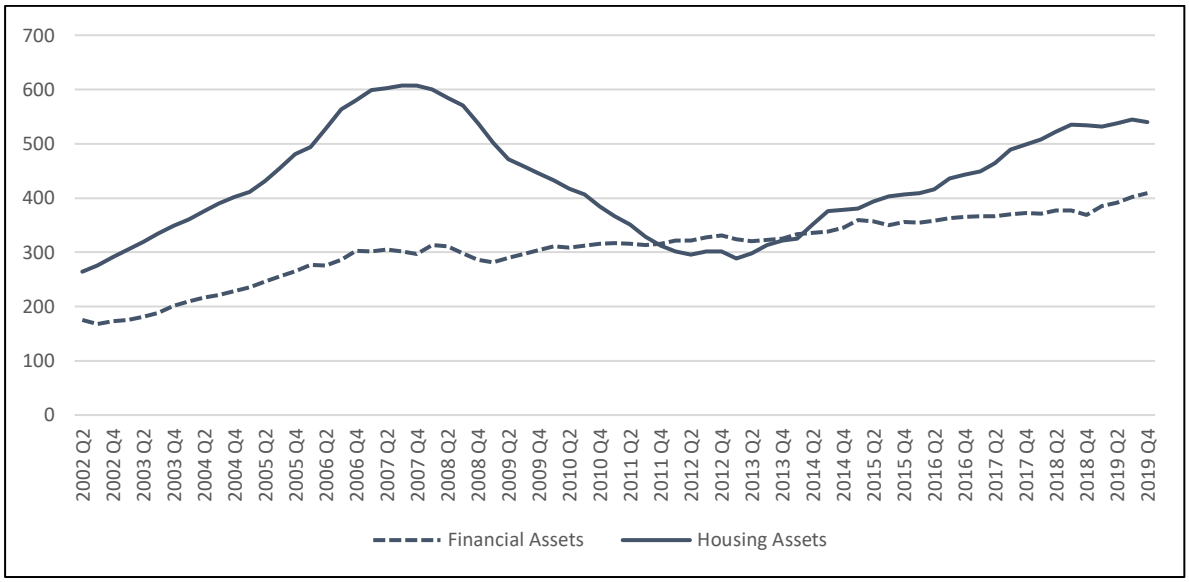
Figure 4. Actual and Fundamental House Price (logs) and Gap (%): 2002Q2 – 2019Q4



Source: Cronin and McQuinn (2021).

From the perspective of household wealth developments, the excessive use of credit in the Irish housing market during the early-to-mid 2000s would have caused household wealth, and its housing component, to exceed sustainable values. Figure 5 shows both the housing wealth and financial wealth components of household wealth in Ireland. Except for a period between 2011Q4 and 2013Q4, housing wealth has the greater share of total household wealth. During the 2000s, housing wealth grew far more quickly than financial wealth, reflecting house price growth at that time. Similarly, its value also declined as house prices fell between 2007Q4 and 2012Q2. While housing wealth subsequently rose, it, and house prices, did so at a more modest pace than during the 2002-2007 period.

Figure 5. Breakdown of Household Wealth into "Housing" and "Financial" (€ bn.): 2002Q2 – 2019Q4



Source: Cronin and McQuinn (2021).

3. Econometric assessment of the consumption-HNW relationship in Ireland

The link between personal consumption and housing wealth has been highlighted in the economics literature in recent years, most obviously in the HNW-channel literature. That channel captures the effect on macroeconomic variables, such as consumption, from a shock to total household wealth that arises from changes in house prices. More formally, Mian *et al.* (2013) propose that the change in housing net wealth between period $t-1$ and t is captured as follows:

$$\Delta HNW_t = \frac{(ln(P_{t)} - \ln(P_{t-1})) * H_{t-1}}{NW_{t-1}} = \frac{\Delta P_t * H_{t-1}}{NW_{t-1}} \qquad (1)$$

where P is the house price, H is housing assets, NW is household net worth, and ΔP_t is used to represent $ln(P_{t)} - \ln(P_{t-1})$. This variable, where the log change in house prices in t is multiplied by housing's share of household net wealth, H_{t-1}/NW_{t-1}, is intended by Mian *et al.* to emphasise the effect of changes in household balance sheets caused by changes in house prices on variables such as consumption. Net wealth at the end of quarter $t-1$ is defined as

$$NW_{t-1} = S_{t-1} + B_{t-1} + H_{t-1} - D_{t-1}$$

with S_t, B_t and D_t are the household sector's outstanding savings, bond holdings and debt levels owed respectively. This captures the total household balance sheet. The Mian and Sufi

variable ΔHNW_t then scales the change in house prices ΔP_t by the ratio of housing assets to household net wealth, $(\frac{H_{t-1}}{NW_{t-1}})$.

We then examine the effect of changes in housing net worth on consumption in Ireland between 2002Q2 and 2019Q4 by means of the following regression equation:

$$\Delta logC_t = \alpha + \eta\, \Delta HNW_t + \epsilon_t \qquad (2)$$

where C is total (nominal) personal consumption.

The regression is also estimated for three sub-categories of this aggregate: durables (d), non-durables (n), and services (s).

$$\Delta logC_t^d = \alpha + \eta_d \Delta HNW_t + \epsilon_t \qquad (3)$$

$$\Delta logC_t^n = \alpha + \eta_n \Delta HNW_t + \epsilon_t \qquad (4)$$

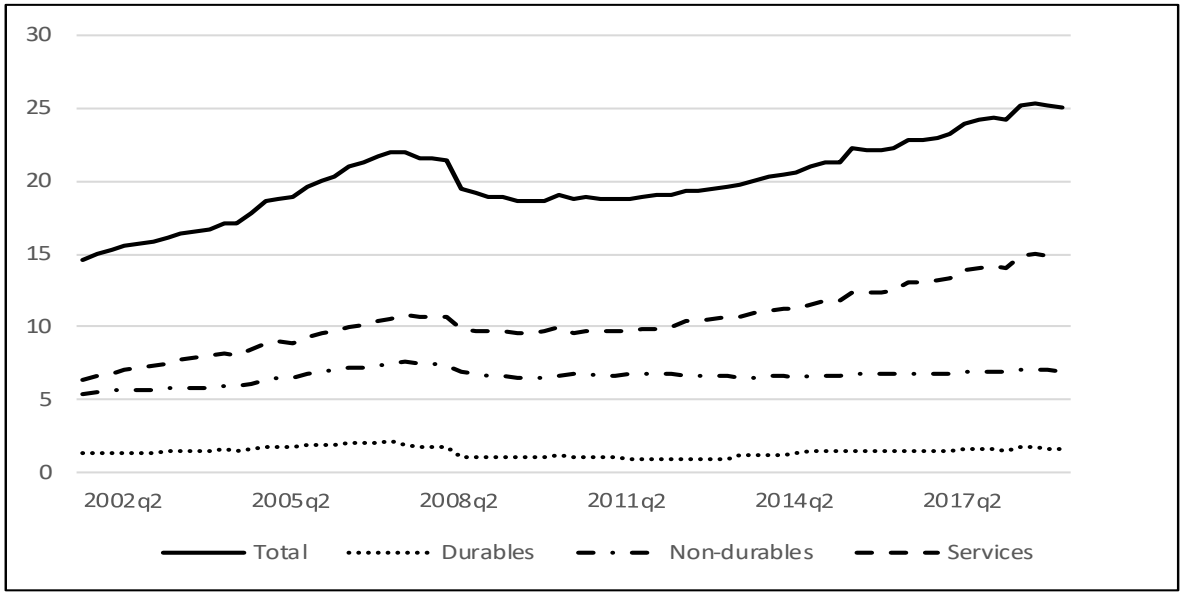
$$\Delta logC_t^s = \alpha + \eta_s \Delta HNW_t + \epsilon_t \qquad (5)$$

Figure 6 plots consumption and its components on a seasonally-adjusted basis. Total consumption increased through the 2000s until 2008Q1 before declining thereafter as an economic downturn took hold. Among its sub-categories, both non-durables and services also peaked in that quarter, while durables started to decrease from the previous quarter. The drop-off in durables consumption was much larger than in the other two categories during 2008 and 2009. It remained the most depressed category of consumption expenditure for some time, only starting to rise once more in 2014Q1. The decline in the other categories of consumption expenditure was less pronounced. Non-durable consumption started to pick up from 2010Q4 and an improvement in services became apparent during the second half of 2012.

The full-sample (2002Q3-2019Q4) estimates of equations (2) to (5) are reported in column (i) of Tables 1 to 4, respectively. The coefficient on ΔHNW is significant in all four cases. The coefficient on ΔHNW where the change in total consumption expenditure is the dependent variable is 0.384. The estimated coefficients on ΔHNW in the regressions for the three sub-categories of consumption differ somewhat from one another. The coefficient on services, at 0.383, is close to that of total consumption, while that on non-durables is lower at 0.259. The coefficient in the durables regression is much higher than in the other three at 1.094. As noted by Casalis and Krustev (2020), household spending on durable goods is that part of private

consumption that is most sensitive to the business cycle. In an Irish context, the period 2002–2019 witnessed pronounced fluctuations in economic conditions that may have rendered the consumption of durable goods to be particularly volatile.

Figure 6. Household Consumption and its Components (€ bn., SA): 2002Q2 – 2019Q4



As a robustness check, we re-estimate equations (2) to (5) by augmenting each with three control variables. The first, $Conshare_t$, represents the share of total employment accounted for by the construction sector. The rationale for including it is to control for construction's varying share of employment in Ireland over the sample period and this having the potential to affect consumption. The other two control variables, the natural log of real household net wealth, $ln(real\ NW_t)$, and the natural log of real total disposable income, $ln\ (real\ TDI_t)$, capture the overall well-being of the household sector, which could also influence consumption notwithstanding the change in housing net wealth. Column (ii) of each of Tables 1 to 4 indicates these control variables to have insignificant coefficients, while the coefficient on ΔHNW_t declines somewhat while remaining statistically significant. In Appendix 2, we control for potential endogeneity between the variable here using an instrumental variable procedure. The coefficient values are broadly in line with those in Tables 1 to 4.

Table 1. Dependent Variable: Change in total household consumption

	$\Delta RHS_t = \Delta HNW_t$				$\Delta RHS_t = \Delta P_t$			
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(ix)
Constant	0.006	0.651	0.012	0.627	0.006	0.755	0.012	0.737
	(3.34)	(1.72)	(4.40)	(1.75)	(3.28)	(2.02)	(4.33)	(2.07)
ΔRHS_t	0.384	0.283	0.096	-0.011	0.279	0.192	0.062	-0.021
	(5.46)	(3.08)	(0.78)	(-0.09)	(5.06)	(2.75)	(0.65)	(-0.21)
MDV_{0712}			0.571	0.607			0.437	0.450
			(2.79)	(2.92)			(2.74)	(2.82)
$Conshare_t$		-0.016		-0.011		-0.019		-0.015
		(-1.13)		(-0.811)		(-1.33)		(-1.14)
$In\ (real\ NW_t)$		0.052		0.039		0.060		0.048
		(1.44)		(1.14)		(1.68)		(1.41)
$In\ (real\ TDI_t)$		-0.102		-0.089		-0.119		-0.108
		(-1.63)		(-1.51)		(-1.91)		(-1.82)
$\overline{R^2}$	0.294	0.299	0.358	0.371	0.263	0.280	0.328	0.350

Note: t-ratios are in brackets

Table 2. Dependent Variable: Change in household durable consumption

	$\Delta RHS_t = \Delta HNW_t$				$\Delta RHS_t = \Delta P_t$			
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(ix)
Constant	-0.0006	1.497	0.027	1.388	-0.001	1.792	0.026	1.706
	(-0.08)	(0.93)	(2.42)	(0.92)	(-0.07)	(1.12)	(2.28)	(1.14)
ΔRHS_t	1.094	0.890	-0.306	-0.477	0.801	0.615	-0.208	-0.374
	(3.68)	(2.26)	(-0.60)	(-0.85)	(3.49)	(2.06)	(-0.53)	(-0.88)
MDV_{0712}			2.777	2.817			2.032	2.081
			(3.28)	(3.21)			(3.11)	(3.10)
$Conshare_t$		-0.071		-0.047		-0.079		-0.063
		(-1.15)		(-0.82)		(-1.29)		(-1.09)
$In\ (real\ NW_t)$		0.126		0.066		0.150		0.095
		(0.82)		(0.46)		(0.98)		(0.66)
$In\ (real\ TDI_t)$		-0.252		-0.193		-0.299		-0.247
		(-0.94)		(-0.77)		(-1.13)		(-1.0)
$\overline{R^2}$	0.153	0.135	0.259	0.243	0.139	0.124	0.236	0.227

Note: t-ratios are in brackets

Table 3. Dependent Variable: Change in household non-durable consumption

	$\Delta RHS_t = \Delta HNW_t$				$\Delta RHS_t = \Delta P_t$			
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(ix)
Constant	0.002	0.513	0.004	0.506	0.002	0.590	0.004	0.586
	(1.53)	(1.57)	(1.55)	(1.55)	(1.52)	(1.83)	(1.54)	(1.81)
ΔRHS_t	0.259	0.168	0.188	0.081	0.185	0.109	0.131	0.057
	(4.11)	(2.11)	(1.62)	(0.67)	(3.78)	(1.82)	(1.49)	(0.62)
MDV_{0712}			0.140	0.179			0.106	0.110
			(0.73)	(0.94)			(0.72)	(0.76)
$Conshare_t$		-0.004		-0.002		-0.006		-0.005
		(-0.35)		(-0.23)		(-0.54)		(-0.46)
$In\ (real\ NW_t)$		0.042		0.038		0.048		0.045
		(1.34)		(1.21)		(1.56)		(1.45)
$In\ (real\ TDI_t)$		-0.078		-0.075		-0.091		-0.088
		(-1.45)		(-1.38)		(-1.70)		(-1.64)
$\overline{R^2}$	0.187	0.237	0.181	0.236	0.161	0.225	0.155	0.219

Note: t-ratios are in brackets

Table 4. Dependent Variable: Change in household services consumption

	$\Delta RHS_t = \Delta HNW_t$				$\Delta RHS_t = \Delta P_t$			
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(ix)
Constant	0.010	0.660	0.015	0.637	0.010	0.759	0.016	0.740
	(5.03)	(1.58)	(5.10)	(1.59)	(4.95)	(1.84)	(5.14)	(1.86)
ΔRHS_t	0.383	0.290	0.119	0.006	0.278	0.199	0.070	-0.015
	(4.91)	(2.84)	(0.86)	(0.04)	(4.59)	(2.58)	(0.67)	(-0.14)
MDV_{0712}			0.522	0.584			0.418	0.451
			(2.26)	(2.50)			(2.36)	(2.53)
$Conshare_t$		-0.013		-0.008		-0.016		-0.012
		(-0.83)		(-0.54)		(-1.01)		(-0.82)
$In\ (real\ NW_t)$		0.041		0.029		0.049		0.037
		(1.04)		(0.75)		(1.24)		(0.97)
$In\ (real\ TDI_t)$		-0.095		-0.082		-0.110		-0.099
		(-1.37)		(-1.24)		(-1.61)		(-1.51)
$\overline{R^2}$	0.251	0.254	0.293	0.309	0.225	0.239	0.274	0.297

Note: t-ratios are in brackets

An alternative regressor to ΔHNW_t, and as employed by Mian *et al.* (2013), is its change-in-house price element, ΔP_t, in in the right-hand-side columns of Tables 1 to 4. Columns (v) and (vi) of the tables then are as per columns (i) and (ii) but for the substitution of ΔP_t for ΔHNW_t. The coefficient on ΔP_t is in all cases significant but somewhat lower than the equivalent entries in columns (i) and (ii). In column (v) of Table 1, for example, the regression coefficient is 0.279 compared to that of 0.384 on ΔHNW_t in column (i).[5] The larger coefficients on the ΔHNW_t variable reflect the scaling variable having a value of less than one.

4. Sub-period analysis

Cronin and McQuinn (2021) establish the housing net worth channel's influence on employment in Ireland occurring solely during the 2007-2012 downturn. As discussed above, the international literature also provides evidence that rising housing wealth, such as occurs when house prices are increasing and loose collateral constraints prevail, has little effect on consumption but a decline in such wealth, including when there are tightening credit constraints, has a negative effect (Guerrieri and Iacoviello, 2017; De Roiste *et al.*, 2021). This suggests assigning a dummy variable, DV_{0712}, to have a value of one for the quarters from 2007Q2 to 2012Q4, and zero otherwise. In all bar three of these 23 quarters, the ΔHNW_t has a negative value reflecting falling house prices in the economic and housing slump of that period. Such a downturn is also the basis on which Mian *et al.*'s (2013) assessment of the housing net worth channel in the US occurs, i.e. that the imbalances caused by a housing boom would subsequently see the decline in housing net worth values adversely affect consumption. Consequently, equations (2) to (5) are re-specified and estimated as:

$$\Delta logC_t = \alpha + \eta\, \Delta HNW_t + \theta(DV_{0712} * \Delta HNW_t) + \epsilon_t \quad (6)$$

$$\Delta logC_t^d = \alpha + \eta_d \Delta HNW_t + \theta_d(DV_{0712} * \Delta HNW_t) + \epsilon_t \quad (7)$$

$$\Delta logC_t^n = \alpha + \eta_n \Delta HNW_t + \theta_n(DV_{0712} * \Delta HNW_t) + \epsilon_t \quad (8)$$

$$\Delta logC_t^s = \alpha + \eta_s \Delta HNW_t + \theta_s(DV_{0712} * \Delta HNW_t) + \epsilon_t \quad (9)$$

The results of the estimation of these regressions are found in column (iii) and (iv), where control variables are added in as per column (ii), of each of Tables 1 to 4. With the exception

[5] In column (vi) of Table 3, the addition of the control variables renders the coefficient on ΔP_t significant only at the 10 per cent level of significance.

of Table 3, the η coefficient in the other tables is now insignificant, while the θ coefficient is highly significant and has a larger positive coefficient than is the case for η in columns (i) and (ii). Consequently, the impact of changes in housing net worth arise solely during the 2007-12 downturn for total consumption, durables and services. The η and θ coefficients are both insignificant for non-durables (Table 3). The same qualitative results arise across all four tables when ΔP_t is used instead of ΔHNW_t in columns (vii) and (viii) of each table.

Consequently, the empirical evidence on the impact of housing net wealth on consumption in Ireland seems to tally broadly with what is reported elsewhere. The rationale offered in those studies (such as Hviid and Kuchler, 2017; De Roiste *et al.*, 2021) as to why an asymmetrical effect arises over the economic cycle also seems apt in the Irish case given the description of housing and credit developments since 2000. It is that consumption (and savings) behaviour is influenced by either a precautionary savings effect or a collateral effect and that one will prevail over the other at different stages of the housing cycle. The precautionary effect dominates during the upside of the cycle with households maintaining, rather than spending, their capital gains from the rise in house prices. When the cycle changes, the collateral effect has greater influence with over-indebted households being forced to constrain their spending. The results in Tables 1 to 4 indicate that this effect worked more strongly on services and, in particular, durables during the 2007-12 housing market downturn in Ireland, while non-durables is unaffected by housing net worth developments during both the upside and downside of the housing market cycle. Using US data, Kaplan *et al.* (2020) find that both initial housing exposure and initial leverage have little effect on non-durable expenditure.

5. Conclusion

Over the period 2002-2109, the Irish economy presents as a particularly interesting test-case for the impact of household net worth on consumption. Significant volatility in house prices along with sizeable fluctuations in household net worth was accompanied, over this time, by substantial volatility amongst key headline economic variables.

Our results indicate that an accumulation of household debt and a severe downturn in house prices has a substantial impact on consumption. The housing net worth channel – the basis for examining the consumption-wealth relationship here – meant that the fall in house prices, and the attendant credit tightening, during the 2007-2012 downturn led to a decline in total consumption. Between its components, the channel had a more pronounced impact on

durables than services, while non-durables consumption was not affected. The channel does not have an impact on consumption in expansionary or normal times.

These results are consistent with a decline in housing net wealth causing households to reduce spending due to credit constraints, as espoused by Mian *et al.* (2013). The econometric evidence also highlights the dangers of credit-led economic growth and policies that result in unsustainable expansions in household balance sheets. The results indicate that the channel has been inactive in its influence on consumption in Ireland since the economic recovery took effect in 2014. More importantly, there is no evidence of credit-led output growth in Ireland in recent years with substantial deleveraging occurring within the economy, including in the household sector, and the gap between actual and fundamental house prices remaining narrow by historical comparison. Consequently, Ireland is now better positioned to cope with any fall in house prices that might materialise in the short-to-medium term than was the case in the late 2000s.

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Appendix 1. Data sources

Variable	*Source*
House prices[6]	Central Statistics Office; Department of Housing, Planning and Local Government[7]
Total value of housing assets	Central Bank of Ireland
Household net worth	Central Bank of Ireland
Credit and deposit data	Central Bank of Ireland
Household disposable income	Central Statistics Office
Consumer price index	Central Statistics Office
Total consumption and components	Central Statistics Office
Euribor interest rate	ECB Statistical Data Warehouse
Mortgage interest rate	Central Bank of Ireland

[6] House prices are expressed as an index, with 1995 Q1 having a value of 100, and the mortgage interest rate is expressed in per cent.

[7] We take the latest price level from the Department of Housing, Planning and Local Government (see https://www.housing.gov.ie/statistics for details) and we back-cast this with the official house price index from the Central Statistics Office.

Appendix 2. Controlling for potential endogeneity

It is important to account for potential endogeneity in the estimated relationships using instrumental variables. As noted by Mian *et al.* (2013), a single source of variation, which explains both house price movements and leverage accumulated by households, is required in considering this issue. Such a source of variation, however, must be largely orthogonal to other variables typically considered endogenous in terms of house price movements. In the context of the Irish residential market, we consider the mortgage interest rate as an appropriate instrument. Since the adoption of the euro, monetary policy and the setting of policy rates in the Irish economy is determined by decisions taken at the euro area level. As is well known, interest rates within the euro area are set by the European Central Bank (ECB) by reference to macroeconomic conditions within the euro area as a whole. Over the period covered here, 2002Q2 – 2019Q4, Irish economic performance typically differed from that of the larger euro area economies such as Germany, France and Italy. Therefore, variations in euro area interest rates can be regarded as being somewhat exogenous to Irish macroeconomic variables.

Over the period 2002Q2 to 2019Q4, ECB policy rates generally followed a persistent, downward path. The Euribor rate is based on the average interest rates at which a large panel of European banks borrow funds from one another and is considered to be the most important reference rate in the European money market. As noted by Honohan (2010), amongst others, the presence of such low interest rates in the euro area had a knock-on effect on residential mortgage rates in Ireland significantly fuelling domestic housing demand in the period up to 2008. Therefore, we choose the residential mortgage interest rate[8] as the instrumental variable in what follows. The Euribor and the domestic residential mortgage rate are plotted in Figure A1. We also include a lag of the change in housing net worth variable as a second instrument.

In columns (ii), (iv), (vi) and (viii) of Table A1, we present the results of the IV estimation of equations (2) to (5), along with the results of a χ^2 overidentification test, for each of the four consumption categories. The OLS regression estimates of those equations, as contained in columns (i) of Tables 1 to 4, are included for comparison in the other columns. As can be seen from the previous tables, the OLS and IV coefficients are very similar in size and are all significant. In all bar the case of non-durables, the IV estimates are marginally larger than the OLS ones; this is also the case for similar estimates in Kaplan *et al.* (2020) and Mian *et al.*

[8] As published by the Central Bank of Ireland. See https://www.centralbank.ie/statistics/data-and-analysis/credit-and-banking-statistics/retail-interest-rates for details.

(2013). Kaplan *et al.* (2020) provide a variety of reasons why this is the case; one possible reason is that the idiosyncratic variation in house prices is more transitory than the variation in the common component of house prices which is being isolated by the instrument.

Figure A1. Euribor and Residential Mortgage Interest Rate (%): 2002Q2 – 2019Q4

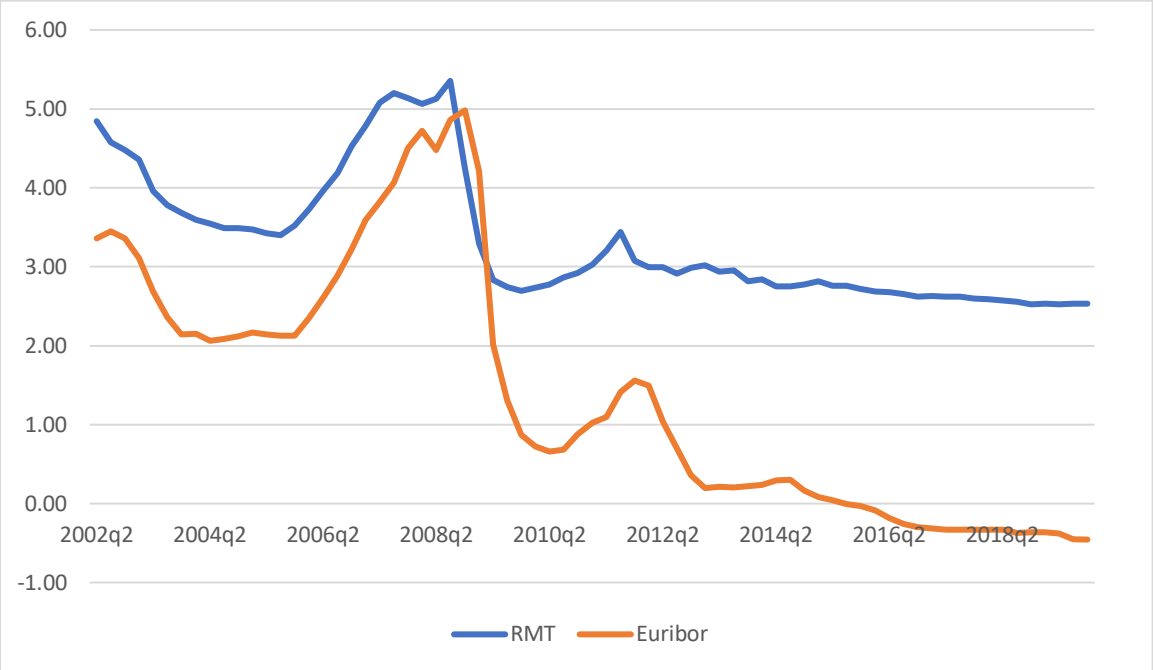

Table A1. Comparison of OLS and IV Estimations

	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)
Expenditure category	Total	Total	Durable	Durable	Non-durables	Non-durables	Services	Services
Estimation procedure	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Constant	0.006	0.006	-0.006	-0.001	0.002	0.002	0.010	0.010
	(3.34)	(3.10)	(-0.08)	(-0.17)	(1.53)	(1.389)	(5.03)	(4.787)
ΔHNW_t	0.384	0.421	1.094	1.219	0.259	0.249	0.383	0.409
	(5.46)	(4.49)	(3.68)	(3.06)	(4.11)	(2.993)	(4.91)	(3.949)
χ^2		1.221		0.087		4.914		2.056