House Prices and the Credit-Driven Household Demand Channel: The Case of the Irish Economy

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Abstract

The performance of the Irish economy stands out across western economies over the past two decades as the later years of its "Celtic Tiger" phase gave way to a sharp and extremely large economic downturn between 2008 and 2012. This severe recession has been followed by a *Lazarus*-style economic recovery in recent years. This paper examines the role played by the credit-driven housing net worth channel in the path that Irish economic performance has taken between 2002 and 2019 by specific reference to developments in the domestic labour market. We find a significant positive relationship between housing net worth and employment growth in Ireland, manifesting itself through the non-traded sector of the economy between 2007 and 2012. This followed the emergence and then bursting of a substantial credit-fuelled housing market bubble in the Irish residential property market. Our analysis indicates no evident link between economic activity and a credit-driven housing net worth channel in recent years. This may reflect market and regulatory responses to the banking crisis-led recession of the late 2000s and early 2010s.

Keywords: Household Wealth, House Prices, Employment.

JEL codes: E24, E32, E44.

I. Introduction

The role of credit in macroeconomic developments has been a focus of research since the international financial crisis of the late 2000s. In particular, the role of credit provision to households and its impact on consumption and employment has been examined in contributions such as those of *Mian/Rao/Sufi* (2013), *Mian/Sufi* (2014), *Mian/Sufi/Verner* (2017) and *Mian/Sufi* (2018). Those

papers identify a credit-driven household demand channel to economic activity, where increased credit supply, as opposed to technology or permanent income shocks, is a determinant of expansions and then contractions in economic activity. *Mian/Sufi* (2018) argue that the expansionary phase of the credit cycle influences macroeconomic activity by increasing household demand rather than stimulating the productive capacity of firms. The contraction phase of the credit-driven business cycle that follows is particularly severe with economies facing acute adjustment difficulties when credit supply eventually contracts and house values decline.

The Irish economy presents as an obvious choice for studying the influence of a housing net worth channel. Even allowing for the comparatively unstable nature of international economic performance over the past twenty years, few economies have witnessed the highs and lows of the Irish economy over this period. The financial crisis of 2007/08 coincided with the demise of Ireland's *Celtic Tiger* economy, which had seen the Irish economy transformed from being one of the European Union's poorer performing countries in the early-to-mid 1990s to one experiencing strong economic growth thereafter up to 2008. Economic conditions deteriorated rapidly after 2008, with unemployment, for example, rising to 16 per cent by early-2012 and house prices falling by over 50 per cent. After this severe recession, the Irish economy started to stage a sustained recovery that was maintained through 2019. Even when controlling for the effects of certain multi-national-related activities, domestic economic indicators such as output growth have significantly out-performed all other European economies over the period 2014–2019.

Crucially, for examining the credit-driven demand channel, developments in the Irish economy since the early 2000s have gone hand in hand with substantial changes to both the domestic financial system and residential property market. The Irish credit market experienced a transformation from the early 2000s through the mid-2000s, including the introduction of mortgage products such as 100 per cent loan-to-value mortgages, tracker mortgages and equity release mechanisms that departed from traditional, prudent loan offerings. Along with their utilisation of international funds markets, domestic banks' lending policies resulted in credit supply rising substantially above its long run rate of increase. Due to the combination of the changes in the mortgage credit market and the improvements in general economic conditions, house prices rose sharply. Between 1995 and 2007, prices, in nominal terms, increased by 334 per cent with the largest annual rates of house price inflation occurring in the later years of that twelve-year period. The international financial crisis of 2007/08 coincided with a collapse in new credit provision in the Irish economy. House prices fell by more than one half between 2008 and 2012. Like the general economy, Irish house prices have rallied significantly since then, increasing by 85 per cent be-

tween 2012 and 2019. Whereas the sharp rise in house prices during the 2000s was accompanied by easy credit conditions, the price increases since 2012 have occurred at a time of household deleveraging and more prudent lending practices.

These developments have resulted in large fluctuations in household net worth. On average, housing wealth accounted for approximately 75 per cent of Irish household net worth over the 2002–2019 period. Sizeable changes in household net worth over time can have implications for economic activity through a number of channels. For example, consumer demand and, in turn, employment can be affected through consumer wealth effects or through variations in borrowing constraints tied to changes in the underlying collateral of the household. In this paper, we consider the presence of the housing net worth channel on Irish economic activity over the period 2002 Q1 to 2019 Q4. In particular, we examine the impact of the channel on the Irish labour market, given that measures of output (specifically, GDP) growth in Ireland are problematic (for example, see *FitzGerald* (2018)) and the focus of much of the literature in this area is the effect of the channel on the labour market.

We first establish the relationship between Irish house prices and their fundamental determinants over the sample period. During a period of strong credit growth and lax lending practices, actual house prices rose substantially above that warranted by their fundamental determinants between 2002 Q2 and 2007 Q1. There then followed a pronounced fall in house prices over the following four years that was accompanied by household deleveraging and the adoption of prudent lending criteria. Since 2012 Q3, positive actual house price growth more closely tracks that warranted by fundamental developments. Against this background, our econometric results indicate that the housing net worth channel had a significant effect on the labour market, via the non-traded sector, during the severe downturn of the late 2000s and early 2010s. This does not hold thereafter with no relationship between labour market developments and housing net wealth evident, a period when the impact of credit on the residential property market dissipated substantially. We conclude that the distortionary effects of the credit-driven household net wealth channel on economic activity no longer hold.

The rest of the paper is structured as follows. In the next section, a brief review of developments in the Irish housing and credit market is provided. The sustainability of house prices in Ireland over time is assessed in section 3. The impact of changes in housing net wealth on the labour market is modelled using the *Mian/Sufi* (2014) approach in section 4. Section 5 concludes.

II. The Irish Housing and Credit Market: A Brief Review

Figure 1 plots relevant Irish macroeconomic series from 2002 Q2 to 2019 Q4.[1] Large increases in disposable income, alongside an accommodative euro area monetary policy, in the early 2000s led to sharp rises in housing affordability for a young, prospective home-owning population. As can also be seen from Figure 1, house prices also began to rise sharply. The Irish property boom was the largest across OECD countries between 1995 and 2007, with average annual house price increases of 9 per cent arising during that period.
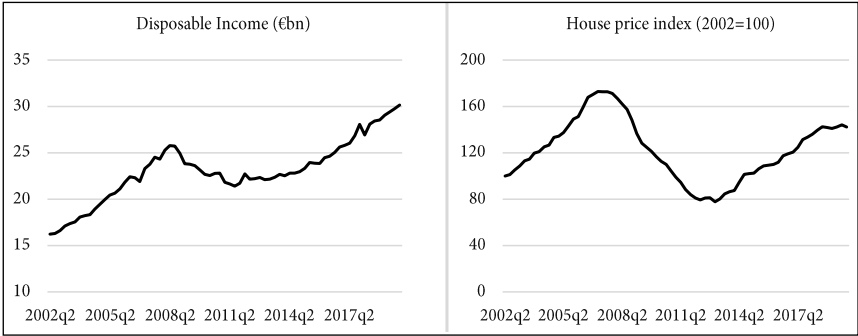

Figure 1: Housing and Macroeconomic Variables: 2002 Q2 – 2019 Q4

The Irish credit market also experienced considerable financial deregulation and liberalisation during this period. Table 1 summarises the main developments affecting credit supply from the late 1980s to 2007.[2] Initially, there were significant changes at the wholesale level. This included the removal of exchange, credit and interest rate controls. Probably the most significant development in the provision of credit was the increased ability of Irish banks, following the adoption of the euro in 1999, to attract deposits from non-residents. Given the demand-side pressures in the Irish economy in the late 1990s, Irish financial institutions accessed the increased funding available within the euro area upon the adoption of the euro, raising the supply of credit in Ireland substantially.

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[1] All data series are described in the appendix.

[2] An exact chronology of the control and subsequent liberalisation of the Irish credit market is discussed in detail in *Kelly/Everett* (2004). See, in particular, Box 1 on pp. 96–7 of that article, which illustrates the building and dismantling of controls over the period 1973 to 1999.

Table 1

Taxonomy of Factors Influencing Irish Credit Supply

1988–1999	1999–2007
Major relaxation of exchange controls.	Adoption of euro and access to non-resident deposits.
Formal trigger mechanism for changes in retail interest rates suspended.	Introduction of 100 per cent loan to value ratio (LTV) mortgages.
Fixed rate mortgages introduced by some banks for first time.	Introduction of tracker mortgages into the Irish market.
Secondary liquidity requirement abolished	Mortgage securitisation.
Reduction in primary liquidity ratio from 8 to 2 percent.	Equity withdrawal and loan consolidation.

The left-hand-side panel of Figure 2 highlights the difference between the actual level of private sector credit and the retail deposit base in the domestic financial system. This rose well above 100 per cent during the early-to-mid 2000s and coincided with a substantial increase in credit provided to households for house purchases (right-hand-side panel). The large gap between lending and retail deposits that had emerged by 2008 was critical to the vulnerability of the Irish banking sector to the severe distress that arose in wholesale funds markets during the financial crisis. Figure 3 highlights the increase in credit provision with respect to the overall economy, proxied by total household disposable in-
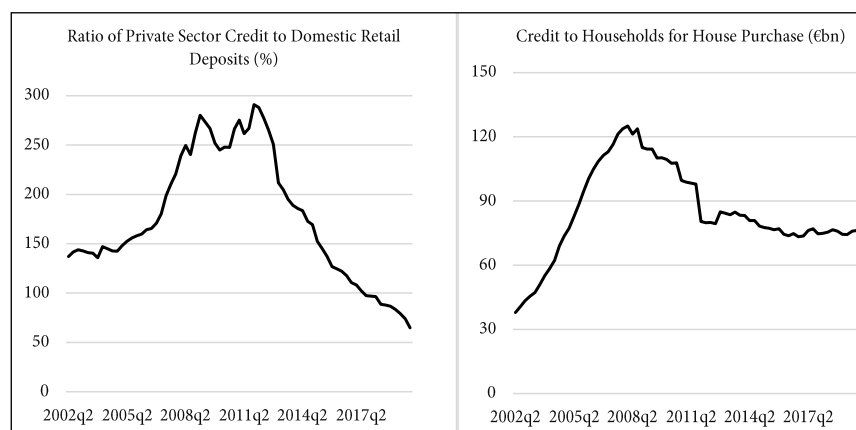
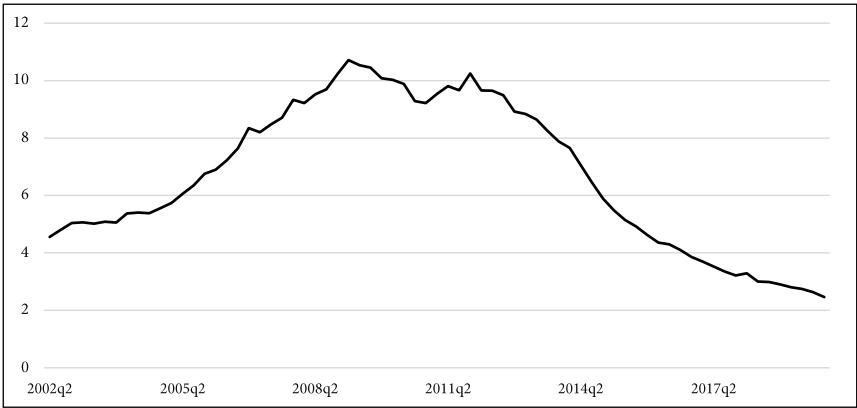*Figure 2: Credit Market Variables: 2002 Q2 – 2019 Q4*

*Figure 3: Private Sector Credit to Total Household Disposable Income Ratio:
2002 Q2 – 2019 Q4*

come given the aforementioned difficulties with using GDP. Even though the Irish economy experienced substantial growth during the period, the pace of credit expansion after 2003 exceeded that of the growth of the overall economy, causing a large increase in the credit-to-output ratio. A significant rise in this ratio above its long-run trend is an indicator of a period of excessive credit growth (*Basel Committee on Banking Supervision* 2010).

The expansionary phase in mortgage credit provision in Ireland can be observed in Table 2. The total value of mortgages issued increased nearly three-fold as a percentage of GDP between 1995 and 2007. The total number of new mortgages issued in a year went from just under 50,000 in 1995, to 80,000 in 2000, and then to almost 90,000 mortgages by 2007. The average size of a mortgage also increased considerably over the period. In 1995, the average mortgage extended by an Irish credit institution was € 54,094. This had climbed to € 271,154 by 2007. House prices increased substantially over the period, almost doubling between 2000 and 2007. The peak in house prices occurred in 2007 Q2.

The right-hand side column of Table 1 lists other important factors that would have been influencing mortgage developments and the sharp rise in house prices and mortgage issue values in the 2000s. These included the introduction of 100 per cent LTV mortgages and the option of house owners realising equity. These products would have allowed households the opportunity to spend their savings and wealth gains on consumption expenditure. The introduction of tracker mortgages gave households an additional mortgage product option with which to organise their financial plans.

Summary of Irish Residential Mortgage Market Statistics for Selected Years

Variable	Unit	1995	2000	2007	2012	2019
Outstanding level of residential lending	% GDP	21.8	30.0	62.4	48.5	21.3
Total value of mortgages issued	% GDP	4.9	8.3	12.2	1.9	3.1
Average mortgage issued	€	54,094	111,355	271,154	184,113	234,818
Total number of mortgages issued		49,288	80,856	88,747	18,532	11,660
House prices	€	77,994	169,191	322,634	227,376	281,947

The scale of the collapse in the Irish housing market from 2007 to 2012 in terms of both credit provision and house prices is illustrated in Table 2. The total value and number of mortgages issued fell substantially, as did the overall amount of residential loans outstanding and the average new mortgage value. Since then, while the total value of new mortgages issued and their average value has risen, outstanding residential lending fell between 2012 and 2019 as domestic financial institutions deleveraged their loan books. The overall changes in credit provision in the economy after 2007 are also apparent in Figures 2 and 3. The ratio between total private sector credit and domestic retail deposits has declined over time and was below 100 per cent by the late 2010s, while credit to households for house purchase declined up to 2011 Q4 and has remained broadly unchanged since. Figure 3 shows a steady fall in the ratio of private sector credit to total household disposable income since 2011 Q4.

This overview of economic and credit conditions in Ireland since 2002 suggests that the conditions for a credit-driven housing net worth channel to have an effect on economic developments, as described by *Mian/Sufi* and their co-authors, held in Ireland during the 2000s and early 2010s. They posit that in circumstances where housing is the dominant source of household wealth then the availability of mortgage credit can influence how that wealth affects economic activity. In *Mian/Sufi* (2014), they hypothesise that a relaxation of lending constraints and the widespread availability of mortgage credit bolsters household demand. This housing demand channel causes a disproportionate rise in non-traded employment relative to traded employment. In any subsequent downturn, the reversal in housing net wealth should cause non-traded employment to fall as a tightening in borrowing constraints driven by a fall in housing

collateral values reduces personal consumption expenditure. Their empirical investigation focuses on the US downturn of 2007–9 and has a strong cross-sectional (regional) orientation. It finds the decline in housing net wealth has an adverse effect on the non-traded sector of the employment market but has no effect on traded employment developments during the downturn.

The investigation here has the benefit of testing for the presence of the housing net wealth channel during three distinct phases of an economy's performance over time and not just during a period of downturn. Given the review of the Irish housing market above, the channel should have been active in Ireland during the first two of those phases, namely the booming economy of 2002–7 and the ensuing downturn of 2007–12. In particular, the build-up of distortions in the housing and credit markets in Ireland during the 2000s meant that any sudden correction in those markets could have a severe impact on the labour market. As shown in section 4, this is what occurred during the downturn of the Irish economy between 2007 and 2012. Subsequently, a market and regulatory response to these developments saw an increasing re-calibration of the loan to deposit ratio, including through deleveraging of bank balance sheets and a focus on financing new loans through domestic retail deposits rather than through the international funds market. There was also the practical exclusion of mortgage products, such as 100 per cent mortgages, tracker loans, and equity withdrawal, and the requirement of borrowers to provide substantial deposits as a condition of mortgage eligibility. Consequently, one could expect the potency of the credit-driven household demand channel to be now diminished or redundant.

To establish whether this is the case or not, we initially assess house price developments on sustainability grounds over the period 2002 Q2 to 2019 Q4 in the next section. We find that actual house prices rose well above their fundamental values up to 2006 Q4 before falling substantially below those warranted by economic fundamentals over the following years. This overshooting in house prices was then corrected and since the mid-2010s, actual and fundamental house prices have broadly coincided with one another. In section 4, we then investigate the influence of these variations in housing prices and housing wealth, through the net worth channel, on labour developments in Ireland.

III. The Sustainability of Irish House Price Levels Over Time

Housing net wealth is the critical variable in explaining the credit-driven household demand channel. In the expansion phase of a credit-based cycle, that wealth will be inflated by distortions in the credit market and its influence on house prices. Easy access to credit and financial liberalisation that eschews prudent lending requirements – such as loan-to-value requirements being at or be-

low 90 per cent – will cause house prices to rise relative to their fundamental determinants (see *Brunnermeier* 2009, *Duca* et al. 2010/2011 for example). Eventually, this house price misalignment will be subject to correction and household net wealth will fall, often rapidly. The discussion in the last section indicates that this train of events arose in Ireland between 2002 and 2012. It also suggests that since 2012, house prices have not been subject to the same distortions and have been on a sustainable path. In such circumstances, the credit-driven household demand channel would be redundant and its influence on the labour market would disappear. In this section, we assess the sustainability of house price movements in the Irish economy over time using a standard house price model that is popular in the international literature before turning in section 4 to labour market developments.

The house price model inverts the housing demand function and rearranges it such that the dependent variable is the house price, as opposed to the quantity of houses. Similar applications are found in *Peek/Wilcox* (1991), *Muellbauer/Murphy* (1997), *Meen* (1996, 2000), *Cameron/Muellbauer/Murphy* (2006) and *Kelly/McQuinn* (2014). The model, which assumes that the demand for housing services is proportional to the housing stock, can be derived, in log-linear fashion, as follows:

(1)
$$Ln\left(\frac{H_t}{POP_t}\right) = \alpha_1 Ln\left(\frac{Y_t}{POP_t}\right) - \alpha_2 Ln\, RENT_t$$

Where H_t is the housing stock in quarter t, POP_t is the population level, Y_t is disposable income and $RENT_t$ is the real rental rate of housing in the economy. The coefficients α_1 and α_2 are the income and price elasticities of demand for housing.[3] In equilibrium, the real rental rate of housing can be assumed to equal the real user cost. This can be outlined as follows:

(2)
$$P_t\,(r_t - P_t^e\,/\,P_t\,) \equiv P_t \times UC_t$$

where r_t is the mortgage interest rate, P_t is house prices, e denotes expectations, and UC is the user cost of housing. While expressions for the user cost can be augmented to include taxation considerations and expenditure rates on maintenance and repair, very often the main determinants of the expression are the mortgage rate and expected house price inflation. Thus, substituting (2) into (1) provides the following inverted demand curve for housing:

(3)
$$LnP_t = \frac{\alpha_1}{\alpha_2} Ln\left(\frac{Y_t}{POP_t}\right) - \frac{1}{\alpha_2} Ln\left(\frac{H_t}{POP_t}\right) - Ln\, uc_t\,.$$

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[3] The housing stock value is calculated using a perpetual inventory method, with housing completions data and an obsolescence rate from the Central Statistics Office.

According to this equation, house prices are positively related to real income per capita and are negatively related to the per capita housing stock and the user cost of capital.

For robustness purposes, several different estimators are used to estimate (3). Along with standard ordinary least squares (SOLS), the *Stock/Watson* (1993) dynamic ordinary least squares or DOLS approach is employed. It explicitly allows for potential correlation between the explanatory variables and the error process. The *Philips/Hansen* (1990) fully modified ordinary least squares (FM-OLS), which allows for statistical inference within multivariate regressions where the regressors have I(1) processes, is also utilised. The results of these estimations are shown in Table 3.

The coefficient estimates are broadly the same across the three estimators and are as expected *a priori*. The coefficient on the income variable is approximately 1.5, with the coefficients on the housing supply variable between –0.57 and –0.86 and on the user cost variable close to –0.05. In all cases, the income variable is highly significant, while the user cost is significant in the SOLS estimation and is significant at the 8 per cent level in the FM-OLS estimation.

Table 3

Inverted Demand House Price Regression Results: 1981 Q1 – 2019 Q4

Variable	Estimator		
	SOLS	DOLS	FM-OLS
Y_t/POP_t	1.490	1.590	1.539
	(16.573)	(2.950)	(12.835)
H_t/POP_t	–0.566	–0.855	–0.699
	(–1.365)	(–0.335)	(–1.204)
uc_t	–0.048	–0.044	–0.054
	(–2.068)	(–0.247)	(–1.742)

Note: N = 156. T-statistics are in parentheses. All variables are in logs.

In the left-hand-side panel of Figure 4, we plot the fitted value from the SOLS model and use this as an indicator of the fundamental house price – that is the price level warranted by the relevant macroeconomic variables. This estimated fundamental price can be compared with the observed/actual prices, with the gap between them a commonly used means of assessing whether house price levels are sustainable or not. The approach has been used extensively in the literature for such purposes (see *Fitzpatrick/McQuinn* 2007, *Kelly/McQuinn* 2014) for applications to data for Ireland). The difference between the actual and ob-
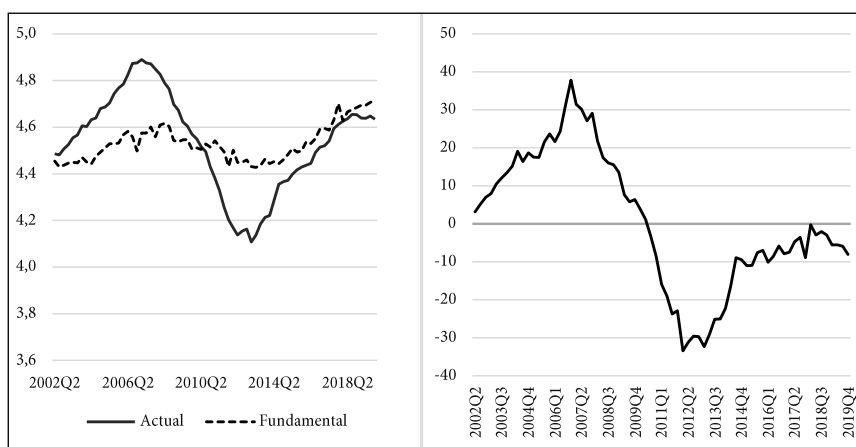
Figure 4: Actual and Fundamental House Price (logs) and Gap (%):
2002 Q2 – 2019 Q4

served price is plotted in the right-hand-side panel of Figure 4. The results indi-cate that in the period preceding 2007 a growing divergence arose between the actual and fundamental price with a bubble of almost 40 per cent occurring. Consequently, house prices were significantly overvalued during this period. In the aftermath of 2007/08, house prices declined sharply and fell below the fun-damental price. Therefore, house prices were undervalued in the early 2010s. Thereafter, both actual and fundamental house prices appear to have grown in tandem with each other and have become broadly aligned, indicating that prices are at a sustainable level.

Mian et al. (2017) demonstrate that household credit supply expansions in-crease GDP per capita in the short-term. Therefore, as the fundamental price is a function of income, the gap between the fundamental and actual price may be greater than is estimated here as credit growth may itself be inflating the funda-mental price.[4]

As a robustness exercise, we compare our estimate of overvaluation with that from another model, that of the house price to rent ratio. The estimate of over-valuation from this model is the difference between the actual ratio and that of the average value of the ratio for the sample. The two estimates of overvaluation are plotted in Figure 5. While the house price to rent ratio would suggest a de-gree of undervaluation in the Irish property market after 2014, it is evident that the two estimates are very similar in both the scale of the under/overvaluation and in the trend of the divergence.

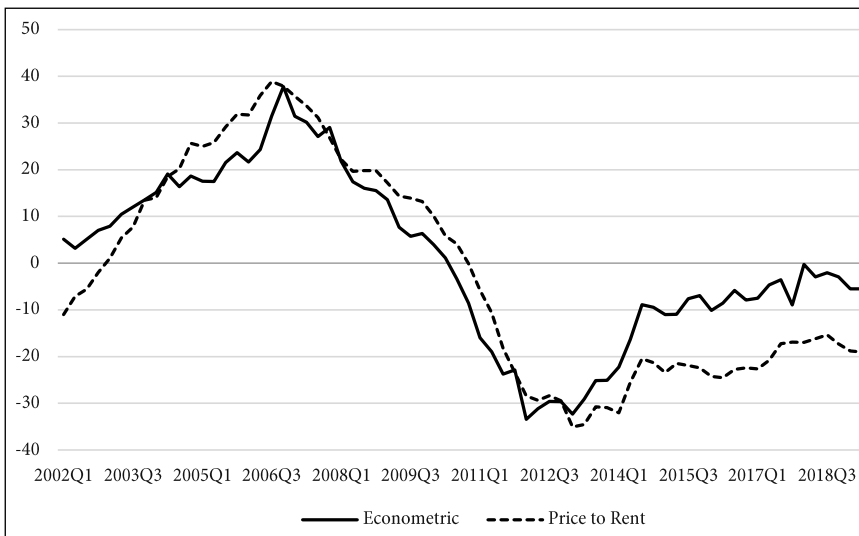[4] We are grateful to a referee for noting this point.

Figure 5: Estimates of Under/Over Valuation Gap (%):
2002 Q2 – 2019 Q4

A further issue we consider at this point is whether the increased credit supply, as outlined in Table 2, had influence on the degree of overvaluation in the Irish property market. To address this in the context of the house price model, we augment the specification outlined in (3) to include a credit conditions indicator. Following *McCarthy/McQuinn* (2017), we take an indicator of average loan size to family income as a guide to credit conditions in the Irish residential market. Based on a study of detailed bank loan-level data, *McCarthy/McQuinn* (2017) conclude that this was the most significant indicator of mortgage credit expansion in Ireland during the 2000s. Accordingly,

$$(4) \qquad Ln\,P_t = \frac{\alpha_1}{\alpha_2} Ln\!\left(\frac{Y_t}{POP_t}\right) - \frac{1}{\alpha_2} Ln\!\left(\frac{H_t}{POP_t}\right) + \frac{\alpha_3}{\alpha_2} Ln(C_t) - Ln\,uc_t$$

Where C_t is the credit conditions indicator. The results for the augmented house price regression are contained in Table 4. As can be seen, the loan to income variable is significant across all specifications and is broadly equal in size to the income per capita variable. In Figure 6, we compare the estimate of overvaluation based on (4) with that of the initial house price model (3). While there still are periods of significant difference between the actual and fundamental price based on (4), it is clear that the resulting estimate of overvaluation is significantly less than the original model (3). This would appear to indicate that

changing credit conditions was one of the main reasons for the degree of over-valuation observed in the Irish property market in the period immediately preceding 2008.

Table 4

Augmented Inverted Demand House Price Regression Results:
1981 Q1 – 2019 Q4

Variable	Estimator		
	SOLS	DOLS	FM-OLS
Y_t/POP_t	1.149 (24.454)	1.170 (7.644)	1.161 (20.613)
H_t/POP_t	−2.560 (−11.066)	−3.002 (−4.110)	−2.849 (−10.219)
C_t	1.196 (21.988)	1.295 (7.795)	1.263 (19.270)
uc_t	−0.006 (−0.518)	−0.002 (−0.031)	−0.003 (−0.246)

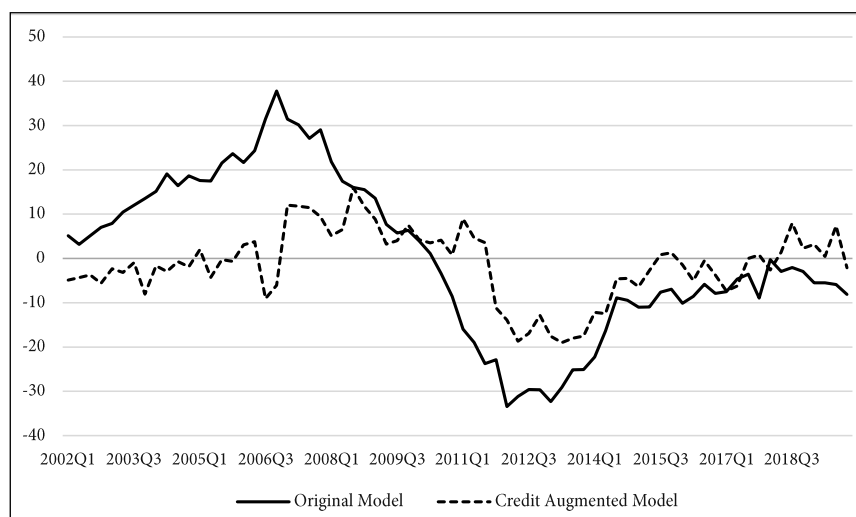*Note:* N = 156. T-statistics are in parentheses. All variables are in logs.

Figure 6: Estimates of Under/Over Valuation Gap (%):
2002 Q2 – 2019 Q4

IV. Housing Net Wealth and the Labour Market in Ireland

The econometric evidence in section 3 indicates that Irish house prices went through a bubble-and-correction phase between 2002 and 2012, which was followed by more sustainable price movements in recent years. This pattern would be consistent with the account of credit developments in section 2, which pointed to an excessive use of credit in the housing market during the early-to-mid 2000s. Such credit provision would have inflated household wealth in the short term, to be corrected beyond that horizon.

We now turn to assessing the impact the housing net worth channel has had on employment in the Irish economy over the period 2002 Q3 to 2019 Q4. *Mian/Sufi* (2014) model the change in employment as a function of the change in housing net wealth. Their basic regression equation is as follows:

$$(5) \qquad \Delta \log E_t = \alpha + \eta * \Delta HNW_t + \in_t$$

where E is employment and HNW is the housing net worth channel, the change in which is defined as follows:

$$(6) \qquad \Delta HNW_t = \frac{\Delta log P_t * H_{t-1}}{NW_{t-1}}$$

where P is the house price, H is housing assets and NW is household net worth.

The total value of Irish housing assets (H) and employment numbers are plotted in Figures 7 and 8, respectively. The total value of housing assets clearly follow a similar pattern to that of house prices in Figure 1. Figure 7 also shows the financial assets of Irish households. Apart from 2011 to 2014, housing is the dominant component of Irish household wealth with the gap between it and financial wealth widening after 2015.

In Figure 8, total employment is divided between its traded and non-traded components. Both sectors saw a rise in employment numbers from 2002 Q2 up to 2007 Q3, with the increase in non-traded employment more pronounced. This is consistent with the Mian-Sufi perspective that a rise in housing net wealth boosts non-traded employment. Likewise, as housing net wealth declined thereafter, there is a larger decrease in non-traded employment from 2008 to 2012. Since mid-2012, both employment sectors have risen broadly in parallel to one another.

The estimated coefficients of (5) are shown in Table 5. The first row of the table shows the employment variable used as the dependent variable in each column. The change in the natural log of total employment numbers is shown in column (i) and its breakdown between changes in traded and non-traded em-
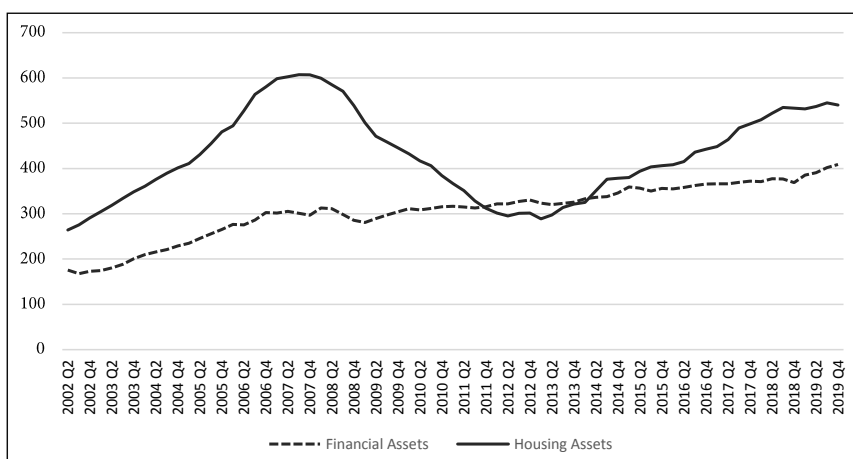
Figure 7: Breakdown of Household Wealth into "Housing" and "Financial" (€ bn.):
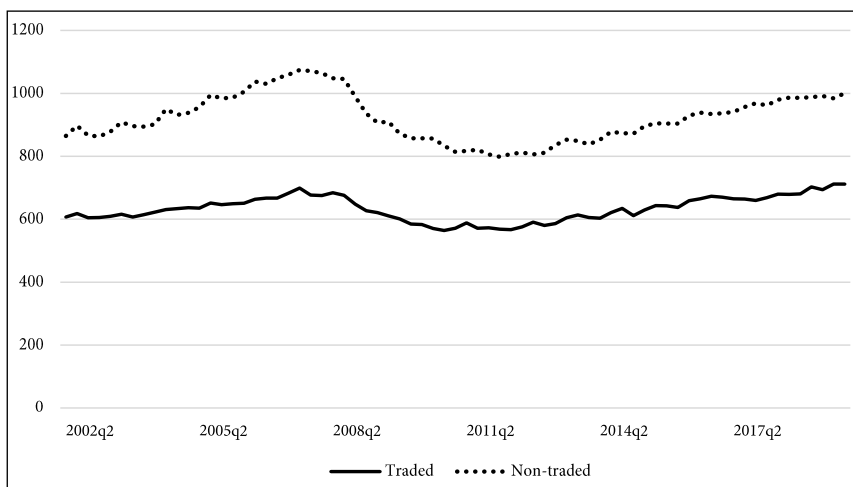*2002 Q2 – 2019 Q4*

Figure 8: Traded and Non-Traded Employment (000s):
2002 Q2 – 2019 Q4

ployment provides the dependent variables in columns (ii) and (iii), respectively. Column (iv) seeks to control for the possibility that the results in column (iii) may be biased due to some common shock affecting both housing net worth and employment in the non-traded sector. In particular, shocks to the construction sector, which is part of the non-traded sector, were subject to a significant

degree of variability in Ireland over the full sample period and may be correlated to shocks to housing net worth. We attempt to control for these common shocks by running an estimation of (5) using the change in employment in the non-trading sector where construction employment has been removed as the dependent variable (what is termed Non-traded** – column (iv) of Table 5).

Table 5

Initial Labour Market Regressions, 2002 Q3 – 2019 Q4

Dependent variable:	(i)	(ii)	(iii)	(iv)
$\Delta \log E_t$	Total	Traded	Non-Traded	Non-Traded**
Constant	0.002	0.001	0.000	0.001
	(2.168)	(0.760)	(0.455)	(0.742)
ΔHNW_t	0.316	0.293	0.430	0.365
	(6.822)	(4.047)	(5.738)	(4.848)
$\overline{R}^2$	0.398	0.182	0.316	0.246

Note: T-stats in parentheses. Non-Traded** is the non-traded sector excluding construction.

We find a significant relationship between the change in housing net worth and employment growth in all four estimations. As would be expected, *a priori*, the coefficient on ΔHNW_t is somewhat larger in the case of non-traded employment. A significant relationship still holds even when we exclude construction sector employment from the non-traded category.

Motivated by the analysis in section 3, and the findings of *Mian/Sufi* (2014), we next examine whether these full sample results are owing to the sharp downturn in the property market in the late 2000s and the early 2010s. To test this, we specify the following regression:

(7) $$\Delta \log E_t = \alpha + \eta * \Delta HNW_t + \delta * DV_{0172} * \Delta HNW_t + \in_t$$

Where DV_{0172} has a value of one between 2007 Q2 and 2012 Q4 and zero otherwise. The initial quarter, 2007 Q2, was the first quarter in which the change in the housing net wealth variable was negative within the full sample period. All bar one of the subsequent 21 quarters had negative ΔHNW values. The Andrews-Ploberger and Andrews-Quandt tests (*Andrews/Ploberger* 1994) indicate a structural break in ΔHNW in 2013 Q1 and so we set the dummy variable to have a value of zero from that quarter forward (alongside it having a value of

zero from 2002 Q3 to 2007 Q1).[5] The coefficient entries in Table 6 indicate the housing net worth channel having no effect on total employment developments outside of the 2007 Q2–2012 Q4 period. While the coefficient on the multiplicative dummy variable is significant for both total and non-traded employment at the five per cent level (and for non-traded-excluding construction traded sector employment at the ten per cent level), it is insignificant for traded employment. Consequently, the results mirror those of *Mian/Sufi* (2014) for the United States.

Finally, we consider further the link between the first and second parts of the paper by examining the relationship between the estimate of overvaluation in the property market, provided by (3), and the ratio of non-tradable to tradable employment. *Mian* et al. (2020) demonstrate that this ratio should rise during a period when there is an expansion of credit as households borrow and consume more, thereby increasing overall local demand and hence non-tradable relative to tradable employment. Therefore, the estimate of overvaluation allows us to test whether changes in house prices not explained by economic fundamentals have an impact on employment dynamics in the Irish economy. We estimate the following model:

$$(8) \qquad \log \frac{NT_t}{T_t} = \beta + \mu * O_t + \in_t$$

Where O_t is the measure of overvaluation from the estimation of (3). Using the three estimators of O_t provided in by Table 3, the estimates of (8) are presented in Table 7. In all three cases, it would appear the degree of overvaluation has a significant impact on the relative share of employment in the non-traded versus the traded sectors. The actual and fitted values from the SOLS model are plotted in Figure 9 and lend support to the *Mian* et al. (2020) view that the credit-supply driven or the non-fundamental component of house price variation can predict employment dynamics.[6]

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[5] The test results are available upon request from the authors.

[6] We also regressed the ratio of non-traded to traded employment on the loan to income credit variable used in Table 4. We find similar results – the results are available upon request from the authors.

Table 6

Labour Market Regressions Controlling for Housing Crash, 2002 Q3 – 2019 Q4

Dependent variable: $\Delta \log E_t$	(i) Total	(ii) Traded	(iii) Non-Traded	(iv) Non-Traded**
Constant	0.006	0.005	0.006	0.006
	(3.437)	(1.629)	(2.086)	(1.835)
ΔHNW_t	0.125	0.117	0.149	0.148
	(1.461)	(0.840)	(1.060)	(1.033)
$DV_{0172} * \Delta HNW_t$	0.351	0.327	0.520	0.401
	(2.591)	(1.489)	(2.347)	(1.773)
$\overline{R}^2$	0.444	0.196	0.359	0.269

Note: T-stats in parentheses. Non-Traded** is the non-traded sector excluding construction.

Table 7

Relative Movements in Employment as a Function of House Price Overvaluation: 2002 Q2 – 2019 Q4

Variable	Estimator		
	SOLS	DOLS	FM-OLS
O_t	0.002	0.002	0.002
	(13.836)	(8.707)	(12.459)

Note: N = 71. T-statistics are in parentheses.

V. Conclusion

In this paper, we have investigated the effects that changes in household net wealth have had on economic developments in Ireland over the past two decades. Irish household net wealth is heavily reliant on those households' ownership of residential properties compared to other western economies (see Central Statistics Office, 2020). The sharp rise in house prices between 2002 and 2007 occurred alongside a steep increase in credit provided to households and, consequently, there is a strong *a priori* case that the grounds for a severe downturn in housing net worth and employment were being laid during this period. The house price-credit boom of 2002 – 7 was indeed followed by an abrupt decline in
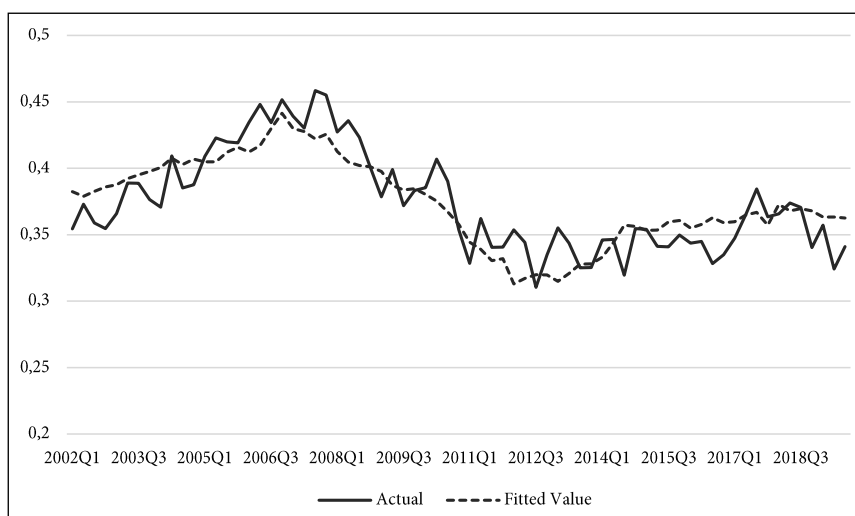
Figure 9: Log Ratio of Non-Traded to Traded Employment and Fitted Value based on Estimates of Under/Over Valuation Gap (%): 2002 Q2 – 2019 Q4

house prices and housing net wealth from mid-2007 through 2012. This raises the possibility that household balance sheet developments were central to the boom-and-bust episode experienced by the Irish economy between 2002 and 2012.

As *Mian/Sufi* (2018, p. 32) note, "we need to understand the boom to make sense of the bust." Our methodological approach to understanding the housing net wealth channel in Ireland in this paper involved two steps. First, given the background on house and credit developments presented in section 2, we illustrated how actual house prices started to rise well above fundamental values between 2002 and 2007. As credit conditions tightened, observed prices then declined rapidly to below those explained by fundamental variables. Since mid-2012, actual and fundamental house prices have developed in a manner where there is little difference between them by historical comparison and growth in household wealth and household credit outstanding have decoupled.

In the second step, to assess the macroeconomic effects of the channel, we focus, as *Mian/Sufi* (2014) do, on developments in the labour market over time. In particular, we adopt the regression approach from their predominantly cross-regional US focus to a time series estimation where the sample period covers three distinct phases of the business cycle. We look at total labour market developments as well as between traded and non-traded employment and control for endogeneity effects. Our initial results show that the housing net worth channel

appears to be important for Irish labour market developments throughout the 2002 Q2–2019 Q4 sample period. Further investigation, however, shows that the housing net worth channel has statistical significance only in explaining changes in employment during the 2007–2012 downturn through the non-traded sector.

The Irish economy was affected severely by the international financial crisis of 2007/8 and the domestic imbalances that had built up in the preceding years, particularly in the housing market. Looking ahead, as Ireland, along with other western economies, faces a harsh downturn owing to the Covid-19 pandemic, the susceptibility of the Irish economy to the credit-driven housing net wealth channel appears no longer to be particularly relevant. This is owing to the substantial deleveraging of households' credit position during the 2008–2012 recession and more prudent lending policies arising in relation to new house loan applications during the 2010s. Housing net wealth is no longer closely linked to credit provision to households (Figure 10). Moreover, according to our estimates, actual and fundamental house prices were closely aligned by 2019 Q4, and Irish household debt had, by 2020 Q1, declined by 35 per cent since its peak value in 2008 Q3.[7] Consequently, while a downturn in house prices could occur as a result of a deterioration in their fundamental determinants during the pandemic, it seems that the adverse effects of distorted household balance sheets witnessed after the 2007/8 financial crisis will not be pertinent on this occasion.
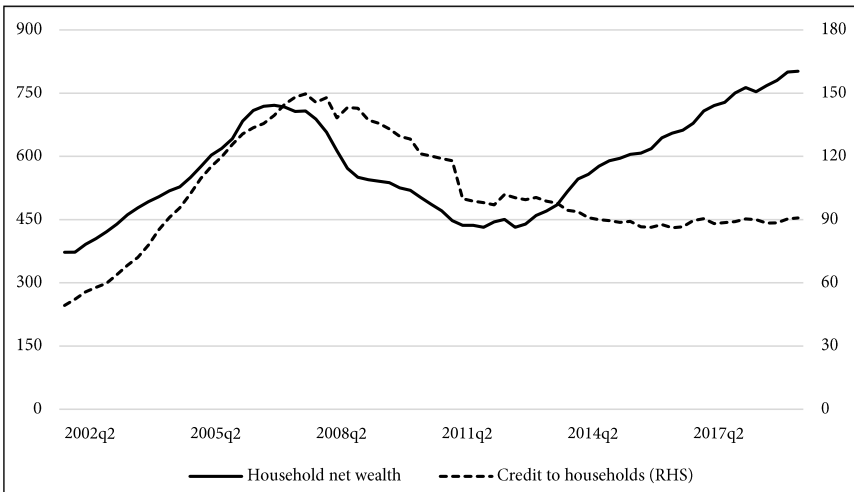

Figure 10: Household Net Wealth and Credit to Households (€ bn.):
2002 Q2 – 2019 Q4

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[7] See Central Bank of Ireland (2020).

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Appendix. Data Description and Sources

Variable	*Source*
House prices[8]	Central Statistics Office; Department of Housing, Planning and Local Government[9]
Total value of housing assets	Central Bank of Ireland
Household new worth	Central Bank of Ireland
Mortgage approvals numbers	Department of Housing, Planning and Local Government[10]
Household disposable income	Central Statistics Office
Consumer price index	Central Statistics Office
Population	Central Statistics Office
Mortgage interest rates	Central Bank of Ireland

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[8] 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.

[9] 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.

[10] This series is only available up to 2016. Data from the Banking Payments of Ireland of Ireland mortgage approvals report is used to update the earlier series. This is available at https://www.bpfi.ie/about-bpfi/.

Variable	Source
Housing stock data	Central Statistics Office[11]
Employment data	Central Statistics Office
Credit and deposits data	Central Bank of Ireland

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[11] The housing stock variable is compiled using a perpetual inventory method, where the initial value is taken from Census data from the Central Statistics Office. This is then updated with housing completions data from the Central Statistics Office. The rate of depreciation is also taken from the Central Statistics Office.