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Eoin Corrigan[a], Conor O'Toole[b], and Rachel Slaymaker[b]

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DHLG&H/ESRI RESEARCH PROGRAMME ON HOUSING ECONOMICS

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Abstract

In this paper, we estimate credit demand for potential Irish first time buyer households currently living in the rental sector. Exploiting individual survey responses to credit demand questions, and characteristics of the household, we estimate the level of latent credit demand that could be serviced by the market given prudent credit risk assessment and the current regulatory environment. We then compare this demand to current market provision to explore whether a credit gap exists. We find evidence of excess demand for credit and an under-supply of loans relative to latent demand. In terms of credit access issues, we find that insufficient savings for a down-payment, rather than income or affordability, is the most binding constraint. Scenario analysis suggests between 2,000 and 9,000 additional loans could be provided per annum depending on the degree to which demand is realised. This would imply an additional €0.4bn to €1.9bn in lending. We show a targeted public mortgage credit instrument could alleviate a portion of this gap and aid market access by providing between 1,100 and 5,800 loans at between €0.2bn to €1bn approximately.

1 Introduction

[1]Access to mortgage credit for first time buyer households has been a topic of considerable focus for both policy makers and researchers. Much of the general literature on credit markets has attempted to explore the extent to which such markets fail and how public policy can be used to address these market failures. Commonly discussed market failures in this regard are credit rationing on loan volumes or prices due to asymmetric information, moral hazard or adverse selection. Recently the literature has also emphasised borrower discouragement as a demand-side market failure. The onset of the financial crisis, the subsequent tightening of credit supply by the banking sector, and the regulatory moves to introduce macroprudential regulations in mortgage markets have all led to some households being unable to access sufficient credit to purchase a home. This has refocused attention on how best to ensure an adequate supply of credit to first time home-buyers internationally (Whitehead and Williams, 2017).

In an Irish context, the severe banking crisis caused a significant and protracted contraction in credit supply with overall new lending activity falling rapidly between 2009 and 2013. Over this period banks considerably tightened lending standards (in terms of the loan-to-income ratio (LTI), loan-to-value ratio (LTV), mortgage term and other credit risk characteristics). This was welcome given the imprudent nature of lending that took place at very loose credit conditions (McCarthy and McQuinn, 2017) during the Irish credit boom. However, given these developments, the structure of the mortgage market has changed such that few households at the lower end of the income distribution receive mortgage credit (Lydon and McCann, 2017) relative to pre 2008 levels. Furthermore, the welcomed introduction of macroprudential regulations by the Central Bank of Ireland in 2015, which set the maximum allowable LTI and LTV of newly originated mortgages, has restricted the allowable credit terms for households. Coupled with the shortage of housing supply, the consequence of this shortage in credit has been a considerable shift towards rented accommodation and rapidly rising rental prices.

Such changes to the structure of the market have led to questions about whether the current lending environment is optimal, or whether a supply-side lending intervention may be required to ease credit access conditions for first-time-home-buyers on the margins. To investigate whether there is a rationale for such an intervention requires a demonstration that this group is under-served by the market at present, and a clear identification of how any intervention instrument could help to alleviate credit access issues.

To explore these concepts, in this paper, we use two separate micro-datasets to

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[1]Results presented in this paper are based on analysis of strictly controlled Research Microdata Files provided by the Central Statistics Office (CSO). The CSO does not take any responsibility for the views expressed or the outputs generated from this research.

provide a partial equilibrium estimate of latent credit demand and the credit gap for Irish first time buyer households using a static microsimulation approach. We put forward a concept of bankable credit demand which is the total level of credit demand amongst Irish households given prudent credit risk assessment and the current regulatory environment. Exploiting individual survey responses to credit demand questions, and characteristics of the household, we estimate the level of latent bankable credit demand for Ireland over the period 2016-2017.[2] We then explore the degree to which policy could help to improve credit access by addressing the market failures and servicing some of the latent credit demand. In particular we focus on direct public mortgage provision as an instrument.

Our micro-founded empirical approach is as follows. We match new survey data on the share of households with a demand for home-ownership with a nationally representative survey of income and living conditions, the Irish Survey of Income and Living Conditions (SILC) dataset. Using this matched dataset, we approximate the level of latent bankable credit demand in the economy by excluding households that are deemed to be of high credit risk or their circumstances do not allow them to purchase a property in the county they are currently living (insufficient gross income, savings or net monthly income left after housing costs).

More specifically, we use the households' individual income and wealth data to approximate how much they could afford to pay for a house given prevailing macroprudential regulatory conditions. Following Kelly et al. (2018), our method calculates three potential house prices that a household could obtain given their savings, gross income and net monthly after tax income. In a sense, this estimates the share of households which have sufficient income, wealth and after tax income to transact in the market. If the lowest of these house prices is above the 25th percentile of the actual transacted house price distribution in their county, they are deemed bankable demand. We can then use this framework to calculate how many rental households with a demand for mortgage credit could conceivably be able to borrow to purchase a home. We can also value the demand as each household has an individual specific loan that is associated with their hypothetical purchase.

A number of findings emerge. First, we estimate 18 per cent of households in the rental sector who wish to purchase a home could obtain a mortgage given the prevailing conditions. As a share of the overall rental sector, this equates to approximately 7 per cent in total.[3] Using our microsimulation model with population weights, we estimate that this equates to approximately 38,000 loans which far exceeds the annual level of mortgage approvals at present. However, it is not likely that all of this demand would come on stream at one point in time. We therefore undertake a scenario analysis

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[2]This time frame is data driven.

[3]As 38% of the rental sector have current home-ownership demand, then 18% of 38% is approximately 7%.

which varies the "demand flow rate" or the level of demand that could conceivably be realised in any one year period. These findings suggest that between 2,000 and 9,000 new loans could be approved at a value of between €0.4 bn and €1.9bn. This is evidence of a considerable excess latent demand for credit relative to the actual level of credit supplied in the Irish market. In our assessment, we do not make any assumptions around whether or not these under-served households would actually be able to find a property and transact in the current market. This would require a search model and is outside the scope of our analysis.

While it is not the objective of this paper to measure the degree of credit supply in the market, nor the reasons determining bank lending activity, it is useful at this juncture to explore some tentative reasons why the banking sector may be under-providing credit, *over and above the macroprudential limits*. McCoy and Wachter (2017) note the importance of cyclicality for credit access. Given the size of the shock faced by the banking sector during the financial crisis, risk attitudes and risk tolerances on the supply-side would inevitably tighten post crisis. In this context of a contraction in credit, creditworthy but marginal cases may be rejected that otherwise would have been accepted under alternative risk contexts. This may explain a portion of the rejection rate. Indeed, the rejection rate of applicants in our ESM sample is one-in-three for renters. Second, the interest rate in Ireland is high by international standards with the reduction in competition that has occurred in the Irish market cited as an explanatory factor[4]. If the interest rate is higher than would be expected in a competitive market, borrowers are going to fail stress tests as a consequence. However, a lower rate may not improve affordability, if it causes house prices to rise.

Another likely reason for the lower levels of latent demand is borrower discouragement; households are not coming forward to apply as they feel they are likely to be rejected. While some of these borrowers are likely correct to self ration, there are a portion that are not and these borrowers are included in our estimate of bankable demand. Our ESM survey shows that the share of discouraged borrowers is much higher than the share of rejections. This is unsurprising given recent research on the uncertainty effecting households credit access under macroprudential (Economides et al., 2019) and challenges around housing affordability more broadly for rental households (Corrigan, Foley, McQuinn, O'Toole and Slaymaker, 2019).

A final group of factors to explain the extent of unmet latent demand are non-credit market frictions such as search frictions or low supply. For example, if information or search frictions are lowering the transaction rate, this would have an impact on latent demand. Cases such as this may include where households just cannot find the

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[4]There are also other factors involved including the recoverability of collateral, the higher arrears rate and the banks cost of funds. These are outlined in a CBI report entitled "Influences on Standard Variable Rate Pricing in Ireland" available at: https://www.centralbank.ie/docs/default-source/publications/correspondence/finance-reports/influences-on-svr-pricing-in-ireland.pdf?sfvrsn=2

right property in the area they would like to live. Extensively searching for properties has a cost threshold that some households with demand may be unwilling to cover at present.

Given our demonstration of a credit gap, we test whether a targeted public mortgage credit instrument could alleviate a portion of this gap and aid market access. By deploying the conditions of the existing Rebuilding Ireland Home Loan, which is provided by the Irish government and was introduced in February 2018, we estimate that demand for the scheme could be between 1,100 and 5,600 loans at a value of approximately €0.2bn to €0.9bn. As a benchmark to our findings from the microsimulation, data on applications to the RIHL scheme have approximated a total of 5400 since inception with over 1000 loans drawn down to June 2019[5]. This suggests our model provides a reasonable approximation of the actual level of demand.

A note of caution on our findings must be presented. Our estimates provide a partial equilibrium estimate of credit demand and do not consider any impacts on the market or macroeconomy of meeting the estimated credit gap. Expanding the level of lending to serve the excess demand through the market or by policy mechanisms would naturally be expected to have an impact on house prices that would be relative to the change in credit. Indeed, given the low level of housing supply in Ireland at present, and the high level of fundamental demographic demand that has been unmet over the past decade, it is likely that any considerable increases in credit which boost demand, would put upward pressure on prices. Previous studies have indicated a house price elasticity of credit between 0.15 and 0.2 (Favara and Imbs, 2015; Kelly et al., 2018), suggesting a high pass through to prices of expanding credit. This would occur as the housing demand curve would shift out, and given the inelastic nature of housing supply in the short run, prices would inevitably rise. These dynamics suggest that any public intervention should be limited in size and scope relative to the overall size of first time buyer lending so as to avoid fuelling credit-house price spirals. Future research should extend the current framework to examine the house price elasticity of credit.

A number of caveats must be noted to our microsimulation approach. Naturally, with these type of models, a range of assumptions have to be made in terms of the parameterisation of the inputs. This is particularly the case given we are matching two micro datasets and estimating wealth levels. Any changes to the input parameters could change our estimates notably, including the aggregations and the assumptions around the demand flow rate. To test the sensitivity of our estimates to these inputs we present a range of robustness checks which alter a number of the key parameters. While the levels adjust in these scenarios, the main finding of a significant credit gap remains. Furthermore, for some of our analysis, the number of data observations is quite low

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[5]See O'Toole and Slaymaker (forthcoming) for more details on the data covering RIHL.

which means the estimates are even more volatile to changes in the parameters.

The rest of this paper is structured as follows: Section 2 provides an overview of credit demand and access from a conceptual perspective. Section 3 presents the main empirical estimates and Section 4 examines the sensitivity of these estimates. Section 5 looks at the policy intervention, while Section 6 concludes.

2 Understanding Credit Demand and Credit Access Across Households

2.1 Credit Demand and Credit Rationing: An Overview

To begin our discussion of household credit access, it is useful to sketch out a conceptual framework for thinking about the latent demand for credit, the degree of credit constraints as well as scoping out where public intervention may be required in credit markets. First, we characterise all households using an overview diagram to depict access to credit across all households similar to that used in Freel et al. (2012) for small enterprises. This is presented in Figure 1.

Figure 1. Overview of Household Credit Access
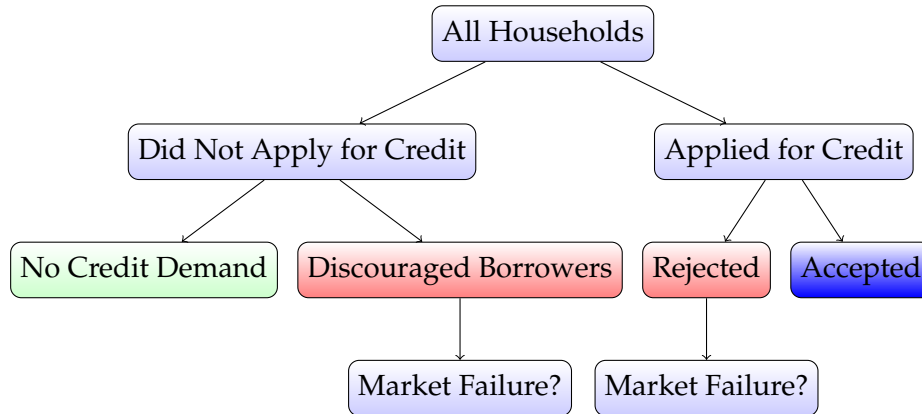
Households can be separated into those who apply for credit to formal financial institutions and those who do not apply. Of those households who don't apply, a proportion of them have no credit demand. A second group of these households do have credit demand but are discouraged from applying as discussed above. For those households that applied for credit, a percentage of households are rejected following bank underwriting and assessment of the application and the remainder are successful and receive credit.

The critical question from a policy perspective is whether market failures exist and thus whether there is a basis for efficiency enhancing state intervention in this market. In their seminal work, Stiglitz and Weiss (1981) define credit rationing as a situation

where either identical borrowers may receive different credit outcomes, or where some borrowers are simply not able to access finance at any interest rate. Broadly speaking, the justification for intervention in the housing credit market can be split into two groups: those on the grounds of economic efficiency from correcting market failures, and those on the grounds of equity and fairness. We will discuss each of the reasons for credit market failures and the potential grounds for intervention in turn.

First, potential borrowers may find themselves unable to access credit due to informational asymmetries between borrowers and lenders. This can occur when a lender does not know how good a borrower is from their observable information. For instance, when a borrower knows more than the lender about their individual circumstances which may affect their future ability to make repayments, such as information on their medical status or the security of their employment. In addition, the borrowers' risk profile may also be unobservable to the lender. Lenders factor in the probability that not all loans will be repaid when pricing the cost of a loan. They therefore include a risk premium, which raises the interest rate. However, offering a higher interest rate to account for the fact that some loans will not be repaid results in the lowest risk borrowers dropping out, leaving a higher proportion of poor quality/higher risk borrowers in the pool of potential borrowers. This therefore increases the likelihood of a poor quality or riskier borrower obtaining credit.

A third reason for credit market failure relates to moral hazard or agency problems. Put simply, the lender wants to maximise the likelihood that the loan will be repaid, while the incentives of the borrower may not be aligned with this. All three of these issues arise due to imperfect information and the costs of overcoming these information barriers may be high both in terms of monetary and time costs. This can result in an economically inefficient situation if credit worthy borrowers are not able to access the credit they require and could use productively. furthermore, the recent literature on household credit access has highlighted income and wealth constraints whereby households may meet credit risk standards but have insufficient income or savings to make a purchase (Barakova et al., 2014).

Credit rationing, that is, excess demand for loanable funds, has been the subject of considerable economic research, including the seminal paper by Stiglitz and Weiss (1981) which identified the potential existence of non-market-clearing equilibria in credit markets. Prices, that is interest rates, need not necessarily clear markets as the interest rate a bank charges may affect the riskiness of the pool of loans managed by the bank; as interest rates increase the quality of the loan portfolio may decrease[6]. It is, however important to note that much of the literature concerning credit rationing is in relation to credit as an input in circumstances in which rationed credit may impair economic

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[6]In practice, however, Irish banks are not unconstrained when setting interest rates which are a product of many variables including funding costs, operating costs, bad debt charges, return on capital and competition (Department of Finance, 2019)

growth by inhibiting productivity growth among firms. As such, credit rationing reduces society's welfare below its non-credit rationed potential. The role of credit as a means to achieve home-ownership is not, perhaps, as straightforward and it certainly seems unlikely that the satisfaction of all demand for mortgage credit would be welfare maximising. The exact quantum of socially optimal home purchase credit would be very difficult to quantify, however, there are economic arguments in favour of home-ownership in general and in favour of making home-ownership accessible to a wider pool of households than might otherwise be the case. The question of the ideal proportion of households that should be homeowners and whether public policy should aim to reverse the tenure shift observed in recent decades is complex and goes beyond the scope of this paper.

Kon and Storey (2003) highlight a demand side market failure by which borrowers are discouraged from applying for credit due to a belief that loans will be unsuccessful; the prevailing literature now treats such borrowers as under-served by the credit market and therefore credit constrained[7].

In addition to intervention on the grounds of economic efficiency and market failure, there is an argument for State intervention in terms of social fairness and equity, as well as due to the positive externalities associated with home-ownership. Housing is a major source through which households accumulate wealth. Di et al. (2007) show that even after controlling for initial wealth levels and personal characteristics likely to affect wealth accumulation such as previous savings habits, home-ownership had a positive effect on the net wealth of households. If certain sections of society are unable to own a property, this has major implications for the distribution of wealth within society. Indeed, Acolin and Wachter (2017) discuss how home-ownership can help to enable intergenerational economic mobility. Furthermore, there is some evidence that home-ownership is associated with a range of positive externalities. For instance, there is evidence that parental home-ownership is positively associated with successful youth outcomes, both in terms of educational attainment, being less likely to engage in crime Blau et al. (2019), and earnings in later life (Boehm and Schlottmann, 1999); although it is not clear that this is a causal relationship.

Given our overview of the market presented in Figure 1, the focus of where these market failures may lie is in both the discouraged borrower group as well as in the rejected group. For discouraged borrowers, the focus is on whether a proportion of discouraged borrowers would be successful if they were to apply for credit. For the rejected borrowers, the question arises as to whether such borrowers were fairly or unfairly rejected by the market. Finally, considering loan pricing, if interest rates are not being set on a competitive market basis, and this causes either heightened rejection

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[7]That is not to say all such borrowers should receive credit as a proportion are potentially excluding themselves with good reason, as they would be rejected if they applied. See Ferrando and Mulier (2015) for further discussion in an SME context.

or higher discouragement, then this is also a form of market failure.

2.2 A Conceptual Framework for Measuring the Credit Gap

We now present a more structured framework for measuring credit demand and credit access in the mortgage market. This is not to be taken for a full model of the credit market, it is purely a descriptive overview of the main channels through which the credit market operates. Let us define the underlying latent demand for mortgage credit in an economy, C^*, as follows:

$$C^* = \left(\sum_{i=1}^{N} L_i \right) \tag{1}$$

where N is the total number of households with positive latent demand for credit. For each household, the loan amount that they desire L_i will be a function of the following characteristics:

$$L_i = f(W_i, HP_i, Y_i, r) \tag{2}$$

where W_i is household wealth, HP_i is the price of the house they desire to purchase, Y_i is household income and r is the market interest rate.

However, not all of the underlying latent credit demand is "bankable" in the sense that there are some borrowers who should not receive credit under any prudent credit assessment. To elaborate, it would not be an efficient allocation of credit in the economy to provide mortgages to households with an elevated default risk, for example, households which are unemployed, those with repayment difficulties on their rent, utilities or other debts, or those who find their existing debts to be a burden. For these households, an alternative to mortgaged home-ownership would be a more suitable tenure. In assessing any optimal provision of credit in an economy, we posit to exclude the credit demand for these high credit risk households from the latent demand.

Furthermore, since the onset of the financial crisis, regulatory authorities globally have introduced a range of macroprudential limits on borrower leverage. The aim of these measures is to boost systemic resilience to financial or economic shocks. These regulatory restrictions must also be incorporated into the reduction in bankable demand as it is not possible for the banking sector to supply those households if circumstances do not allow them to meet the regulations. In Ireland, these regulations include a 3.5 loan-to-income ratio and a 90 per cent maximum loan-to-value ratio for first time buyers (Kinghan, 2018). Some exemptions to the regulations are also available[8].

Let us define bankable credit demand, BC^* as follows:

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[8]The following exemptions are permitted: up to 5 per cent of the value of new FTB lending may exceed the 90 per cent LTV limit and up to 20 per cent of the value of new FTB lending is allowed above the 3.5 times gross income LTI limit.

$$BC^* = \sum_{i=1}^{N} (L_i \times (1 - CR_i) \times (MP_i)) \qquad (3)$$

and

$$CR_i = \begin{cases} 1 & \text{if } CR_i^* \geq \delta; \\ 0 & \text{if } CR_i^* < \delta. \end{cases} \qquad (4)$$

where δ is a default risk above which it is imprudent to lend from an idiosyncratic risk perspective and CR_i^* is the underlying latent credit risk of household i. Ensuring safe lending and proper underwriting is a clear lesson from the global financial crisis which had many of its roots in unsafe mortgage lending practices (Anderson et al. (2011); Jiang et al. (2013); Jiang et al. (2014)). The following identity depicts which households are unable to enter the market as their circumstances do not allow them to pass the regulatory tests:

$$MP_i = \begin{cases} 1 & \text{if household } i \text{ complies with MP ;} \\ 0 & \text{if household } i \text{ does not comply with MP .} \end{cases} \qquad (5)$$

In a sense, what identity 3 provides is the latent credit demand that could be satiated by the market if reasonable credit risk standards were deployed and the current regulations were complied with.

The extent to which bankable demand is met in an economy is determined by both demand and supply side factors and the degree to which the market is in equilibrium. We can use a traditional disequilibrium model of credit demand and supply to illustrate this relationship. If credit demand is depicted by BC_i^*, then credit supply can be depicted as follows:

$$C^s = f\left(LTV, LTI, \tau, r, cr(\delta), X_b, \frac{p_s}{Y_i}\right) \qquad (6)$$

Credit supply is a function of the loan-to-value ratio, the loan-to-income ratio, the term available to the borrower, the market interest rate r, other characteristics X_b of the banks that affect lending (such as capital ratios, funding structures etc.), their own credit risk standards which will be some function of δ the underlying latent credit risk, and an assessment of affordability in terms of the ability of the household to meet a stressed mortgage payment, p_s, normalised by their income Y_i.

In a mortgage market with a macroprudential framework limiting credit conditions, it is possible that the loan-to-value (LTV) and loan-to-income (LTI) supply conditions will be set by the regulatory authority as noted above, thus putting a regulatory ceiling

on the borrowing capacity. Furthermore, legislation can also determine the condition for the stressed payment, as is the case for Ireland. In a sense, credit supply will therefore be an interaction between bank lending practices and the regulatory environment.

The observed level of lending in the economy will therefore be:

$$C = min\left(BC^*, C^s\right) \tag{7}$$

In periods of excess demand for credit, $C^s = C^a$ and the credit gap will be:

$$GAP = BC^* - C^a \tag{8}$$

For periods in which credit supplied outweighs credit demand, this "gap" will be negative.

Figure 2. Credit Demand Framework
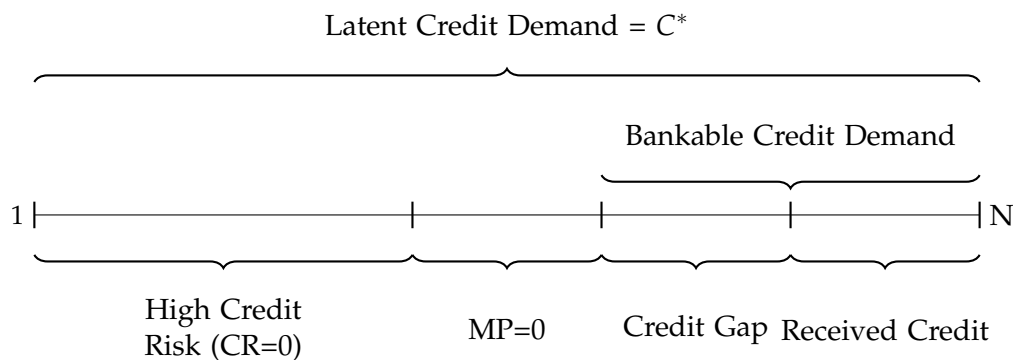
Figure 2 provides a graphical depiction of the measurement of credit demand and the credit gap suggested by this framework. Total latent credit demand can be split into bankable demand and two separate groups of non-bankable demand: those who are inherently high credit risk and those who are constrained by macroprudential regulations. Of the potentially bankable demand, a certain proportion will receive credit, while the remaining portion will be unserviced. In this illustrative framework, there is no distinction between discouraged borrowers and credit rationed households as both of these are included in the measure of the gap as households who have a demand for credit that is under-served by the market at present.

3   Measuring Latent Credit Demand and the Credit Gap

In this section we build on the conceptual framework of credit demand outlined in Section 2.2 in order to examine the level of mortgage credit demand and the extent to which access to credit is an issue among potential first time buyers (FTB) in Ireland. Combining data from two household micro-datasets enables us to first estimate the level of mortgage demand before then separating households into those who are high credit risk and those who face insufficient wealth or income and also those households unable to meet credit stress tests. This provides us with an estimate of bankable credit demand as outlined in the above framework. We can then measure whether the market is currently servicing the estimated level of latent credit demand.

3.1   Measuring Mortgage and Homeownership Demand

In order to examine the level of mortgage credit demand among Irish households, we exploit data from the ESRI's Economic Sentiment Monitor Survey (ESM). The ESM is a nationally representative study surveying approximately 800 households per month on a variety of topics ranging from views on the economy as a whole to savings and investments behaviour and the housing market, in addition to a set of socio-economic variables. Importantly for our purposes, since 2018 the survey has also contained a series of questions related to mortgage credit. Specifically, we make use of information on households' desire to enter the home-ownership market, whether they have applied for mortgage finance or whether they feel discouraged from doing so.

Our sample period runs from January 2018 to February 2019 and as our focus is on those households looking to enter the home-ownership market for the first time, we limit our sample to those living in either the private rental sector, local authority or housing association rented property, or rent free[9]. This leaves us with a sample of 1,228 households. In Table 1 we present summary statistics on the composition of the sample. Unsurprisingly, more than half of our sample are aged 18-35, while half have third level education and just under half live in the Greater Dublin Area (GDA).[10] Regarding household composition, 80 per cent of households comprise more than one adult, but just under 40 per cent contain any dependent children.

Turning now to the demand for mortgage credit, we classify a household as having a demand for credit if they satisfy at least one of the following criteria: (i) they have

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[9]While it is common in other analysis of potential FTBs to impose an age restriction on households, in this work we take the view that all households who do not own a property are potential home-owners. This approach is consistent with the Rebuilding Ireland Home Loan eligibility criteria which states that applicants must be aged between 18-70. In practice, we then limit a household's ability to obtain a mortgage by altering the maximum mortgage term according to their age. We discuss this further in Section 3.2.2

[10]This share is consistent with the data from the Residential Tenancies Board new registrations information available in their Quarterly Rent indices.

Table 1. Sample Composition Summary Statistics

	Share of Households (%)
Age	
Aged 18-35	54.69
Aged 36-50	28.71
Aged >50	16.60
Education	
Third level educ.	48.51
Prim./Sec. educ.	51.49
Household Composition	
1 Adult Hhold	18.14
2+ Adults Hhold	81.86
Dependents	
1+ children aged <18	38.53
Employment Status	
Employee - Public sector	15.76
Employee - Private sector	38.08
Employee - not specified	1.67
Self-employed	5.99
Unemployed	11.61
Inactive	26.89
Tenure	
LA/Housing Assoc. renter	30.27
Private renter	56.89
Rent free	12.84
Region	
GDA	45.19
Saving Behaviour	
Save regularly	50.85
Don't save regularly	49.15
Ability to make ends meet	
Great-some difficulty	54.59
Fairly-very easily	45.41
Obs.	1228

applied for a mortgage within the last six months; (ii) they did not apply for a mortgage as they feared their application would be unsuccessful i.e. discouraged borrowers; (iii) they intend to buy or build a property within the next two years. From the first row of Table 2 we see that 38 per cent of the households in our sample have credit demand; this can be thought of as the underlying latent demand for mortgage credit in the Irish economy.

Regarding heterogeneity, as we might expect, the desire to obtain credit and enter the home-ownership market is strongest amongst those households who we might deem as the most prepared to do so: those in employment, two adult households, those who regularly put money into a savings account and households easily able to make ends meet. With regards to age we see a higher demand amongst the younger households in our sample (aged 18-35) and a much lower demand for credit amongst those over 50. This is unsurprising as we would expect many younger households to live in the rental sector before transitioning into home-ownership, whereas those older households who remain in rental accommodation will have more limited opportunities to do

Table 2. Latent Mortgage Credit Demand by Socio-economic Group

	%
Overall	38.37
Age	
Aged 18-35	44.87
Aged 36-50	38.56
Aged >50	16.64
Education	
Third level educ.	50.06
Prim./Sec. educ.	27.36
Household Composition	
1 Adult	23.81
2+ Adults	41.60
Dependents	
Dependents - 1+	36.07
No dependents	42.03
Employment Status	
Employed	49.58
Unemployed	20.38
Inactive	20.56
Saving Behaviour	
Save regularly	46.97
Don't save regularly	30.06
Region	
GDA	43.27
Non GDA	34.33
Tenure	
LA or Housing Assoc. Renters	16.66
Private Renters	49.72
Rent free	39.24
No. Obs.	1,228

The figures represent the percentage of households within each socio-economic characteristic group who have a demand for mortgage credit.

so. Regarding rental tenure, roughly half of those in the private rental sector expressed a demand for mortgage credit, with a much lower figure of 16 per cent for those living in local authority or housing association accommodation.

Table 3. Characterisation of Mortgage Demand and Credit Constrained - Summary Statistics

	Latent Mortgage Credit Demand	Applied	Discouraged Borrowers
%	38.37	7.10	15.68
No. Obs.	1,228	1,228	1,228

Latent mortgage credit demand includes households who expressed an intent to buy or build a house within the next two years plus those who have already applied for credit in the past 6 months and those who considered applying for a mortgage in the past 6 months but did not apply or those who responded that they did not apply because they expected to be unsuccessful (discouraged borrowers).

In Table 3 we see that while 38 per cent of the sample expressed an underlying demand for credit, approximately only one fifth of those households, or 7 per cent of our entire sample, actually applied for mortgage credit in the last six months. In fact, roughly double this number, 15 per cent of households, explicitly say that they were discouraged from applying as they expected their application to be unsuccessful.

Table 4. Determinants of Mortgage Credit Demand - Probit Regressions

	(1)	(2)	(3)
	Latent Mortgage Credit Demand	Applied	Discouraged Borrowers
Aged 36-50	-0.0114	0.0484**	-0.0393
	(0.0374)	(0.0213)	(0.0264)
Aged > 50	-0.0512	0.000135	0.00258
	(0.0451)	(0.0265)	(0.0348)
2+ Adults	0.0765*	0.0441**	0.0229
	(0.0399)	(0.0183)	(0.0273)
Third level educ.	0.0601	0.0350**	0.00748
	(0.0367)	(0.0169)	(0.0290)
1+ Dependents	0.0999***	0.0559***	0.0359
	(0.0345)	(0.0209)	(0.0288)
GDA	0.0524	0.00488	0.0448*
	(0.0319)	(0.0166)	(0.0255)
Self-employed	-0.0310	-0.0131	-0.0741**
	(0.0625)	(0.0247)	(0.0344)
Unemployed/Inactive	-0.166***	-0.0335*	-0.0408
	(0.0391)	(0.0194)	(0.0306)
Save regularly	0.0665**	0.0605***	0.00117
	(0.0336)	(0.0156)	(0.0264)
Easily make ends meet	0.0703**	0.0264	-0.0798***
	(0.0342)	(0.0167)	(0.0266)
Private renter	0.216***	0.0732***	0.121***
	(0.0422)	(0.0143)	(0.0268)
Rent free	0.146**	0.0626**	0.0874**
	(0.0570)	(0.0272)	(0.0443)
Observations	1,228	1,228	1,228

Dependent variables are (1) =1 if household has latent mortgage credit demand; (2) =1 if household has applied for mortgage credit in last 6 months; and (3) =1 if household did not apply for mortgage credit due to being discouraged. Base categories are: 1 adult household; primary/secondary education; no dependents; non-Greater Dublin Area; employee; does not regularly save income; difficulty making ends meet; local authority/housing association renter.

Further to the descriptive statistics presented in Table 2, we now examine the determinants of demand for mortgage credit more formally. We estimate a simple probit model of the determinants of mortgage credit demand ($D_{it} = 1$):

$$Pr(D_{it} = 1) = f(\mathbf{X_{it}}, \mathbf{Ec_{it}}) \tag{9}$$

where $\mathbf{X_{it}}$ is a vector of standard household characteristics likely to affect demand including age, household composition, whether there are dependent children in the household, education, tenure and whether the household lives in the GDA. $\mathbf{Ec_{it}}$ is a vector of household economic status variables including the employment status, household saving behaviour and their ability to make ends meet. The results from this estimation are presented in column 1 of Table 4.

We see that the economic status variables are highly statistically significant determinants of whether a household has a demand for mortgage credit. Unsurprisingly the

unemployed and inactive have a lower demand relative to those in employment, while those regularly able to save their income and those who are easily able to make ends meet have a higher demand for credit. Those living in the private rental sector and rent free have higher demand relative to those in local authority accommodation. Those with children also have higher levels of demand for credit. We find that age, education and whether the household lives in the GDA are not statistically significant determinants of credit demand. We also report the results from estimating the determinants of credit application and of being a discouraged borrower in columns 2 and 3 of Table 4 respectively. While age and education had no significant effect on the latent demand for credit, we do see that those with third level education are more likely to have applied for credit, as are those aged 36-50 relative to younger households.

3.2 Towards an Estimate of Bankable Demand

3.2.1 Matching the ESM to the EU SILC

Using the ESM dataset enabled us to obtain a clear picture of both the level and key determinants of mortgage finance demand among potential first time buyers in the Irish housing market in Section 3.1. However, as discussed in Section 2.2, not all of this latent demand for credit should be serviced; high credit risk potential borrowers should not receive credit under a prudent credit assessment, while others will be constrained by current macroprudential regulations. There is widespread evidence that the scale of the default crisis which began in 2008 was exacerbated by the poor quality of underwriting practices at the point of loan origination (Anderson et al. (2011); Jiang et al. (2013); Jiang et al. (2014)), which resulted in non-credit worthy borrowers obtaining mortgage finance. For Ireland McCarthy and McQuinn (2017) document the loosening of credit underwriting standards. The scale of mortgage defaults and the global financial crisis that followed highlighted the importance of adequately assessing the credit risk of potential borrowers.

One limitation of the ESM survey is that it does not contain sufficient information, particularly regarding income, other loans and payment histories, to enable us to perform a credit risk assessment of households. We therefore utilise a second dataset, the CSO's Survey of Income and Living Conditions (SILC). SILC is a nationally representative household survey which also incorporates an individual level questionnaire. The survey contains a wealth of information including household income, rental payments, current employment status and whether an individual has had any recent spells of unemployment. Furthermore, the survey collects information on a number of other indicators regarding a household's potential level of credit risk, such as whether they have been in arrears on rental, utility and other loan payments in the last twelve months and whether they have any existing debt which they perceive to be a burden. Matching

data on underlying mortgage credit demand from the ESM survey with the SILC data allows us to estimate the level of bankable credit demand of first time buyers in the Irish economy.

We limit our sample in SILC to households currently in the private rental or local authority rental sectors, as well as those living rent free or paying a below market price rent and we pool data from the two most recent waves, 2016 and 2017. As SILC does not contain information on households' demand for credit, we utilise our findings from the ESM survey. Specifically, we use the β coefficients from the model of mortgage demand estimated in column 1 of Table 4 to predict the probability of each household in SILC having a demand for mortgage financing. This ensures that households possessing the characteristics that were determined to be key drivers of mortgage demand in the ESM survey receive a higher predicted probability of having demand for mortgage credit in our SILC data. From Table 3 we know that 38 per cent of potential first time buyer households had a demand for mortgage credit, so we then rank households in SILC according to their probability of having mortgage demand. Our final sample contains the 38 per cent of households with the highest predicted probability of mortgage demand. Crucially, having combined the two datasets, the income data in SILC, in addition to questions on rent and other loan arrears and the burden of current debt allows us to assess the credit risk of these households, which is a critically important aspect for determining whether the household should be able to access mortgage financing.

In Table 5 we present a comparison of the summary statistics of the ESM and SILC samples. These samples contain households who expressed a demand for mortgage credit (ESM) and those in SILC who we have determined as having a demand for mortgage credit following the method outlined above. The first thing to consider when combining two datasets is whether the compositions of the samples are similar. One of the principal motives for combining the ESM and SILC survey data was to enable us to credit risk assess households, for which the income data in SILC is crucial. It is therefore particularly reassuring that the two samples are very closely matched on two key variables which we would expect to determine income: employment status and education. The samples are also well matched in terms of household composition, mean age and the proportion living in the GDA. The proportion of households with dependents in SILC is somewhat higher, while the proportion in local authority rental accommodation is lower in SILC than in the ESM sample. Nevertheless, we are satisfied that the samples are similar on key characteristics to justify combining them in this way.

Having established the set of households in our SILC sample with an underlying demand for mortgage credit, we now examine the extent to which these households are (i) high credit risk and (ii) the extent to which they have insufficient gross or net income or savings to enter the housing market due to the current regulatory environment. This will then provide us with a level of bankable mortgage demand in the Irish economy.

Table 5. Comparison of ESM and SILC Sample Composition Summary Statistics

	ESM	SILC
Age		
Mean Age	34.73	36.53
Education		
Third level educ.	63.28	64.07
Prim./Sec. educ.	36.72	35.93
Household Composition		
1 Adult Hhold	11.25	14.42
2+ Adults Hhold	88.75	85.58
Dependents		
1+ children aged <18	42.21	69.98
Employment Status		
Employee	72.07	75.99
Self-employed	7.31	6.14
Unemployed/Inactive	20.61	17.86
Tenure		
LA/Housing Assoc. renter	13.14	5.51
Private renter	73.72	80.31
Rent free	13.14	14.18
Region		
GDA	50.96	46.09
Saving Behaviour		
Save regularly	60.16	51.64
Don't save regularly	39.84	48.36
Obs.	458	897

Notes: For the ESM sample we present the summary statistics for those households that have a demand for mortgage credit. For the SILC sample we present the summary statistics for those households that we have determined have mortgage credit demand.

3.2.2 Measuring the Credit Risk Component

As previously discussed in Section 2.2, not all of the underlying demand for credit should be serviced as some potential borrowers are simply too high credit risk and should therefore not receive credit under a prudent credit assessment. In practice lenders use a variety of factors to determine a household's level of credit risk. In the US for example, Acolin et al. (2016) identify a household's credit score as an important factor which constrains access to mortgage credit. Irish households are not assessed according to a single credit score, such as the FICO score in the US. Nevertheless, Irish mortgage providers do perform credit record checks with the Irish Credit Bureau, as well as requesting information on employment status, income, age, outgoings, savings and outstanding loans in order to determine whether an application for credit is successful. The new Central Credit Registry will also provide good information going forward.

We use a number of indicators in SILC to determine whether a household is high credit risk. Regarding employment status, we mark a household as high credit risk if the head of household has had any spells of unemployment in the previous 12 months or if they are inactive in the labour market. While we do not have information on the value of any outstanding loans in SILC, we utilise a number of questions which we be-

lieve to be a good proxy for whether a household has a poor credit record. We determine a household to be high credit risk if they have had any rent, utilities or consumer loan arrears in the previous 12 months due to financial difficulties, as these are indicators of poor repayment history or poor debt management which are likely to be picked up in a credit bureau check. In addition, households who either state that their existing debt is a burden or that they are unable to meet an unexpected expense, and also either face at least 1 deprivation indicator in SILC[11] or state that they face difficulties in making ends meet are determined to be high credit risk. Because whether existing debt is a burden and whether a household is able to meet an unexpected expense are subjective measures, we cross reference them with the deprivation and making ends meet measures to ensure that we are capturing households which are facing some material difficulty as a result. As the households in our sample do not have a mortgage, existing debt refers to products such as auto loans, credit cards and other consumer loans. If these households are suffering material hardship due to holding these loans, then we determine that they are not suitable candidates for mortgage credit at present.

3.2.3 Controlling for Macroprudential Regulations

To determine the level of bankable credit demand, we exclude all households whose credit risk is high as measured in Section 3.2.2 above. However, the degree to which households can enter the market given the current regulatory environment depends on their income and wealth. We therefore need to include these individual characteristics in any assessment of how many households can pass the regulatory hurdles. To take these regulations into account, our methodology draws on the framework in Kelly et al. (2018); we calculate the maximum potential house price a household could afford under the current market and regulatory conditions. This in turn provides each household with a maximum loan that they could draw down given the combination of their own personal circumstances and the prevailing regulatory environment. While there is an extensive literature on the calibration of macroprudential regulations and the level at which the specific parameter should be set, we abstract from this debate in our analysis and accept the current regime as binding. We now outline how we estimate how much each household can afford to purchase relative to their income, wealth and an affordability stress test.

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[11]Deprivation indicators include: had to go without heating due to lack of money; deprived of 2 pairs of shoes; deprived of roast joint of meat (or equivalent) once a week; deprived of meal containing meat, fish, or vegetarian equivalent every second day; unable to replace worn out clothes with new; unable to afford warm, waterproof coat; deprived of ability to keep home warm; unable to replace worn out furniture; deprived of get together with friends or family for drink or meal once a month; unable to buy presents for family at least once a year; deprived of a social activity in last 2 weeks due to lack of money; at least 1 day in past 2 weeks where could not have substantial meal due to lack of money.

3.2.3.1   Do Households Have Sufficient Wealth?

Under the macroprudential mortgage regulations introduced in 2015, first time buyers (FTB) in Ireland are permitted a maximum loan-to-value ratio (LTV) of 90 per cent (Kinghan, 2018)[12], meaning they must make a down-payment of at least 10 per cent of the value of the property.

One of the limitations of the SILC dataset is that it does not contain any measure of household wealth which could be used to calculate the size of any potential deposit the household could make. To the best of our knowledge there are no data on the wealth of potential first time buyers outside of the 2013 CSO Household Finance and Consumption Survey (HFCS). Given the major economic challenges faced at that time in the wake of the financial crisis and the rapid increase in both incomes and asset prices since 2013 in Ireland, we do not believe the information in this survey is likely to provide an accurate reflection of the current wealth of potential first time buyers. Nevertheless, we do make use of these data in a robustness check in Section 4. Our preferred method is therefore to utilise information on current income and expenditure to calculate the estimated savings a household might reasonably be expected to accrue to put towards a down-payment. More specifically, we allow a household to save S_m each month:

$$S_m = Y_m - R_m - E_m$$

where Y_m is net monthly income, R_m is their current monthly rent and E_m is their minimum necessary monthly expenditure. E_m is calculated as the higher of either the minimum the household states they need to make ends meet minus their current rent, or the Minimum Essential Standard of Living (MESL) income for each household type defined by the Vincentian Partnership for Social Justice[13] plus average childcare costs[14] if the household has dependent children. If a household responds that they do not regularly save any of their income, we let $S_m = 0$. We cannot observe the precise amount these households would save in practice. However, these are all households with a demand for mortgage credit who state they regularly save a portion of their income, so the assumption that they would save intensively towards a down-payment does not seem an unreasonable assumption.

In addition to considering how much a household is able to save on a monthly

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[12] At present (December 2019), up to 5 per cent of the value of new FTB lending may exceed the 90 per cent LTV limit.

[13] The Minimum Essential Standard of Living (MESL) income measure includes spending on the following items: food, clothing, personal care, healthcare, household goods, household services, communications, social inclusion, education, transport, household energy, personal costs, insurance, savings and contingencies.

[14] We use weekly average childcare costs from the CSO transformed into a monthly figure and updated to 2017 prices using core CPI.

basis towards a deposit, another important aspect is whether they are likely to receive an intergenerational wealth transfer. A 2016 Bank of Ireland survey found that 51 per cent of prospective borrowers aged 25-45 expected to receive a financial gift towards a deposit[15]. We therefore randomly allocate 50 per cent of non high credit risk households a one-off €10,000 gift. We use €10,000 as up to €10,000 was the modal choice of mature home-owners providing gifts to children from a recent survey (Corrigan, 2019). As the size of this gift varies, in Section 4 we examine the sensitivity of our results to changes in the size of this gift.

Just over half of households in the Bank of Ireland's recent survey said they had been saving for 2 years, while in analysis based on a couple with no children and wishing to purchase a 3 bedroom property in 2016, Kelly and McCann (2016) found that the time required to save for a deposit ranged from less than a year in non-urban areas, to 1-1.5 years in urban areas excluding Dublin, and 2.5-4 years in Dublin depending on the area. Using these estimates as a guide, we therefore allow households to save for 3 years to accumulate a deposit, d, which is a function of their monthly savings S_m and whether they receive a gift, G. We examine the sensitivity of our estimates to this parameter choice in Section 4.

$$d = \begin{cases} (S_m * 12 * 3) + 10,000 & \text{if } G = 1 \\ S_m * 12 * 3 & \text{otherwise} \end{cases}$$

First time buyers are permitted a maximum LTV of 90 per cent which gives:

$$LTV = \frac{hp_{ltv} - d}{hp_{ltv}}$$

which gives a maximum house price a household could face under these LTV conditions of hp_{ltv}:

$$hp_{ltv} = \frac{d}{1 - LTV}$$

3.2.3.2 Do Households Have Sufficient Gross Income?

First time buyer households are permitted a maximum loan size of 3.5 times their gross income under current macroprudential regulations. Under this loan-to-income (LTI) constraint, the maximum house price the household could afford, hp_{lti} is:

$$hp_{lti} = (LTI * Y_g) + d$$

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[15]https://www.bankofireland.com/about-bank-of-ireland/press-releases/2016/bank-of-ireland-research-shows-first-time-buyer-support-for-new-help-to-buy-measures/

where Y_g is gross income and d is the deposit they are able to save.

3.2.3.3 Can Households Pass an Affordability Stress Test

In an attempt to ensure the financial stability of both households and the banking system more generally, mortgage providers in Ireland stress test households to ensure that they would be able to maintain their mortgage repayments in the event of an increase in interest rates which would result in higher monthly payments. We therefore calculate the maximum house price a household could afford if interest rates were to rise by 2 percentage points, hp_{dsr}, using the following formula:

$$hp_{dsr} = \frac{P_m}{LTV * \frac{r_s(1+r_s)^\tau}{((1+r_s)^\tau)-1}}$$

where $P_m = Y_m - E_m$ is the potential monthly payment (net income minus necessary expenditure), LTV is 90 per cent, $r_s = r + 2\%$ where r is the prevailing interest rate on new mortgage loans[16], and τ is the mortgage term which is the minimum of either 30 years or the number of years until the household head reaches retirement age.

3.2.4 What is the Maximum House Price Buyers Can Afford?

Having calculated three potential house prices, hp_{ltv}, hp_{lti} and hp_{dsr}, under the current regulatory conditions surrounding wealth, income and affordability, the maximum priced house a household can afford, hp_i is given by:

$$hp(max)_i = min(hp_{ltv}, hp_{lti}, hp_{dsr})$$

Put simply, this ensures the household can only afford the lowest of these three house prices i.e. it forces the household to have the house price of the factor they are most constrained by. We determine a household to form part of the bankable demand and therefore to potentially be able to enter the housing market if:

$$hp(max)_i > hp_{cp(25)}$$

where $hp_{cp(25)}$ is the house price at the 25th percentile in the household's county house price distribution. This condition is necessary to ensure that hp_i is actually sufficient to allow the household to purchase a property given current prices. Furthermore, we use the 25th percentile because Gaffney (2018) shows that the vast majority of sales,

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[16]3.6% in 2016 and 3.4% in 2017 from Central Bank of Ireland.

approximately 95 per cent at the 10th percentile and roughly 80 per cent at the 20th percentile of the price distribution, are made by cash buyers and institutional investors, with very low levels bought by first time buyers. Nonetheless, we examine the sensitivity of our estimates to this assumption in Section 4.

Thinking back to the concept of bankable credit demand established in Section 2.2, households are excluded if they are either high credit risk, or if the maximum house price they could afford under the current regulatory conditions would not allow them to purchase at least the house at the 25th percentile of the price distribution in their county. All remaining households form part of the estimated bankable credit demand.

3.2.5 Towards a Household Specific Estimate of the House Price

While the above assessment calculates the maximum priced house that a household could afford to purchase given its level of income and wealth, in practice the purchaser may not wish to stretch themselves to the absolute maximum. Furthermore, households naturally choose to purchase different houses depending on their circumstances and factors such as the location, number of bedrooms, family structure and other characteristics. Rather than forcing all households to purchase the most expensive house possible, to account for this, we estimate a household specific house price, that varies according to their characteristics, but is pinned to the average first time buyer house price in the county in which they are purchasing.

Methodologically we run a hedonic regression using existing mortgaged homeowner households in SILC controlling for household characteristics such as age, education, number of adults and family size:

$$HV_i = \beta_0 + \beta_1 Age_i + \beta_2 HHSize + \beta_3 Education + \beta_4 Adults + \epsilon_i \qquad (10)$$

where HV_i is the reported value of the current dwelling in SILC provided by the household. Fahy et al. (2018) and Slaymaker et al. (2019) show this variable to be very accurate when used to calculate the proportion of households in negative equity. For each household we then predict an adjusted house price given these characteristics. Taking the average of these predicted values, and calculating the deviation of each household to the average, we then obtain a household specific adjustment to the overall average, and this adjustment is applied to the actual new market average first time buyer house price from the Central Statistics Office. We then allow the household to transact at this value if it is less than or equal to $hp(max)_i$ i.e. the house price becomes the following: $hp = min(hp(max)_i,$ adjusted county FTB price). The required loan is equal to $hp - d$ i.e. we do not force the LTV to be 90 per cent. This means that while $hp(max)_i$ is the maximum house price each household can face, we do not force them to

purchase this maximum priced house, and instead allocate them their household specific adjusted county FTB price if this is lower. In other words, if $hp(max)_i$ is very high, it moderates this. This has no impact on the number of households able to transact, but simply adjusts the house price and loan size of those who are able to transact. This gives an average loan of €208,000. The actual mean FTB loan size in 2017 was €206,000.

3.3 What Share of Households Have Bankable Credit Demand?

We present the results of our assessment in Table 6. Overall, we see that 82 per cent of our sample of renting households with an underlying demand for mortgage credit do not have bankable demand. Regarding the decomposition into credit risk and income and wealth channels, 65 per cent of the overall sample are high credit risk. 70 per cent of households have insufficient wealth (that is, are LTV constrained), while, on the other hand, approximately only half as many households have insufficient gross income or fail affordability stress tests. In column 2 of Table 6 we focus purely on households who are not high credit risk. Of these, we see that nearly half are nevertheless outside bankable demand. The majority of these are LTV constrained (45 per cent), with only approximately 20 per cent of these households constrained by LTI or affordability stress constraints.

As explained in Section 3.2.2, we calculate three potential house prices, hp_{ltv}, hp_{lti} and hp_{dsr}, and the minimum of these is the maximum potential house price a household could afford to purchase. In Table 7 we show the proportion of households for which maximum house price is determined by the LTV, LTI and affordability conditions. While Table 6 shows that LTV constraints are crucial in terms of whether a household is credit constrained or not, from Table 7 it is clear that for non high credit risk households, the 3.5 loan-to-income condition is the most likely to be limiting the maximum house price they could afford. This illustrates the dual challenges faced by many prospective home-owners; the majority face difficulties in raising a sufficient down-payment, while many of those able to overcome that hurdle are then faced with constraints on the amount they are able to borrow due to their income.

One of the most striking inferences from Table 6 is that more than four fifths of

Table 6. Mortgage Credit Access and Bankable Demand

	% of all with mortgage credit demand	% of non high credit risk
High credit risk households	65.03	-
Insufficient down-payment	70.62	45.35
Insufficient Income	36.90	23.33
Fail affordability stress test	36.14	20.04
Excluded Share of Mortgage Demand	82.41	49.70
No. Obs	897	303

Table 7. Is the maximum potential house price determined by down-payment, income or affordability?

	% of all with mortgage credit demand	% of non high credit risk
Down-payment channel	55.84	41.48
Income channel	23.75	45.04
Affordability stress channel	20.41	13.48
No. Obs	897	303

our sample are not part of the bankable demand concept discussed in Section 2.2. From Table 8 we see that these bankable demand households are high income households, with a mean gross income of €87,000 compared to €51,500 for those in the non-bankable demand group. It is also interesting to note that on average they are currently paying approximately 20 per cent of their net income on their rental payments compared to nearly 28 per cent for non-bankable households. This highlights the difficulties faced by these households; they are not suitable candidates for mortgage credit, yet they face paying a substantial portion of their income on rental payments. It is also important to remember that the sample on which this analysis is based is not a representation of the entire rental sector, but of the roughly 40 per cent with an underlying demand for mortgage credit. This therefore excludes many of the lower income households and many of those living in local authority rental accommodation for example. This highlights the need for affordable, alternative tenures for those not eligible for mortgage credit.

Table 8. Bankable v Non-bankable demand

	Bankable	Non-bankable
Mean gross income (€)	87,039	51,549
Mean rent-to-income ratio	0.1969	0.2770
No. Obs	152	745

Rent-to-income ratios are based on net income.

3.4 Towards an Aggregate Measure of Bankable Credit and A Comparison to Actual Lending

In this section, we use the household micro-data-based market segmentation above to provide an aggregate measure of bankable credit. We then compare the bankable credit to actual lending in the market to explore if a credit gap exists in Ireland at present.

In order to estimate the aggregate credit requirement, we focus on the 18 per cent of households in our sample who we find are not excluded by credit risk or the regulatory environment. Using the survey weights in SILC as a grossing factor enables us to estimate the number of potential FTB households across Ireland who have bankable credit demand according to the criteria we use. Applying the weights to our sample provides an underlying number of 38,171 households per annum, with an implied

value of €7.9bn. It must be noted that these figures represent the stock of latent mortgage demand in the population and do not imply that this level of flow of new lending could occur on an annualised basis. Indeed there could be a considerable difference between the degree to which aspiration to own housing translates into active mortgage demand. Naturally, as some households get allocated credit the share in the population that wish to transition may fall over time in Ireland given the likely high level of pent up demand at present due to the low supply and high credit access hurdles. There would also be a replacement to the pent up demand as new households are formed (by natural increase or migration) and enter the rental market with a latent mortgage demand.

To provide some context, we compare the estimated stock of bankable demand to the actual level of mortgage approvals that the Banking and Payments Federation reported across 2016 and 2017 (on average for comparison purposes). We choose mortgage approvals as we are making no assumptions in our latent demand assessment about whether households can actually find an adequate house, close the sale and draw down the funds. Given the large gap between approvals and draw-downs in Ireland at present, this difference could be sizeable. On average across 2016 and 2017, total mortgage approvals in Ireland were 19,477 which is 18,171 lower than the estimate of bankable demand in terms of the number of loans. In value terms, €4bn of first time buyer loans were approved on average across 2016 and 2017 which is €3.9bn lower than the bankable demand level.

Table 9. Estimated Stock of Bankable Demand from Renters and Comparison to Actual Lending

Aggregate Stock of Bankable Demand	
% bankable credit demand	17.59
Implied No. Loans (Annualised)	38,171
Implied Value of Loans (€bn, Annualised)	7.9
Comparison to Actual Lending	
Implied no. Loans	38,171
BPFI actual no. approvals	19,477
Difference	18,694
Implied value of Loans (€bn)	7.9
BPFI actual value of approvals (€bn)	4.0
Difference (€bn)	3.9

Notes: In SILC we pool 2016 &2017 data. We therefore divide estimates by 2 to obtain annual figures.

In one sense, this comparison is potentially misleading as it compares the stock of households with mortgage demand, with the flow of households obtaining new mort-

gage approvals. In any one specific year, it is not likely that all households with a latent demand for credit will activate a credit process or come forward to service that demand. This is particularly likely to be the case here as our measure of latent credit demand is drawn from a measure which asks households if they are intending to buy a property within the next two years. To provide an accurate measure of the annual credit gap, we need to address this issue. Our approach to deal with this consideration, is to vary the rate at which the latent credit demand comes forward into realised credit demand on an annual basis.

To calibrate the level of realised credit demand, we provide three scenarios in addition to the total bankable credit demand. As a baseline estimate we use the application rate of households with mortgage demand in the Economic Survey Monitor and apply this to our expanded group of households; this application rate is 30 per cent. As a high scenario, we make the simplifying assumption that, given our credit demand estimate is over a two year period, half of the households come forward in each year which provides a 50 per cent flow rate. We also provide a low scenario which considers a 10 per cent demand flow rate. Using these scenarios, we estimate that between 2,000 and 9,000 new loans could be approved at a value of between €0.4bn and €1.9bn. The medium, baseline scenario suggests approximately 5,600 new loans are required at a value of €1.2bn per annum. This is evidence of a considerable credit supply under-provision in the Irish market relative to the demographic demand.

Table 10. Towards a Flow Estimate of the Annual Credit Gap

Scenario	Low	Medium	High
Demand Flow Rate	10%	30%	50%
Implied Additional Loans	1869	5608	9347
Actual Flow	19477	19477	19477
Total Flow of Latent Demand (Loans)	21346	25085	28824
Implied Additional Value Loans (€bn)	0.39	1.17	1.95
Actual Value Flow (€bn)	3.95	3.95	3.95
Total Flow of Latent Demand (Value €bn)	4.3	5.1	5.9
Implied Loan Drawdowns (at 80% rate[17])	17,248	20,269	23,290
Implied Value Drawdowns	3.4	4.0	4.6

While at first glance these estimates may seem sizeable in terms of the percentage increase in credit, it is helpful to put them into context. In Table 11 we provide a comparison between our 2016/17 figures and 2006 in the height of the boom period. From the BPFI data we know that in 2016/17 there were 19,500 FTB loan approvals on average per year, with 15,700 FTB mortgages actually drawn down; roughly an 80 per cent ratio between approvals and draw-downs. If we add our estimates of loans to the actual data for each scenario, we can approximate the level of draw-downs that would be implied in each scenario. These data are presented in Table 10 and Figure 3. In Table 11,
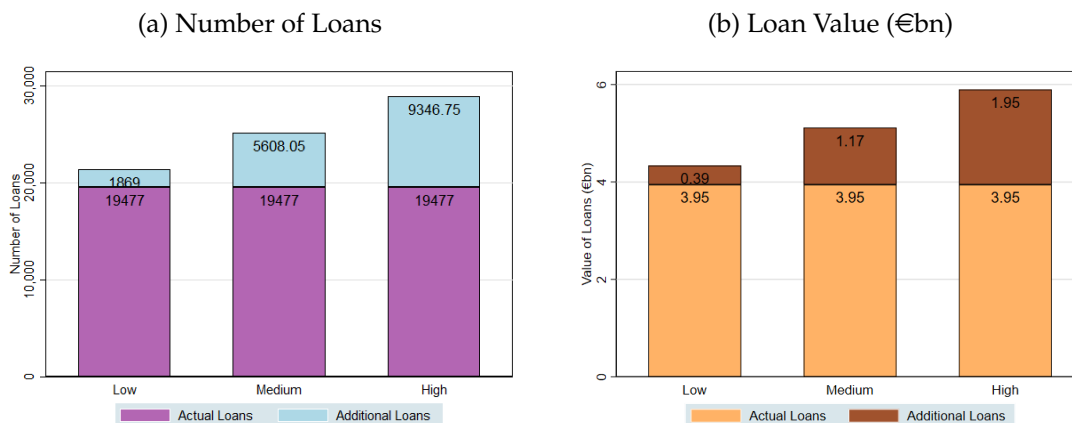
Figure 3. Scenarios for Credit Gap

(a) Number of Loans

(b) Loan Value (€bn)

Table 11. Comparison of Mortgage Drawdowns and Population Size between 2016/17 and 2006

	Drawdowns	Number of Households	Population	% of Households	% of Population
Demand Flow Rate					
Low (10%)	17,248	2,003,645	4,761,865	0.9%	0.36%
Medium (30%)	20,269	2,003,645	4,761,865	1.0%	0.43%
High (50%)	23,290	2,003,645	4,761,865	1.2%	0.49%
2006 - Credit Boom	37,064	1,769,613	4,239,848	2.1%	0.87%

Source: 2006 & 2016 Census.

we compare the levels of implied draw-downs as a percentage of households and of the population (from the 2016 Census) to the position in 2006 at the height of the unsustainable credit boom. We see that this actually amounts to 14,000 fewer loans per year in the high (50 per cent demand flow rate) scenario, and 17,000 fewer loans per year in the 30 per cent baseline scenario, compared to in the boom of 2006. This is despite the fact that Census figures show that the population has increased by 0.5 million people in that time, an increase of 234,000 households.

At this point it is important to provide some further context to these findings. These estimates are based on households currently in the rental sector. However, in practice, first time home buyers are not only drawn from the rental sector, but also from those continuing to live with parents or family while trying to save for a down-payment, as well as a likely smaller number of households migrating to Ireland. These estimates of excess demand for mortgage credit among current renters are therefore likely to under-estimate the true overall level of demand and can therefore be thought of as a lower bound of the excess demand for mortgage credit of all potential first time buyers.

4   Sensitivity

Microsimulation models such as the one presented in this paper require a series of assumptions around the parameterisation of particular variables. In Section 3 we docu-

mented the assumptions made, which were informed by prior research. In this section we examine the sensitivity of our estimates to the parameters chosen. Specifically, we focus on how changing the following affects the estimates: the length of time borrowers are permitted to save for a down-payment; the initial wealth levels of borrowers; the minimum house price borrowers are permitted to purchase; and the size of any intergenerational gift towards down-payment. We will now discuss each of these in turn.

Table 12. Sensitivity Estimates

	(1) Baseline	(2) 2 yrs saving	(3) HFCS wealth	(4) hp p(10)	(5) Gift €5000	(6) Gift €15000
% Households:						
High Credit Risk	65.03	65.03	65.03	65.03	65.03	65.03
Insufficient Down-payment	70.62	72.43	61.09	64.61	74.48	66
Insufficient Income	36.9	37.13	35.88	22.46	37.04	36.64
Fail Affordability Stress Test	36.14	36.14	36.02	30.34	36.14	36.14
Overall Non-bankable	82.41	83.08	79.53	79.1	83.75	80.8
Stock of Bankable Demand						
Bankable	17.59	16.92	20.47	20.9	16.25	19.2
Implied no. loans (Annualised)	38171	36697	44454	45362	35284	41656
Implied value loans (Annualised)	7.9	8.2	8.55	8.8	7.55	8.4
Flow of Bankable Demand						
Implied additional no. loans						
10%	1869	1722	2498	2589	1581	2218
30%	5608	5166	7493	7766	4742	6654
50%	9347	8610	12489	12943	7904	11090
Implied additional value loans (€bn)						
10%	0.39	0.42	0.46	0.48	0.36	0.44
30%	1.17	1.26	1.37	1.44	1.07	1.32
50%	1.95	2.10	2.28	2.40	1.78	2.20

Length of Time Permitted to Save for Down-payment

In our baseline estimates presented in Section 3, we allowed households to accumulate a down-payment by saving their income remaining each month after making rental payments and covering minimum necessary expenditures for 3 years. We chose this baseline of 3 years because it falls within Kelly and McCann's (2016) estimated range of 2.5-4 years for Dublin, depending on the area, and because previous research shows potential first time buyers in urban areas, particularly in and around Dublin, face the most acute affordability challenges (Allen-Coghlan et al., 2019). Nevertheless, we would expect our estimates to be somewhat sensitive to this choice and it is therefore important to examine how sensitive our estimates are to this parameter. For areas outside of Dublin, Kelly and McCann (2016) find that the time required to save for a deposit ranges up to 1.5 years. As a sensitivity check, we therefore reduce the time allowed to accrue a down-payment from 3 to 2 years.

The results are presented in column 2 of Table 12. The baseline estimates are reported in column 1 for ease of comparison. Unsurprisingly, reducing the length of time borrowers save for a deposit increases the proportion of households with an insufficient

down-payment, although at 2 percentage points, the magnitude of the increase is relatively small. An increase in the number of households unable to meet LTV conditions therefore reduces the level of bankable demand, as this refers to the level of demand that could be serviced at present given current credit and macroprudential conditions. The effect on the overall proportion of the sample with bankable demand is even smaller than on the proportion of households unable to meet LTV conditions, falling from 17.6 to 16.9 per cent. In terms of loans, using the middle 30 per cent credit realisation scenario, this would reduce the estimate of the credit gap by 450 loans per year. This fall in the credit gap may at first appear counter-intuitive, but it happens because we only classify those with sufficient savings (can meet the LTV condition) as having bankable demand and therefore in the gap. If we reduce the amount of savings households accumulate by lowering the savings time, the share of households with LTV constraints increases which reduces the share with bankable demand and the credit gap therefore declines.

Initial Household Wealth

As discussed in Section 3.2.3, one of the major challenges in this research is how to estimate the size of a household's potential down-payment, given the lack of household wealth information in SILC. As a consequence of this, in our baseline model, our preferred approach was to utilise information on current income and expenditure to calculate the estimated savings a household might reasonably be expected to accrue to put towards a down-payment. The drawback of this method is that it assumes all households start from a position of zero wealth, which is obviously unrealistic. An alternative to this is to use data from the 2013 Household Finance and Consumption Survey (HFCS). There are a number of points to note with these data. First, given the state of the Irish economy in 2013 coupled with the rapid increase in both incomes and asset prices since then, we believe these data are likely to be out of date and unlikely to provide an accurate reflection of the current wealth of potential first time buyers. Second, we are unable to distinguish between rental households actively preparing to become home-owners and those with no immediate demand to do so; we would expect their savings levels to differ. Third, the HFCS data give a one-off snapshot of household wealth, with no indication of if and how long a household may have been saving for. As our credit demand variable relates to intending to buy within the next two years, rather than now, this distinction is important.

However to address this consideration, as a robustness check, we combine our approach of utilising information on current income and expenditure to calculate the estimated savings a household might reasonably be expected to accrue, with increasing their initial wealth level using data from the HFCS. The results are presented in column 3 of Table 12. The proportion of down-payment constrained borrowers falls by nearly 10 percentage points to 61 per cent, while the overall share with bankable demand rises 3 percentage points to 20.5 per cent. In terms of loans, using the middle 30 per cent

credit realisation scenario, this would increase the estimate of the credit gap by nearly 1900 loans per year. However, given this approach both provides households with an initial level of wealth yet also allows them to further add to their savings for 3 years, the estimates are therefore likely to be an overestimate of the size of the serviceable credit gap and must be treated with caution. Nonetheless they provide a useful comparison with the baseline estimates. There are pros and cons to both our baseline model approach and the sensitivity check using the HFCS data. On balance, our baseline method of utilising information on current income and expenditure to calculate the estimated savings a household might reasonably be expected to accrue remains our preferred specification.

Minimum House Price - altering p(25)

In our baseline model, we allow a household to be considered as having bankable credit demand provided the minimum priced house they can afford is at or above the 25th percentile house price in their county. This entry point is crucial as it connects what the household can afford to current market prices. The 25th percentile of the house price distribution was chosen because Gaffney (2018) shows that the vast majority of sales, approximately 95 per cent at the 10th percentile and roughly 80 per cent at the 20th percentile of the price distribution, are made by cash buyers and institutional investors, with very low levels bought by first time buyers. Furthermore, the house price distribution contains all property types and it is therefore likely that properties sold below that point may well be smaller properties such as one bedroom apartments. This would be consistent with Gaffney (2018) who finds that the vast majority of transactions below the twentieth percentile are by cash buyers and institutional investors; many of these are likely to be for properties in the rental market, rather than transactions by owner occupiers.

On the other hand, it could be argued that one of the reasons virtually no first time buyers are purchasing properties at the tenth percentile of the property price distribution is because currently only households towards the higher end of the income distribution are receiving mortgage credit (Lydon and McCann, 2017). If a greater number of households from further down the income distribution were to enter the home-ownership market, we may expect this to change over time. We therefore provide a sensitivity check in column 4 of Table 12, where we lower the house price threshold to the tenth percentile, i.e. we consider a household to have bankable demand if:

$$hp(max)_i > hp_{cp(10)}$$

This substantially reduces the share of households with insufficient income, a fall of 15 percentage points, as well as reducing the shares with an insufficient down-payment and those who would fail an affordability stress test. In terms of the estimate of the

credit gap, using the middle 30 per cent credit realisation scenario, this would increase the estimate of the credit gap by more than 2000 loans per year. While this is a sizeable increase, opening up an additional 15 per cent of the property price distribution is also a large change to the model.

At this juncture it is important to re-emphasise that the analysis in this paper refers solely to credit demand and those who could be approved for credit, not whether there would be sufficient housing supply to allow households to convert a credit approval into actually drawing down the credit and purchasing a property. Nevertheless, it is important to consider how realistic this lowering of the house price threshold parameter is. The tenth percentile house prices for each county are reported in Table 15. Taking Dublin as an example, the tenth percentile property price was €172,500 in 2016, rising to €200,000 in 2017. This raises questions as to whether this demand can really be considered serviceable or bankable demand. Our findings suggest that the choice of this entry point is important. On balance, we prefer the more conservative baseline model estimates.

Gift Size

The final sensitivity check we perform is to vary the size of the intergenerational wealth transfer, or family gift. In the baseline model we assumed a gift size of €10,000. This choice of gift was motivated by the initial findings of a Department of Housing, Local Government and Heritage survey of mature home-owners (Corrigan, 2019). Respondents were asked whether they gave each child a gift towards a down-payment for a property and if so what the value of the gift was (in bands). Of those who did provide a gift, the modal response was up to €10,000, although there were some considerably larger gifts. To test the sensitivity of our estimates to the gift size, in column 5 we decrease this to €5,000, while in column 6 we instead increase it to €15,000. Using the middle 30 per cent credit realisation scenario, reducing the size of the gift would reduce the estimated credit gap by 850 loans per year, while increasing the gift would increase the gap by 1050 loans.

Overall, it is clear that the precise magnitude of our estimates is sensitive to the parameters chosen and assumptions made. Nonetheless, what is consistently clear under all scenarios is that there is a substantial unmet demand for mortgage credit under current credit conditions for first time buyers in the Irish economy.

5 What Role Could State Supports Play in Aiding Access to Credit?

To this point, we have demonstrated that there is considerable latent underlying demand for credit in the Irish mortgage market that is unserviced at present. While there

are various reasons for this, it is likely this gap can be linked to both demand and supply side market failures which are capping credit flows. On the demand side, we have demonstrated that potential first time buyers suffer from three types of constraint: down-payment, income and affordability. In this section, we explore whether State mortgage supports could be used to address a portion of this credit gap and unlock some of the underlying latent demand. Specifically, we look at the direct provision of mortgage credit which aims to remove the income and affordability constraints.

In February 2018 the Irish government launched the Rebuilding Ireland Home Loan (RIHL), a government backed scheme which directly provides mortgage credit for eligible low to middle income first time buyers available through local authorities. In this section we undertake a microsimulation exercise which deploys the conditions of this direct mortgage credit provision RIHL scheme to examine what proportion of rental households with an underlying demand for mortgage credit would be eligible to enter the home-ownership market through the RIHL scheme.

Under this scheme potential home-owners can borrow up to 90 per cent of the market value of the property, up to maximum market values of €320,000 in Dublin, Wicklow, Meath, Louth, Kildare, Cork and Galway, and €250,000 elsewhere. Borrowers have a choice of three rate products (exclusive of mortgage protection insurance): 2 per cent fixed for up to 25 years; 2.25 per cent fixed for up to 30 years; 2.30 per cent variable for up to 30 years. In order to be eligible for RIHL, potential home-owners must satisfy the following criteria: be aged 18-70; have annual gross income not to exceed €50,000 (€75,000) for single person (couple); have been in continuous employment for a minimum of two years; consent to an Irish Credit Bureau check; purchase or build a property of no more than 175 m^2; and be able to provide evidence of insufficient offers of finance from 2 banks/building societies.

At this juncture it is useful to consider which groups of households may be eligible for RIHL, relative to those contained in our analysis of the credit gap presented so far in this paper. To do this, in Figure 4 we provide a visual overview of the different groups in the model. Beginning with all households with mortgage demand, these are then categorised as either 1) bankable demand; 2) constrained by current credit and macroprudential conditions (either LTV, LTI or affordability conditions); or 3) high credit risk. Our measure of the credit gap concerns only those adjudged to have bankable demand for credit. On the other hand, RIHL aims to loosen both the LTI and affordability credit constraint factors relative to the current market and regulatory conditions used in Section 3.2.2. There is no loan-to-income limit and as two fixed rate interest rates are offered for the duration of the mortgage term, this means that an affordability stress test to account for potential interest rate rises is no longer required.

There is no change to the wealth requirements as potential borrowers are still expected to make a minimum 10 per cent down-payment under RIHL, so those who faced

Figure 4. Who is Potentially Eligible for RIHL?
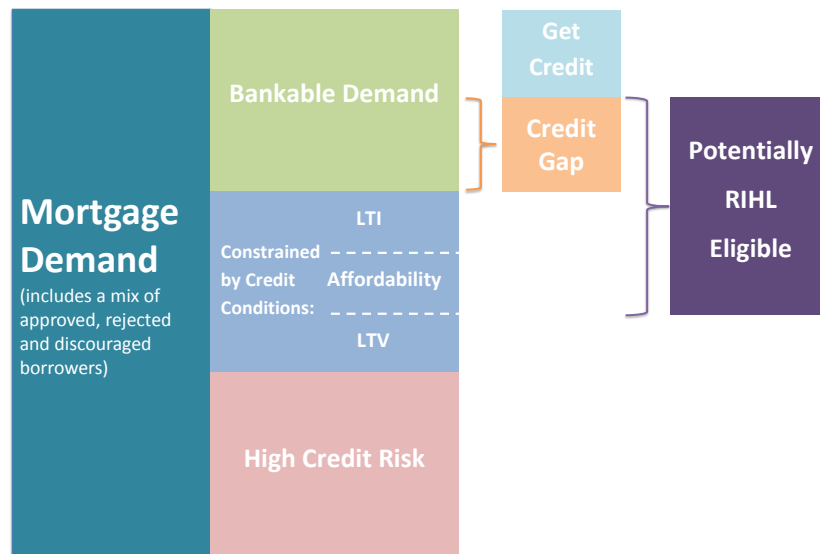
LTV or down-payment constraints will not be eligible for RIHL. Similarly, households have to undergo an Irish Credit Bureau check. In practice it is possible that this could be a less stringent credit risk assessment than the one applied by the banking sector. However, for the purposes of this study we therefore apply the same credit risk criteria that we applied under current market conditions in Section 3.2.2. This means that households assessed to be high credit risk in Section 3.2.2 remain so in our RIHL analysis. Overall, we therefore see from Figure 4 that households potentially eligible for RIHL come from both the bankable demand group and those who may have been constrained by LTI and affordability constraints under current credit conditions. Furthermore, not all households with bankable demand will be eligible for RIHL, some will not meet the maximum income thresholds for example. It is therefore important to highlight that the group of households eligible for RIHL will not simply be a subset of those with bankable demand.

In practice, in our microsimulation exercise we apply the following conditions. We determine a household to be eligible for RIHL if they are: aged 18-70; are currently in employment and have not had any spells of unemployment in the previous 12 months[18]; have a maximum annual gross income not exceeding €50,000 (€75,000) for a single person (couple). In addition, we exclude households we determined to be high credit risk according to the method discussed in Section 3.2.2: households with any rent, utilities or consumer loan arrears in the previous 12 months due to financial difficulties; households who either state that their existing debt is a burden or that they are unable to meet an unexpected expense, and also either face at least 1 deprivation indicator in SILC or state that they face difficulties in making ends meet are determined

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[18]Unfortunately in the data we only have this information for the previous 12 months, rather than 2 years. Nevertheless, we believe this is likely to be a good proxy.

to be high credit risk. We exclude these households as these measures are indicators of poor repayment history or poor debt management which are likely to be picked up in the credit bureau check required to determine RIHL eligibility. We also apply a maximum debt-service-to-income ratio of 35 per cent which can only be breached in 10 per cent of cases as per the RIHL credit policy. We do not adjust the interest rate to include the cost of mortgage insurance which is outside the scope of this research.[19]

As the LTV condition remains, we allow the household to purchase a house priced hp_{ltv}, as calculated above. We then apply a modified affordability stress constraint to ensure that a household could meet the prospective monthly mortgage payment and meet their minimum necessary expenditure:

$$Payment_m = LTV * hp_{ltv} * \frac{r(1+r)^\tau}{((1+r)^\tau) - 1}$$

$$Y_m - Payment_m > E_m$$

where LTV is 90 per cent, r=2.25 per cent fixed rate and $\tau = min$(30 years, years til retirement)[20]. A household would be eligible for RIHL as long as they would be able to meet their necessary expenditure after paying this prospective mortgage payment.

Table 13. Estimated RIHL Eligibility

Demand Flow Rate	10%	30%	50%
Implied RIHL Loan Numbers	1,163	3,489	5,815
Implied Additional Value Loans (€bn)	0.20	0.59	0.98
Implied RIHL Drawdowns	930	2,791	4,652
Implied Value of Drawdowns	0.156	0.468	0.78

We present the findings of this microsimulation exercise in Table 13. Our estimates show that, depending on the demand flow rate, between 1,163 and 5,815 households could be eligible for RIHL on an annual basis, with a total implied loan value of between €0.2 billion and €0.98 billion. In order to estimate the total value associated with this number of loans, we cap the maximum loan the household could receive at 90 per cent of maximum market values allowed under RIHL: €320,000 in Dublin, Wicklow, Meath, Louth, Kildare, Cork and Galway, and €250,000 elsewhere.

It is useful to compare the relative magnitude of the estimated potential RIHL in-

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[19]Mortgage Protection Insurance (MPI) is compulsory for local authority borrowers at a rate of 0.555 percentage points which operationalises as an increase in the interest rate. We do not include this in our analysis as we do not account for insurance costs in our research.

[20]We allow τ = year til retirement as long as this is at least 25 years; the minimum fixed rate term under RIHL.

tervention with the size of the estimated credit gap. However, at this juncture it is important to reiterate that households eligible for RIHL are not simply a subset of those with credit demand. Rather, RIHL will include some households who have bankable demand i.e. part of the credit gap, as well as some currently constrained by LTI and affordability conditions, which RIHL loosens (see Figure 4). Nevertheless, our estimates indicate that RIHL could potentially aid credit access equivalent to roughly half the amount of the credit gap[21]. However, it is important to note that we are not able to observe in our data whether a household has received two loan rejections or insufficient offers of mortgage credit from the banking sector; one of the criteria for receiving a RIHL loan. These estimates must therefore be thought of as an upper bound of the portion of the credit gap that could be addressed by RIHL. It is interesting to note that the vast majority of the households who are eligible for RIHL in our sample come from the group who make up bankable demand. In reality, relatively few of the 82 per cent of households we find to have insufficient wealth or income in Table 6 are only LTI or affordability stress constrained and therefore potentially eligible for RIHL. This is unsurprising given that in Table 6 we showed that 70 per cent of households had insufficient deposits. Put simply, an intervention such as RIHL will have little impact on reducing the overall proportion of credit constrained households because it still requires households to be able to put down a sufficient down-payment.

Table 14 provides a comparison between households who are eligible for RIHL and the portion of bankable demand households not eligible for a RIHL loan. From this we see that RIHL is, as we would expect, targeted at households lower down the income distribution, with a mean gross income of roughly €58,000 compared to €98,000 for those with bankable demand who are not eligible. Similarly, the mean loan sizes and house prices are substantially lower for the RIHL eligible group, with a mean house price of roughly €200,000 compared to €320,000 for those not eligible for RIHL. Interestingly, allowing these RIHL eligible households to enter the home-ownership market would lower their housing payment to income ratio from about 22 per cent to just under 20 per cent. It must be noted that our sample sizes for these splits are usable but relatively small. Therefore these figures may not be representative in a broader sense.

Table 14. A Comparison between RIHL eligible and Bankable but non RIHL eligible households

	RIHL eligible	Bankable - not RIHL eligible
Mean gross income (€)	57,602	97,791
Mean loan size (€)	167,524	226,817
Mean house price (€)	198,086	318,903
Mean mortgage payment to net income ratio	0.1993	0.2096
Mean current rent to net income ratio	0.2235	0.1915

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[21]60 per cent in terms of number of loans and 50 per cent in terms of value.

6 Conclusion

In this paper, we use two separate micro-datasets to estimate credit demand and credit access for Irish first time buyer households. Exploiting individual survey responses to credit demand questions, and characteristics of the household, we estimate the level of latent credit demand that could be serviced by the market given prudent credit risk assessment and the current regulatory environment. We then explore the degree to which policy can help improve credit access by addressing the market failures and servicing some latent credit demand. In particular we focus on public mortgage provision as an instrument.

Our research has three main steps. First, we present a conceptual framework for measuring latent demand under prudential credit risk assessment and macroprudential regulation by introducing a concept entitled "bankable demand". We then apply this framework to data for Ireland using two complementary micro-datasets. Finally, we approximate the credit gap by comparing our estimates to market lending.

We find a sizeable unmet credit demand amongst Irish rental households, when those who would not meet credit risk assessment or comply with market regulations are excluded. In terms of credit access issues, we find insufficient savings for a down-payment to be the most critical factor relative to income or affordability constraints. We also find a role for a public mortgage credit instrument to aid access to credit and alleviate a portion of the gap.

Several potential research extensions are possible. Firstly, this paper does not seek to estimate the level of bankable credit demand among those aspirant first time buyers who are living with their parents or other family. In a recent survey of renters Corrigan, Cotter and Hussey (2019) found a relatively large proportion (almost 31 per cent) of respondents living with family and considered that this may, in part, be a response to price inflation in rental markets and may also be the result of individuals seeking to maximise deposit savings. Exploring the level of mortgage credit demand among adults living with family could help to further inform estimation of the mortgage credit gap.

Secondly, the techniques applied in this paper could be deployed to examine the potential impact of rental affordability measures on the capacity of households to achieve home-ownership. The relatively high market rents paid by some households undoubtedly inhibit such households from overcoming the LTV constraint, as their potential to save for a deposit is eroded by high rents. Often, public policy mechanisms to subsidise rents, such as affordability or cost rental measures, are viewed as tenure end-points for recipient households, however such measures may provide a platform by which recipient households accumulate a deposit and become home-owners. Exploring the dynamics of affordability and tenure choice could provide useful insights for the calib-

ration of housing affordability and related policy interventions.

Appendix

Table 15. Tenth Percentile House Prices by County - 2016 & 2017

County	10th Percentile House Price 2016 (€)	10th Percentile House Price 2017 (€)
Carlow	65,000	70,000
Cavan	40,000	45,000
Clare	60,000	60,000
Cork	75,000	90,000
Donegal	40,000	50,000
Dublin	172,500	200,000
Galway	68,000	76,000
Kerry	56,750	60,000
Kildare	110,000	131,393
Kilkenny	69,500	73,334
Laois	60,000	73,000
Leitrim	35,000	43,000
Limerick	50,000	57,250
Longford	35,000	40,000
Louth	75,000	87,000
Mayo	40,000	41,000
Meath	110,000	130,000
Monaghan	37,000	40,000
Offaly	50,000	60,000
Roscommon	32,000	40,000
Sligo	43,000	51,668
Tipperary	45,000	46,000
Waterford	50,000	60,000
Westmeath	60,000	70,000
Wexford	60,000	70,000
Wicklow	137,000	151,300

Figure 5. Visual Overview of Microsimulation Model
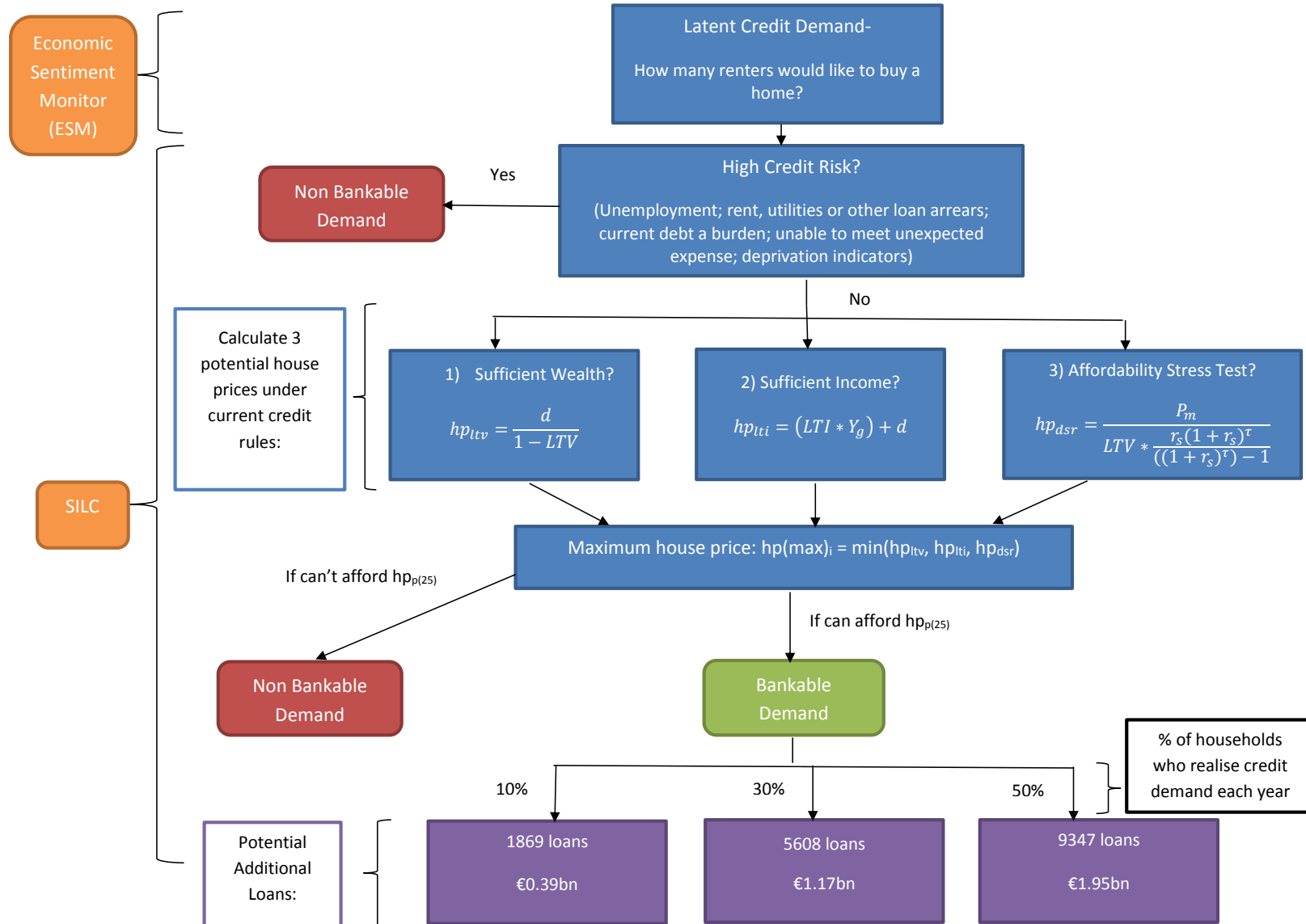
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