Cheap Credit, Affordable Housing?
Evidence from the French Interest-Free Loan Policy

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Abstract

We use exogenous shifts in credit to assess how credit conditions affect borrowers' characteristics and house prices. We identify credit supply shifts using within ZIP-code variations in the Interest-Free Loan (IFL) policy in France between 2009 and 2011. These credit supply shifts are neither house prices nor demand driven, in the sample of ZIP-codes bordering housing policy zones limits. The credit supply shocks alleviate loan-to-value conditions. This in turn reduces the difference between borrowers' and average incomes. Credit supply shifts are also channelled into housing prices. We find a high short-term elasticity of housing prices to credit (close to 0.7). These results point at a low efficiency of credit subsidies to improve housing affordability.

JEL: G21, R28
Keywords: Housing Credit, Interest-Free Loan, Real estate prices, Homeownership

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1. Introduction

Easy access to credit markets catalyses homeownership. And homeownership affordability is a widespread policy objective in developed countries. In France, four out of 10 newly home-owning households between 25 and 44 years-old received financial assistance from their families, which increases the probability to buy by 15 percentage points (Bonnet et al., 2016). And while 80% of housing purchases are credit purchases (Arnault et al., 2015), borrowers income is now about 25% higher than the average household's available income. This paper tests whether credit subsidies are efficient means to increase housing affordability. We analyse whether changes in credit conditions affect who enters the credit and housing markets and if these changes impact house prices.

Giving an empirical answer to these questions requires handling the endogeneity between the housing and the credit markets. Closest to our paper, Gabriel and Rosenthal (2008) estimates the impact of the Government-Sponsored Enterprise (GSE) mortgage purchase goals and Community Reinvestment Act (CRA) targets in underserved areas on homeownership. As these credit policies are not themselves exogenous to the housing market, they cannot be used to trace the impact of credit supply on housing market activity.

We use an exogenous shift in credit to assess how borrowers' characteristics and house prices vary with credit conditions. We identify exogenous shifts in credit thanks to the *Prêt à Taux Zéro* policy limitations. The policy offers interest-free loans (IFL) to first-time buyers. It amounted to 2 billion euros of subsidies per year between 2009 and 2011.[2] Up to 40% of operations financing main residences included an IFL during this period.

We use the IFL policy changes as an instrumental variable (IV) for credit to trace its impact on homeownership and house prices. We identify a credit supply shock in the following way. We use the three IFL subsidy reforms which took place between 2009 and 2011 to identify within ZIP-codes credit supply shifts. The 2009 reform doubled the maximum IFLs available for new housing. The measure lasted until June 2010. Maximum IFL amounts available to the households decreased then by 25% in the second semester of 2010 compared with the first one. The 2011 reform suppressed income eligibility conditions and increased the maximum loan amount for both existing and new housing. We can thus observe both expansionary (e.g. between 2010h2 and 2011) and contractionary (between 2010h1 and h2 for new housing) movements of the IFL.

Borrowers are eligible throughout the country. But the subsidy varies along administratively defined housing policy areas. There are four housing policy areas – A, B1, B2 and C – to classify the 36 000 French municipalities. Zone A gathers municipalities with the highest housing market imbalances, Zone C those with the lowest ones. The bigger is the imbalance, the more generous is the subsidy. Because of this zoning, the subsidy is conditional on housing market conditions.

This creates endogeneity between the Interest Free Loan policy and house prices. However, the French administration auditing body underlines zoning weaknesses in a 2012 report. The auditing body has interrogated local State representatives who use local housing market studies to pinpoint both over- and under-subsidised municipalities. These weaknesses are the results of poor information systems as well as interferences with political objectives. Information sources are described as "scattered, non-exhaustive and often unreliable" (*Cour des Comptes*, 2012). The report also underlines that because of political motives, the zoning "does not reflect housing market imbalances for several agglomerations for which downgrades had been discussed". We can thus observe similar municipalities and housing markets with different subsidies around the housing policy areas borders. In the sample of bordering municipalities, IFL policy is exogenous to contemporaneous housing prices

[2] Total housing policy amounts to 40 billion euros, about 2% of GDP (Service for observation and statistics (2015)).

One could worry about exogeneity to expected housing prices. The policy-maker could increase credit subsidies the most where house prices are expected to increase the most. This is highly unlikely as the zoning methodology has no prospective ambition (*Cour des Comptes*, 2012). There is no reference to future prices. The criterion is whether contemporaneous housing supply satisfies contemporaneous housing demand. In any case, the auditing body – *Cour des Comptes* – describes available datasets with highest geographical precision as low quality sources. The most reliable survey is available only every 3 to 6 years and reports only price proxies. IFL policy is thus also exogenous to expected house prices in the sample of bordering municipalities.

One could also worry about IFL reforms being demand-driven. Mayors of municipalities with a high demand for homeownership might lobby for the reclassification of their cities into high subsidies housing policy areas. The IFL-making process ensures the subsidy constitutes a supply and not a demand shock. Zoning and IFL subsidy size reforms are not simultaneous. Zoning is used for other policies (unchanged during our sample period) and revised independently every 3 years. We rely on changes in the subsidy size to identify credit supply shifts. But we work with a constant zoning during our sample period. Local demand pressures would be conveyed through zoning redefinitions but we never use change of zoning induced variations as source of identification.

We benefit from a loan-level dataset of more than 100 000 housing loans granted by all major French banking groups in more than 1 600 ZIP-codes after the sampling step. We observe loans' and borrowers' characteristics at origination as well as the housing location at the ZIP-code level. We combine these data with households' average fiscal income data at the ZIP-code level publicly available from the fiscal administration.

Our framework helps us answer four questions: (i) Does the IFL subsidy impact the housing credit market? (ii) Does it affect borrowers' characteristics? (iii) Does this affect house prices? (iv) Are these effects channelled via the housing credit market response? We find the IFL policy relaxes credit conditions and increases credit volumes. It allows borrowers with relatively smaller income into the credit market. Evidence points to this being the consequence of the relaxed credit conditions. Higher IFL subsidies increase house prices as well. This is channelled by the higher credit volumes.

We first verify whether IFL subsidies do relax credit conditions. We measure credit conditions by the loan-to-value (LTV) ratio. This simple risk measure is commonly used by banks to assess the loan file creditworthiness. We find that bigger IFL subsidies are associated with higher loan-to-value ratios, controlling for both borrowers and loan characteristics.
We then test if IFL subsidies change borrowers' characteristics. We approximate credit market selection by the difference between borrowers' and average household income in each ZIP-code. In our sample of bordering ZIP-codes, higher IFL subsidies reduce credit market selection - make borrowers' income closer to the average income.
Our third step is instrumenting the LTV by the IFL subsidy to identify how a credit supply shift affects borrowers' characteristics. We find an exogenous – IFL induced – increase in LTV reduces credit selection. We also find this increase to raise the loan-to-income ratio. Softer credit conditions allow lower income borrowers on the market and the credit they draw down is a higher share of their incomes.

We also consider secondary effects of the IFL policy. IFL subsidies growth increase total credit volumes and the average credit size. Growth in IFL subsidies also favors house prices growth. We then instrument growth in average credit size by IFL growth to trace the effect of exogenous shifts in credit supply into house prices. Positive credit supply shifts spur house prices growth. We find a high elasticity of housing prices to housing credit when we instrument the latter variable by the IFL (close to 0.7). But this effect is only temporary and fades out after one semester.

As income eligibility conditions are loose, the difference between the eligible and the whole populations is negligible. This alleviates concerns of our estimate between a local effect one. This effect is not driven by relocation choices of borrowers buying a house where the subsidy is the most generous. To verify this, we have run robustness tests considering only bordering ZIP-codes, on the side of the border where

the subsidy is the least generous. These ZIP-codes cannot be suspected of relocation inflation. As there are four different housing policy zones, borders do not always separate the same zones. Focusing on bordering ZIP-codes on the side of the border where the subsidy is the least generous thus still allows for identification. Our results are confirmed in this sub-sample.

The paper belongs to three literature strands. Our paper first contributes to the IFL policy evaluation. We underline the policy relaxes credit market selection as well as the partial subsidy capitalization into house prices. This is consistent with Gobillon and Le Blanc (2005). Using a theoretical model calibrated with survey data, they show IFLs do spur homeownership, especially for the poorest first-time buyers. Using individual data on land and property prices, Beaubrun-Diant and Maury (2015) underline the inflationist effects of the IFL policy and the low elasticity of land supply in France. They show the IFL subsidy increases the sum of land and property prices as well as land prices considered separately. Our results about the transmission to prices are consistent with theirs. They underline the need for the interest-free loan policy to be precisely targeted. Contrary to these papers, we directly observe the credit market, which allows identifying the transmission channels of this subsidy.
Our paper also contributes to the micro-econometric literature using regulation shocks to identify the causal role of credit on the housing market. A neat estimation requires identifying a shift in credit exogenous to the current and expected state of the economy. Favara and Imbs (2015) use branching deregulations in the US as IV for the supply of mortgage credit. One contribution of the paper is to develop a comparable framework for the French market as our identification strategy also handles the policy endogeneity to housing market conditions. On top of the impact on asset pricing, we can analyse the impact on homeownership.
The paper's main contribution is to use an exogenous shift in credit to assess how borrowers' characteristics vary with credit conditions. To the best of our knowledge, our paper is the first to propose a neat identification strategy of this effect and to quantify it using micro-level data. Closest to our paper, Gabriel and Rosenthal (2008) estimates the impact of the Government-Sponsored Enterprise (GSE) mortgage purchase goals and Community Reinvestment Act (CRA) targets in underserved areas on homeownership. But the paper finds no evidence of GSEs' activity effect on lending hence cannot use this policy to trace the impact onto homeownership.[3] As regards the CRA, data availability issues prevent from singling out credit market activity as the driver of homeownership rate changes. In any case, the paper does not discuss the exogeneity of the policy with regards to the housing markets.
We show exogenous – IFL induced – relaxations in credit conditions allow households with relatively lower income to enter the credit market. Increases at the extensive margin can bear different consequences than increases at the intensive margin. Mian and Sufi (2009) argue distortions in the flow of credit towards subprime borrowers caused the US housing boom and crisis. Adelino et al. (2015) challenge this view documenting an increase in mortgage origination across the whole income distribution and a sizeable contribution of middle- and high-income borrowers to delinquencies. This supports the idea of house price expectations driving credit and defaults following price drops. We contribute to this literature strand by quantifying both the intensive and extensive margins effects of changes in credit supply. Our estimates on the impact of credit conditions on homeownership affordability are statistically significant but economically small. Effects at the intensive margin would be the first order ones when considering the impact of credit conditions on the housing market in France.

The rest of the paper is organized as follows. Section 2 presents the IFL framework and the data. Section 3 describes the effect of credit conditions on homeownership access. Section 4 discusses the effects of credit on house prices Section 5 concludes.

[3] The inefficiency of the GSE home loan purchase goals in elevating the homeownership of targeted neighborhoods is also documented in Bostic and Gabriel (2006).

2. Data

We describe the Interest-Free Loan (IFL) framework, our loan-level database and other data sources used.

2.1. Interest-Free Loans

We detail the Interest-Free Loan conditions and how we use them in our identification strategy.

The *Prêt à Taux Zéro* is a homeownership policy tool. The current IFL framework has existed since 2005. It provides zero interest loans to first-time buyers of their main residence. IFL eligibility, amount and amortization are conditional on the location of the house, the household income and size and the house being new or existing. The IFL cannot cover the whole cost of the operation. It has to be combined with a standard loan. Commercial banks grant the IFLs and the government makes up for the absence of interests by fiscal reductions. Banks are responsible for evaluating borrowers' creditworthiness.[4]

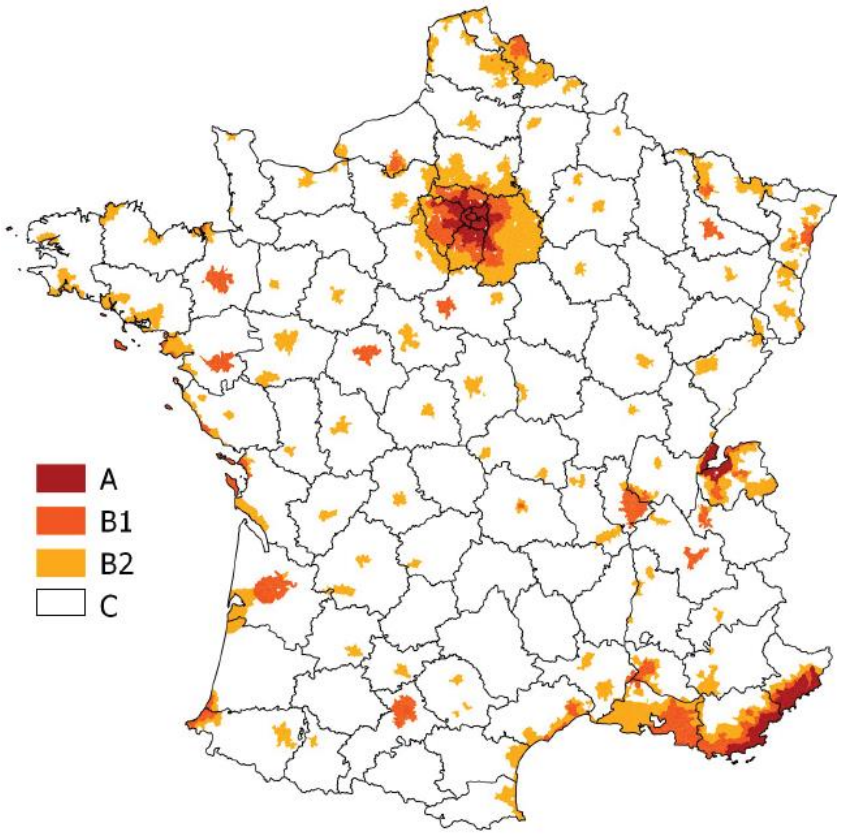

Figure 1 - Housing Policy Areas in France, 2009

The subsidy is conditional on the house location. The policymaker accounts for local housing markets specificities. Each of the 36 000 French municipalities belongs to one of four housing policy areas (A, B1, B2 or C; see Figure 1). This classification depends on the balance between housing supply and demand in the area. The bigger is the imbalance, the more generous is the housing policy instrument. We verify prices are higher in zone A than respectively in zones B1, B2 and C (see Figure 2). IFL subsidies are conditional on housing market conditions. This makes the housing policy endogenous to housing prices.

[4] See appendix A.1 for a detailed presentation of the tool and its reforms.

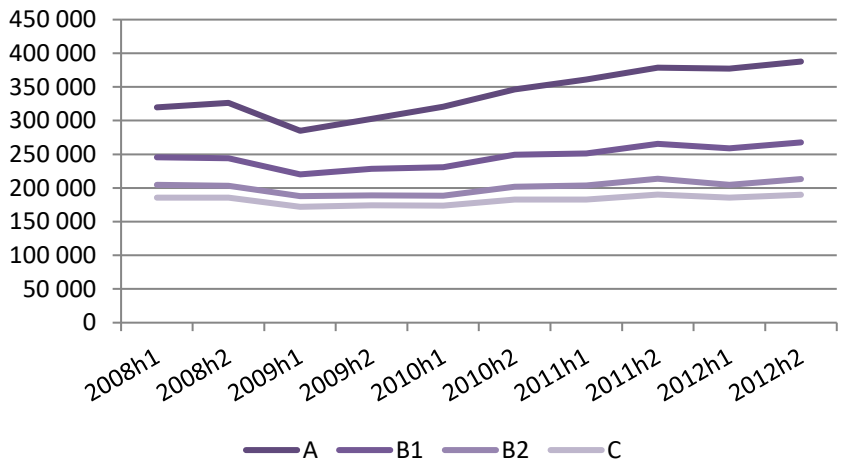

Figure 2 - Real estate prices through time, according to the IFL area

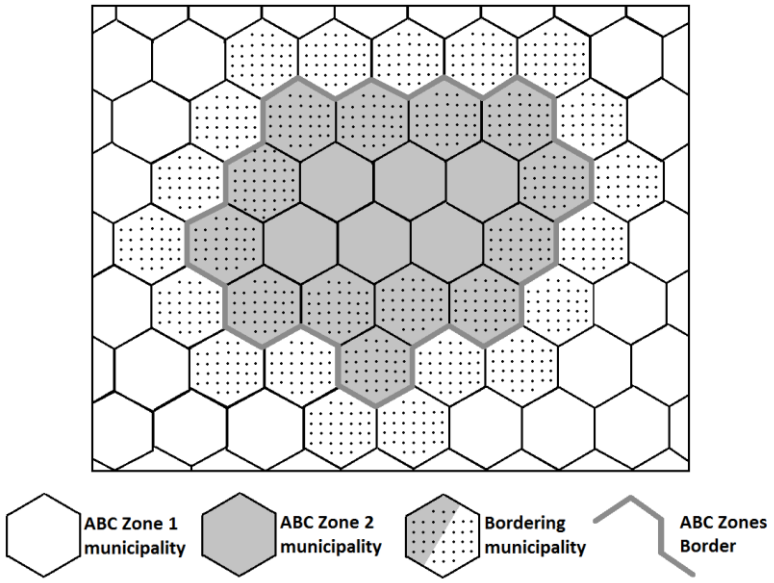

Figure 3 - Selection of ZIP codes adjacent to an IFL border

Note: Each hexagon represents a municipality. Grey municipalities are in a given ABC area while white ones are in a different zone. The so-formed ABC border is delimited in bold. We restrict the analysis to bordering municipalities when considering only dotted municipalities. We can refer to grey dotted municipalities as inside *municipalities and to white dotted municipalities as* outside *municipalities.*

We handle the endogeneity of housing policy to housing market conditions using the weaknesses of the classification around borders. These weaknesses are the results of poor information systems as well as interferences with political objectives. They are underlined in a report by the French administration auditing body (*Cour des Comptes* (2012)). The auditing body interrogated local State representatives who use local housing market studies to pinpoint both over- and under-subsidised municipalities. The report underlines this zoning creates borders around which municipalities are not significantly different. The report underlines data quality issues in the information system used to design the 2009 classification. Information sources are described as “scattered, non-exhaustive and often unreliable”. Further, political objectives interfere with the classification process. In the general context of stimulus policy prevailing in 2009, it was not allowed to reclassify a municipality in a lower-subsidy zone. Only reclassification in a higher-subsidy zone took place. This jeopardizes the classification accuracy.

We now turn to illustrate statistically that ZIP-codes are not significantly different around borders. We analyze house prices, housing hedonic characteristics and the quality of the segmentation proposed by the zoning.

We use our dataset to test the similarity of house prices close to the borders. Let us consider two housing policy areas, grey and white, represented in Figure 3. The border between the two is represented by the thick grey line. We argue that in dotted municipalities – bordering municipalities – housing markets are comparable yet receive different IFL subsidies. We can use our borrower level price data to test for this point. We isolate each of the housing policy zones we can see on Figure 1, keeping only ZIP-codes along each border, both *inside* and *outside* the zone (see Figure 3 for an example). We build 78 conglomerations. We compare *inside* and *outside* ZIP-codes in each conglomeration. *Inside* ZIP-codes are in the supposedly most expensive zone while *outside* ZIP-codes are in the supposedly cheapest zone.

Averages across conglomerations	**2009**
House Price difference between *outside* and *inside* ZIP codes (% of inside ZIP codes prices)	-0.38% (1.18)
Highest price is in an *outside* ZIP code	71%
Highest mean price in an *outside* ZIP code	44%

Table 1 – Comparability of *inside* and *outside* ZIP codes: House Prices

Note: Standard deviations in parentheses. For each housing policy area, we keep ZIP codes bordering its limits, both inside and outside. We call such a set a conglomeration. We build 78 conglomerations. In 2009, on average across conglomerations, prices in outside ZIP-codes were 0.38% lower than in inside ones. In 71% of housing market areas, the maximum price was observed in an outside ZIP code and for 44% the mean price was higher in an outside ZIP code.

For each conglomeration, we compute the percentage difference between *outside* and *inside* average price. We also check if the maximum price or the average prices are observed in an *outside* ZIP-code (see Table 1). On average across conglomerations, the price difference between *inside* and *outside* bordering ZIP codes is less than 0.4% of prices in *inside* ZIP codes in 2009. Across the period, in 62% to 76% of housing market areas, the maximum price was observed in an *outside* ZIP-code. In about 45% of housing market areas, average mean price was higher in *outside* ZIP-codes than in *inside* ones. For both *inside* and *outside* ZIP codes, the share of existing housing is 97%.

	Mean	**sd**
Vacancies	-0.327	2.097
Houses	-21.32	14.83
Main Residences	2.280	7.989
Existing Housing	0.004	0.023
# rooms	-0.424	0.336
# rooms - recently moved in	-53.67	41.80

Table 2– Comparability of *inside* and *outside* ZIP codes: House Characteristics

Note: For each housing policy area, we keep ZIP codes bordering its limits, both inside and outside. We call such a set a conglomeration. We build 78 conglomerations.

We observe house price but not housing hedonic characteristic. We use house price data from our loan-level dataset. There are no municipalities or ZIP-code level house prices series holding quality constant in France that we could use instead. It could be the case that only raw house prices are comparable around borders but not in hedonic terms. We use INSEE (French national institute of statistics) Housing Survey data to check if house characteristics are different around borders. These data for 2011 provide the following variables: percentage of vacancies, percentage of houses, share of main residences, share of existing housing, number of rooms per main residence and number of rooms per main residence of households who moved in less than 2 years ago. We also compare *inside* and *outside* ZIP codes as regards house characteristics. As in table 1, we isolate each of the housing policy zones we can see in Figure 1, keeping only the ZIP-codes along each border, both *inside* and *outside* the zone. For each one

of the above-mentioned variables, we compute the difference of their means in inside and outside ZIP codes and test for its significance. Results are presented in Table 2. For all these variables, the difference is not statistically significant. *Inside* and *outside* ZIP codes house characteristics do not differ significantly either. It is thus very unlikely the absence of house prices difference documented earlier is valid in non-hedonic terms only.

We can think about the housing policy zoning as a segmentation of house prices in four categories. The more precise is the segmentation, the better the subsidy is adjusted to local conditions. Let us see this segmentation as a model of housing prices and the ABC areas as explanatory variables. These zones are buckets (classes) of municipalities. We measure the quality of the zoning thanks to an analysis of variance, presented in Table 3. We can measure the goodness of fit of the segmentation by the R-square – ratio of explained to total variance. We can also measure the class homogeneity by the ratio of inter-class to intra-class variance (corrected by degrees of freedom, F statistic). In this analysis of variance framework, we compare the segmentation quality for whole France on the one hand and for the sample limited to bordering ZIP-codes on the other hand. We use 2009 data to be consistent with the classification definition period. The R-square drops by 40% in the bordering ZIP-code sample compared with the whole France sample. Class homogeneity in the former sample is 80% lower than in the latter one. ABC areas are much more heterogeneous when focusing on bordering ZIP-codes than when considering whole France.

	N	R-square	F value
Whole France	128 360	0.11	5312.46
Bordering ZIP codes	35 468	0.065	827.08

Table 3 – Housing policy zoning: analysis of variance

Note: Analysis of variance of the house price segmentation created by the housing policy zoning. There are four housing policy zones considered in the analysis (A, B1, B2 and C).

Comparability of both raw house prices and hedonic characteristics around borders as well as the lower segmentation quality for the sample of bordering ZIP-codes all confirm classification weakness around borders. As underlined above, this is the result of poor information systems and interferences with political objectives. Close to borders, comparable housing markets are receiving different IFL subsidies. In the sample of bordering ZIP-codes (dotted ones in Figure 3), we can argue the exogeneity of the IFL subsidy to contemporaneous house prices.

	House Price (k€)	Income (k€)	Age
Whole France	199	38	37.9
	(95.6)	(18.7)	(6.7)
Bordering ZIP codes	222	40	37.4
	(83.3)	(19.0)	(5.4)

Table 4 – Descriptive statistics: whole France and bordering ZIP codes

Note: Standard deviation in parentheses. Income is borrowers' income. We compare average values for selected variables – house prices, borrowers' income and borrowers' age – taking into account either whole France data or only ZIP codes bordering housing policy areas limits data.

One could worry about exogeneity to expected housing prices. The policy-maker could increase credit subsidies the most where house prices are expected to increase the most. There is no prospective goal in the zoning definition, as underlined by *Cour des Comptes* (2012). A zone is considered 'imbalanced' if available housing supply is not enough to satisfy demand. The zone is balanced if housing supply satisfies housing demand. The only criterion is the contemporary situation and there are no references to future prices. Anyway, available data would not allow precisely capturing very local house price dynamics. Available datasets with highest geographical precision are presented as low quality sources. The most reliable survey is available only every 3 to 6 years and reports only price proxies. IFL policy

is thus also exogenous to expected house prices in the sample of bordering municipalities. We restrict our sample to bordering ZIP-codes.[5]

The sample of bordering ZIP codes is not representative for whole France. Table 4 presents average value of house prices, borrowers' incomes and ages for both the whole of France and ZIP codes in our estimation sample. On average, borrowers' in bordering ZIP codes are richer and buy more expensive houses. They are slightly younger than the average French borrower. This is consistent with the sampling, which leads to focus on ZIP codes in or close to the most dynamic housing markets.

One could worry we identify demand-side instead of supply-side credit shifts. But the institutional organization of IFL reforms allows ruling out demand-induced shocks. Two administrations are in charge of defining the IFL framework: the Treasury and the Housing Ministry. These are national level administrations. The IFL framework is composed by two elements, as illustrated in Figure 4. The first element is how IFL subsidies vary with house and borrowers' characteristics and the housing policy zones. The second element is the classification of municipalities into housing policy zones itself.

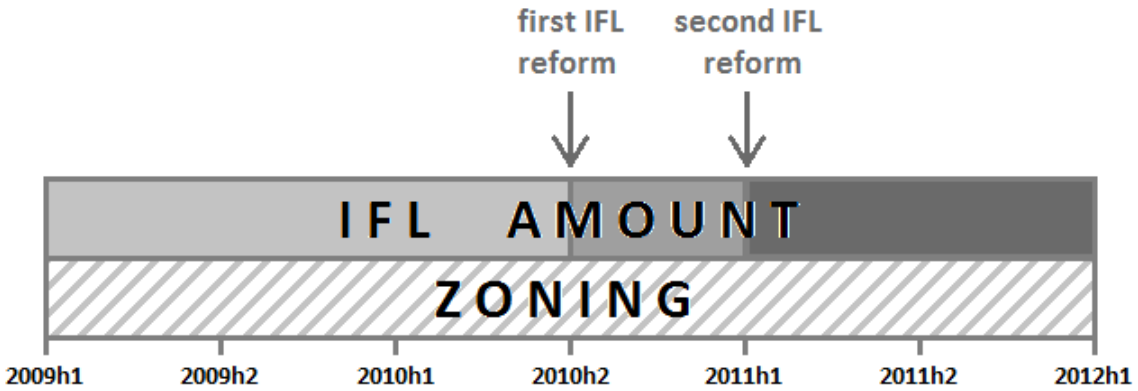

Figure 4 – IFL policy making process
Note: An IFL framework is a function from house and borrowers' characteristics and the housing policy areas to IFL conditions, which are eligibility conditions, amount and amortization. Housing policy areas are themselves the output of an administrative process of classification of municipalities into ABC areas.

The definition of this classification could be the occasion of demand-induced adjustments. Mayors of municipalities in which demand for homeownership is higher could channel the demands of their citizens to the national level. They would do so lobbying for the reclassification of their municipality into high-subsidy areas. But classifications and IFL reforms are not simultaneous. The classification is revised at least every three years. Revisions took place in 1999, 2003, 2006 and 2009 (and 2014). Our identification does not rely on classification revisions. It relies on the change of IFL conditions, holding zoning constant. It is very unlikely that local demand pressures would be conveyed through the nation-wide revisions of the IFL policy. Indeed, there are no regularly used direct communication channels between municipalities and the administration in charge of the IFL policy reforms. Anyway, there are no incentives for the mayor to spend resources trying to impact the nation-wide revision as borrowers would not identify her as responsible for the benefits they receive.[6]

[5] Regulation is defined at the municipality level, so we define borders between two IFL areas and adjacent units at the municipality level. Our data are available at the ZIP code level, but 6 000 ZIP-codes correspond to 36 000 municipalities. We exclude from our sample ZIP-codes including municipalities from different IFL areas. This excludes 573 ZIP codes from our sample (see appendix A.2).

[6] We work with the 2009 classification, consistently with the timing of the reforms we study. 98% of French municipalities' zones were left unchanged between 2006 and 2009. We have identified 804 municipalities (398 ZIP-codes) changing zones between 2006 and 2009. Four of these ZIP-codes are in our estimation sample of bordering ZIP-codes in 2009. We treat them as if they had always been in their 2009 zone. Taking them out of the sample does not affect results.

The IFL policy was reformed three times between 2009 and 2011. The 2009 reform doubled the maximum IFLs available for new housing. The measure lasted until June 2010. Maximum IFL amounts available to the households decreased then by 25% in the second semester of 2010 compared with the first one. The 2011 reform suppressed income eligibility conditions and increased the maximum loan amount for both existing and new housing. We can thus observe both expansionary (e.g. between 2010h2 and 2011) and contractionary (between 2010h1 and h2 for new housing) movements of the IFL (see Figure 5).

Figure 5 - Maximum IFL amount for two-people households in zone C.
Note: In 2009h1, a two-person household living in zone C and buying new housing could be granted a maximum IFL of 30,900€.

		Prices (k€)	IFL amount (k€)	Share (%)
A	**2009 - 2010h1**	272	24	9
	2010h2	300	22	7
	2011	314	43	14
B1	**2009 - 2010h1**	248	18	7
	2010h2	266	15	6
	2011	278	32	12
B2	**2009 - 2010h1**	191	18	10
	2010h2	205	15	7
	2011	211	26	13
C	**2009 - 2010h1**	183	18	10
	2010h2	193	15	8
	2011	200	24	12

Table 5 – Summary statistics: IFL amount available (IV) and house prices.
Note: IFL amount is our instrument variable. We report house prices observed in our dataset and corresponding IFL amounts. For the period 2009-2010h1, in zone A, a two-person household could be granted an average maximum IFL of 24 k€. The average price of housing was 272 €. The IFL was on average 9% of the housing prices.

We summarize IFL conditions by the maximum amount of IFL available for a two-person household.[7] This amount differs for new and existing housing. It varies at the ZIP-code and time levels (see Table 5).

We compute the maximum amount of IFL available in ZIP-code z at semester t $IFL_{z,t}$ as:

$$E_{z,t} * IFL_{existing,z,t} + \left(1 - E_{z,t}\right) * IFL_{new,z,t}$$

$IFL_{existing}$ and IFL_{new} are the maximum IFL amount for existing housing and new housing, respectively. E_z is a dummy for existing housing when using data at the loan-level and the share of existing housing purchases in ZIP-code z when using data at the ZIP-code level. We see in Table 4 that depending on the housing policy zone and the time period, the IFL can cover between 6% and 14% of house prices.

2.2. Loan-level database

We use a loan-level dataset gathering loans granted by all major French banking groups. All these loans are secured by insurance and not thanks to a mortgage. This is a very common credit risk management tool in France, used for half of the housing credit market (Autorité de Contrôle Prudentiel et de Résolution (2015)). This is the preferred tool for the less risky segments of this market.

Loans and borrowers' characteristics are available at origination. We observe the house location at the ZIP-code level. There are about 6000 ZIP codes in France.[8] We restrict the analysis to main residence financing[9] and focus on metropolitan France (excluding overseas ZIP-code and Corsica). We work at half-yearly frequency, to be consistent with IFL reforms. The date associated with a loan is its date of origination.

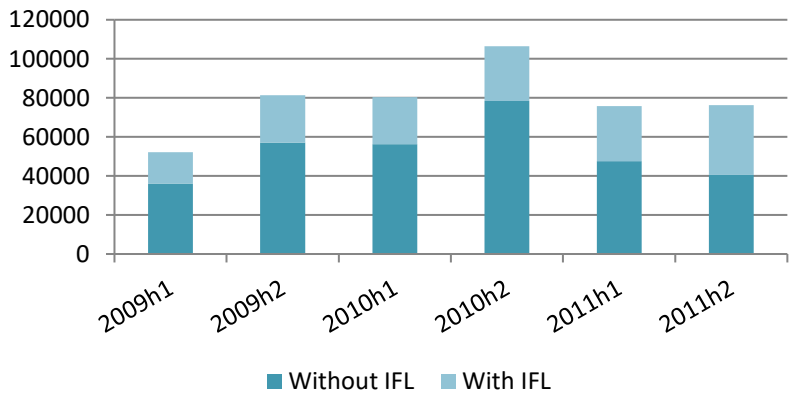

Figure 6 – Number of operations financing main residence, 2009-2011, metropolitan France
Source: banks data, authors' computation.
Note: In 2009h1, we observe 52,130 operations, 16,102 of which include an IFL.

Figure 6 presents the number of operations through 2009-2011 We observe more than 470 thousands operations[10] over the period. The share of operations including IFL varies with eligibility conditions: 30% in 2009, 28% in 2010 and 42% in 2011. Figure 7 presents average loans and house prices for main residence financing. House prices are not hedonic prices. Evolution of loans amount and real estate

[7] We choose the amount for a two-person household to be consistent with the average size of households in France. Moreover, IFL amounts grow linearly going from the two-person household to 6+ household. There is no differentiated treatment of larger than two-person household across housing policy zones.
[8] There are 36 000 municipalities. The biggest cities include several ZIP codes and one ZIP code can also include several small cities.
[9] We do not consider credit repurchase, except when associated with a new acquisition or construction. This case represents no more than 0.1% of the database.
[10] An operation is a set of loans destined to finance one real estate purchase.

prices are parallel through the period. Except for a small decrease until the first semester of 2009, prices have increased continuously between 2009 and 2012.

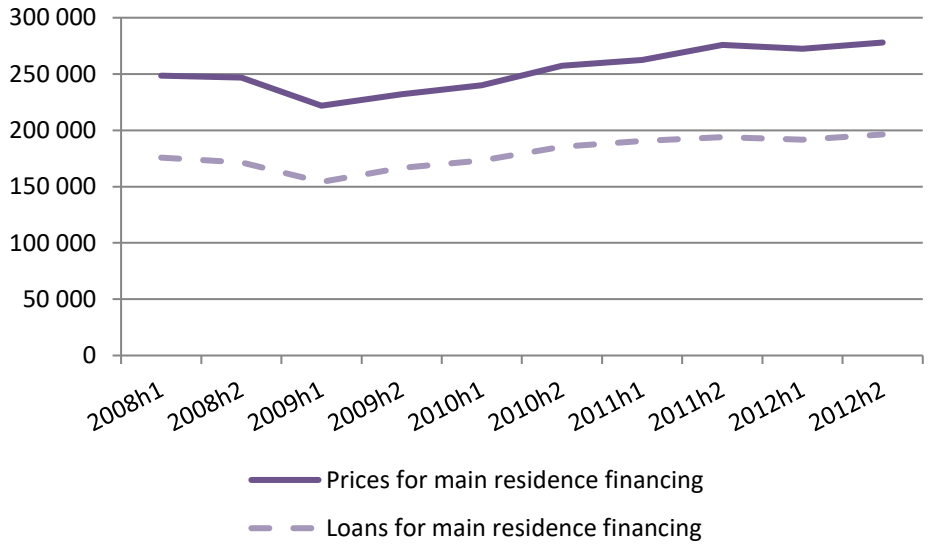

Figure 7 – Average Loans and Real Estate prices for main residence financing (Euros)
Source: banks data, authors' computation.

2.3. Additional data

We combine our loan-level dataset with IFL regulation characteristics, fiscal income, housing characteristics and demographic data. IFL regulation characteristics data are extracted from regulatory texts (*Code de la construction et de l'habitation*). Fiscal income data are publicly available at municipality level and yearly frequency from the tax administration (DGFIP) dataset. Housing characteristics and demographic data are extracted from INSEE (French national institute of statistics) publicly available results of the 2011 census. Employment areas are extracted from INSEE databases.

3. Credit conditions and homeownership access

We first assess if the IFL policy can allow new households on the credit and housing markets.

3.1. Borrowers' selection

We test whether the IFL policy allows new households into the credit market. By creating a credit line with zero interest, the IFL affects the debt service to income (DSTI) ratio as well as the loan to value (LTV) ratio. Banks monitor these credit standard ratios to take credit allocation decisions. If the IFL subsidy affects these ratios, it could allow new households into the credit market.

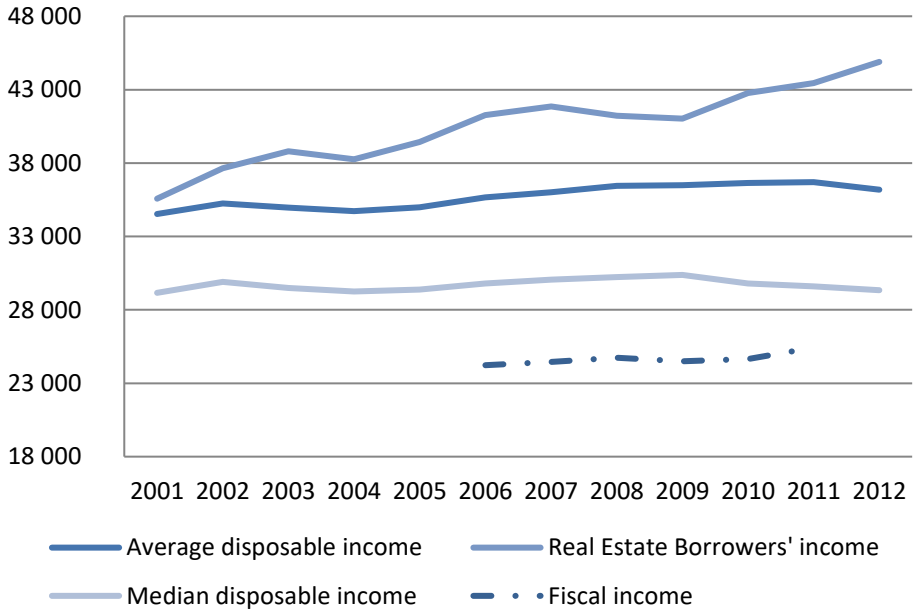

Figure 8 – Average income and Real Estate Borrowers' income – 2001-2012
Source: Borrowers' income is the average computed on whole France operations in our dataset. Average disposable income is from INSEE. Average fiscal income is from DGFIP. All variables are in Euros 2012.

We observe households who did manage to enter the housing credit market. We compare their characteristics to the average household characteristics. We know borrowers' incomes. We also know average fiscal income in each ZIP-code. The percentage difference between borrowers' income and average income in each ZIP-code is our proxy for credit market selection. We compare borrowers' characteristics with whole population characteristics. If borrowers significantly differ from the whole population, it means there is selection on the credit market. The whole population figures include households who were refused housing loans. Difference between borrowers' and average incomes is not an unbiased measure of selection. Average fiscal income includes homeowners who entered the credit market some periods ago or did not need a loan. These homeowners are certainly older and richer than new borrowers. To this extent, our proxy underestimates housing credit market selection.

Figure 8 graphs the evolution of both incomes – average (disposable or fiscal) income in the population and real estate borrowers' income – through time. Borrowers' income is on average 45% higher than average fiscal income in 2010-2011. This is consistent with the 41% difference documented for 2010 in Arrondel et al. (2015). Real estate borrowers' income has been higher than median and average incomes since 2001. But the difference between real estate borrowers' income and average income has significantly widened through time. In 2001, borrowers' income was about 3% higher than average disposable income. In 2012, it is 25% higher. As a comparison, in the Euro Area, owners with mortgage have an average *disposable* income 39% higher than the whole population of households (HFCN (2013)). In the US, Adelino et al. (2015) find an 80% difference between average household income and average homebuyers income.

3.2. Specification

We first test for the direct relationship between the IFL generosity and credit market selection. We estimate the following equation using loan-level data:

$$Accessibility_{i,z,t} = \beta \ln IFL_{z,t} + \gamma X_{i,t} + \lambda_t + \rho_z + \xi_{i,z,t} \qquad (1)$$

$Accessibility$ is a measure of credit market selection. It is either the percentage difference between borrowers i's income at time t and the average income in her house ZIP-code at time t or her loan-to-income ratio. We observe borrowers at origination, i.e. only once. $IFL_{z,t}$ is the amount of IFL available in ZIP-code z, at time t, computed as described in section 2.1. X_i is a vector of borrowers and loans characteristics controls including the borrowers' age, the borrowers' probability of default rating, the loan maturity at origination, the house price, the household wealth (net real estate wealth and other wealth), a dummy for the house being existing and a dummy for the borrower being a couple. These controls hold constant common determinants of banks' loans granting decisions. ρ_z is a vector of ZIP-code fixed effects. They account for all ZIP-code specific determinants that are constant over time. λ_t is a set of macroeconomic variables: aggregate housing credit interest rates at time t of origination, growth rate and employment area level employment rate. Employment areas are geographical areas within which most inhabitants both reside and work and in which firms can find most of the labor required to fill available jobs. They are thus economically consistent zones to correct for local housing market dynamics.

We then use movements in $\mathbf{IFL_{z,t}}$ to identify exogenous movements in credit conditions and how they affect credit market conditions. We test for the relation between IFL amounts and the loan-to-value. We estimate:

$$LTV_{i,z,t} = \beta' \ln IFL_{z,t} + \gamma' X_{i,t} + \lambda'_t + \rho'_z + \xi'_{i,z,t} \qquad (2)$$

with $LTV_{i,z,t}$ the LTV of household i's loan, buying a house in ZIP-code z at time t and ρ'_z is vector of ZIP-code fixed effects. In a second stage, we use the IFL variations as an IV for LTV. We use (2) as a first stage to instrument $LTV_{i,z,t}$ in (3), with ρ''_z a vector of ZIP-code fixed effects:

$$Accessibility_{i,z,t} = \beta'' LTV_{i,z,t} + \gamma'' X_{i,t} + \lambda''_t + \rho''_z + \xi''_{i,z,t} \qquad (3)$$

In all three equations we cluster standard errors at the ZIP-code level, which is the level of variation of our IFL instrument.

3.3. LTV constraints and homeownership access

Table 6 presents results for the reduced forms. In columns 1 and 2, we estimate how the income difference reacts to the IFL policy and the LTV, respectively. Bigger amounts of IFL reduce income differences between borrowers' and the average households' incomes. Increasing IFL amounts by 10% would decrease the income difference by 3%. A higher LTV is associated with a bigger income difference between borrowers' and average income. There is certainly an endogeneity bias as richer borrowers can be granted a bigger loan. In columns 3 and 4, we replicate the exercise for the loan-to-income ratio. In column 3, we find bigger IFL amounts increase the loan-to-income ratio. This is either the results of increase in credit volumes at the extensive or the intensive margin. At the extensive margin, the bank can grant credit to lower-income households whose indebtedness will likely be higher. At the intensive margin, the bank can have a more generous credit supply policy for the market as a whole, consistently with loose income eligibility criteria. Spontaneously, a higher LTV is associated with a smaller LTI (column 4). Again, there is an endogeneity bias as higher income borrowers certainly buy

more expensive houses. In column 5, we test for the relationship between the IFL amount and the loan-to-value. The IFL amount has a significant and positive impact on the LTV. Increasing IFL amounts by 10% would increase LTV by 0.1%. It points at the efficiency of the IFL policy in relaxing credit conditions. We will use this equation as a first-stage to identify exogenous changes in LTV and how these affects credit market selection.

	(1)	(2)	(3)	(4)	(5)
	Income diff.	Income diff.	LTI	LTI	LTV
IFL amount	-0.128***		0.111***		0.686***
	(0.008)		(0.018)		(0.224)
LTV		0.025***		-0.027***	
		(0.000)		(0.000)	
Existing housing	-0.045***	0.004	-0.019	-0.052***	2.406***
	(0.009)	(0.005)	(0.019)	(0.013)	(0.253)
House price (log)	0.591***	0.978***	1.675***	1.259***	-15.445***
	(0.009)	(0.009)	(0.016)	(0.016)	(0.186)
Borrowers' Age	-0.005***	0.002***	0.011***	0.003***	-0.282***
	(0.000)	(0.000)	(0.001)	(0.001)	(0.008)
Maturity at origination	0.018***	-0.025***	0.032***	0.078***	1.690***
	(0.001)	(0.000)	(0.001)	(0.001)	(0.016)
Couple	0.345***	0.134***	-1.089***	-0.862***	8.359***
	(0.007)	(0.005)	(0.013)	(0.012)	(0.148)
Net Real Estate Wealth (log)	0.032***	0.016***	-0.041***	-0.024***	0.638***
	(0.001)	(0.000)	(0.001)	(0.001)	(0.014)
Other Wealth (log)	0.018***	0.008***	-0.029***	-0.019***	0.363***
	(0.001)	(0.000)	(0.001)	(0.001)	(0.015)
PD rating	0.274***	0.031***	-0.289***	-0.028***	9.569***
	(0.004)	(0.003)	(0.007)	(0.007)	(0.101)
Interest rate	0.088***	0.152***	-0.232***	-0.300***	-2.243***
	(0.015)	(0.011)	(0.032)	(0.030)	(0.410)
Unemployment rate	-0.015	0.026**	0.066***	0.025	-0.715**
	(0.013)	(0.010)	(0.025)	(0.024)	(0.337)
Growth rate (%)	0.048***	0.044***	-0.133***	-0.130***	0.018
	(0.013)	(0.010)	(0.027)	(0.026)	(0.377)
Observations	117,614	117,614	117,614	117,614	117,614
R-square	0.336	0.656	0.280	0.375	0.444
ZIP-code FE	yes	yes	yes	yes	yes
Cluster	ZIP code	ZIP code	ZIP code	ZIP code	ZIP code
# ZIP code	1633	1633	1633	1633	1633

Table 6 –Homeownership: reduced form

*Note: The dependent variable is the income difference between borrowers and average household. Regressors are the loan-to-value ratio, the IFL amount, the borrowers' age, the aggregate interest rate, the borrowers' probability of default rating, the loan maturity at origination, the house price, the household wealth (net real estate wealth and other wealth, in logarithm), the growth rate, the employment area unemployment rate, a dummy for existing housing and a dummy for the borrower being a couple. The sample includes all loans for houses located in metropolitan France ZIP-codes bordering housing policy areas limits for which data are available for the period 2009-2011. All regressions include ZIP code and employment area specific time fixed effects. Standard errors are clustered by ZIP code. Standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1).*

Results for the instrumented specifications are presented in Table 7. We vary the set of controls across columns. In column 1, we test for the effect of the LTV on the income difference, not controlling for borrowers' age or wealth. The first stage R-square is 42% and the F-stat is about 7 (results are unchanged

if using a limited-information-maximum-likelihood (LIML) estimator). Bigger IFL amounts significantly increase the LTV. In the second stage, we show an exogenous increase in the LTV ratio reduces the difference between borrowers' and the average households' income. exogenously increasing LTV by 1 basis point reduces the difference between borrowers' and average income by 20 basis points. These results are confirmed when controlling for borrowers age in column 2 and both of age and wealth in column 3. But the size of the effects somewhat varies, even though standard deviation estimates do not point to significant differences. The effect is reduced when controlling for age in column 2. The first stage R-square is 43% and the F stat is 13.52 for this specification. This suggests part of the adjustment stems through younger borrowers. The effect is also relatively smaller than in column 1 when controlling for both wealth and age in column 3. The first stage R-square is 44% and the F stat is 9.35 for this specification. The adjustment can thus also take place through less wealthy borrowers allowed on the market.

We replicate this exercise replacing the income difference variable by the loan-to-income in columns 3 and 4. The first stages are the same as for the income difference variable. Across all specifications, we find an exogenous increase in the loan-to-value also increases the loan-to-income ratio. Again, the biggest effect is found when not controlling for either age or wealth in column 4.

	(1)	(2)	(3)	(4)	(5)	(6)
	Income diff.	Income diff.	Income diff.	LTI	LTI	LTI
First stage: LTV						
IFL amount	0.600***	0.849***	0.686***	0.600***	0.849***	0.686***
	(0.232)	(0.231)	(0.224)	(0.232)	(0.231)	(0.224)
Second stage						
LTV	-0.201**	-0.141***	-0.186***	0.178**	0.118***	0.162**
	(0.089)	(0.046)	(0.070)	(0.086)	(0.045)	(0.067)
Borrowers' Age		-0.028***	-0.057***		0.028***	0.056***
		(0.009)	(0.020)		(0.009)	(0.019)
Net Real Estate Wealth (log)			0.151***			-0.145***
			(0.044)			(0.043)
Other Wealth (log)			0.085***			-0.087***
			(0.025)			(0.024)
Observations	117,614	117,614	117,614	117,614	117,614	117,614
ZIP-code FE	yes	yes	yes	yes	yes	yes
Cluster	ZIP code	ZIP code	ZIP code	ZIP code	ZIP code	ZIP code
Est	2sls	2sls	2sls	2sls	2sls	2sls
R2 first	0.422	0.426	0.444	0.422	0.426	0.444
F stat	6.676	13.52	9.348	6.676	13.52	9.348
# ZIP code	1633	1633	1633	1633	1633	1633

Table 7 –Homeownership: Controls set

*Note: IV estimations of the effect of the loan-to-value on the income difference and the loan-to-income. The LTV ratio is instrumented by the IFL amount. Not reported controls include: the borrowers' probability of default rating, the loan maturity at origination, the house price, the aggregate interest rate, the growth rate, the employment area unemployment rate, a dummy for existing housing and a dummy for the borrower being a couple. Reported controls include: the borrowers' age and the household wealth (net real estate wealth and other wealth). The sample includes all loans for houses located in metropolitan France ZIP-codes bordering housing policy areas limits for which data are available for the period 2009-2011. All regressions include ZIP code and employment area specific time fixed effects. Standard errors are clustered by ZIP code. Standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1).*

4. Housing Credit and Prices

Section 3 has shown the IFL policy allows relaxing credit constraints. We now turn to estimate secondary effects of the IFL policy. We assess whether it increases house prices.

4.1. Specification

We aggregate data at the ZIP-code level to build growth rates variables. We observe raw house prices and cannot control for houses hedonic characteristics. We thus want to work with growth rates of house prices rather than their levels. In this section, our level of observation will be the ZIP-code x date level.

We first test the impact of the IFL reform on credit supply. We estimate:

$$L_{z,t} = \beta^{(1)} IFL_{z,t} + \gamma^{(1)} X_{z,t} + \mu_z + \lambda_{EA,t} + \varepsilon_{z,t} \qquad (4)$$

$L_{z,t}$ is a measure of activity on the housing credit market. It is either the number of loans granted, or the total volume of loans or the average credit size. All these variables are taken in growth rates. $IFL_{z,t}$ is the growth rate of the maximum IFL amount available in ZIP-code *z* at semester *t*.
$X_{z,t}$ is a set of controls including both borrowers and loans characteristics. Borrowers' characteristics include: the share of couple borrowers, the borrowers' average age, income and wealth. Loans characteristics include: the share of existing housing and the down-payment rate. We also include the measure of ZIP-code level average income previously used to compute the credit selection indicator in section 3. This helps us capture wealth effects at the ZIP-code level and proxies hedonic characteristics of houses.
We also include a set of fixed effects. μ_z is a ZIP-code fixed effect. Using growth rates and including ZIP-code fixed effects de-trends the variables, with ZIP-code specific trends. $\lambda_{EA,t}$ is an employment area specific time fixed effect. Employment zones are geographical areas within which most inhabitants both reside and work and in which firms can find most of the labor required to fill available jobs. They are thus economically consistent zones to correct for local housing market dynamics. We cluster standard errors at the ZIP-code level.

We then test for a direct link from maximum IFL amounts and house prices $P_{z,t}$ estimating the following reduced form equation:

$$P_{z,t} = \beta^{(2)} IFL_{z,t} + \gamma^{(2)} X_{z,t} + \eta_z + \kappa_{EA,t} + \epsilon_{z,t} \qquad (5)$$

with η_z a ZIP-code fixed effect and $\kappa_{EA,t}$ an employment area specific time fixed effect.

Credit and prices are simultaneously determined. As prices were increasing the household may have negotiated a bigger loan. Or rather, as the bank has offered softer credit conditions the household may have bid higher. We finally use IFL as an instrument for L and estimate the elasticity of real estate prices to credit in the following instrumented equation, with (4) the first stage, ν_z a ZIP-code fixed effect and $\iota_{EA,t}$ an employment area specific time fixed effect :

$$P_{z,t} = \beta^{(3)} L_{z,t} + \gamma^{(3)} X_{z,t} + \nu_z + \iota_{EA,t} + \varepsilon'_{z,t} \qquad (6)$$

4.2. Housing credit and prices

Results for equation (4) are presented in Table 8. In column 1, we test the impact of the IFL amount on credit volumes. We find a positive and significant impact of the IFL amount on credit volumes. Increasing IFL by 1 percentage point increases credit volumes by about 10 basis points. In column 2, we test the impact of the IFL policy on the number of loans. We find weak evidence that it increases the

number of loans observed on the credit market. We have shown in section 3 that the IFL policy allows new borrowers on the credit market but the effect is economically small. As we are working with average number of loans growth rates, it is unlikely the policy generates highly significant changes to this variable. In column 3, we test for the effect of the IFL policy on the average credit size. We find a positive and significant relationship. Increasing IFL by 1 percentage point raises the growth rate in average credit size by 5 basis points. The IFL policy thus spurs activity on the credit market. We find evidence of bigger activity at the intensive margin (total credit and average credit) and weak evidence for the extensive margin (number of loans).

	(1) Credit volume	(2) Number of loans	(3) Average credit size
IFL amount	0.131***	0.068*	0.052***
	(0.042)	(0.038)	(0.020)
Down payment	-0.429***	0.193***	-0.575***
	(0.067)	(0.048)	(0.052)
Age	-0.005**	-0.009***	0.003**
	(0.002)	(0.002)	(0.001)
Borrowers' income	0.333***	-0.018	0.419***
	(0.042)	(0.037)	(0.023)
Average income	-0.684*	-0.338	-0.030
	(0.372)	(0.280)	(0.142)
Net real estate wealth (log)	0.031***	0.029***	0.003*
	(0.003)	(0.003)	(0.001)
Other wealth (log)	0.026***	0.025***	-0.001
	(0.006)	(0.006)	(0.003)
Couple	0.070	-0.071	0.142***
	(0.051)	(0.046)	(0.026)
Existing housing	0.111*	0.106*	-0.007
	(0.061)	(0.055)	(0.029)
Observations	7,242	7,242	7,242
ZIP-code FE	yes	yes	yes
EA*Time FE	yes	yes	yes
Cluster	ZIP-code	ZIP-code	ZIP-code
R2 within	0.100	0.0396	0.390
# ZIP code	1452	1452	1452

Table 8 – IFL policy and credit market activity

*Note: The dependent variable is either the credit volume, or the number of loans or the average credit size. Regressors are: the IFL amount, the share of existing housing in the ZIP-code, the down payment rate (relative to house value), the average borrowers' age and income (log), the average income of all households in the ZIP code (log) and the borrowers' wealth (net real estate wealth and other wealth) and the share of couple borrowers. The sample includes all metropolitan France ZIP-codes bordering housing policy areas limits for which housing loans data are available for the period 2009-2011. All regressions include ZIP code and employment area specific time fixed effects. Standard errors are clustered by ZIP code. Standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1).*

Results for equation (5) are presented in Table 9. We test for the direct effect of credit activity measures and IFL amounts on house prices. In column 1, we document a positive correlation of credit volumes and house prices. In column 2, we find a negative correlation of the number of loans and house prices. It can be that more loans mean lower income borrowers hence lower price houses observed. Or this estimate can be the result of reverse causality and higher house prices prevent access to the market to a high number of potential borrowers. In column 3, we test for the link between average credit size and house prices. Spontaneously, a 1 basis point increase in credit growth leads to a 0.7 basis point house

price growth increase. Finally, in column 4, we test for a direct effect of growth in IFL amount on house prices. We find a positive and significant relationship between IFL growth and house prices. Increasing IFL by 1 ppt leads to an increase of the growth rate of house prices by 0.4 ppt.

We then estimate equation (6) and estimate the elasticity of house prices to credit activity by using the IFL as an instrument. Results are presented in table 10. In column 1, we analyze the link between house prices and average credit size. The first stage R-square is high (about 54%) and the F-stat is 7.047. Results are unchanged if replacing the 2SLS estimator by a LIML one so results are not driven by a weak IV issue. We find an increase of the growth rate of credit by 1 basis point increases the growth rate of housing prices by about 0.7 basis points. A 1 standard deviation change in credit growth is associated with a 0.6 standard deviation change in house price growth.

	(1)	(2)	(3)	(4)
	House prices	House prices	House prices	House prices
Credit volume	0.114***			
	(0.006)			
Number of loans		-0.030***		
		(0.007)		
Average credit size			0.725***	
			(0.021)	
IFL amount				0.039**
				(0.017)
Down payment	0.542***	0.499***	0.908***	0.491***
	(0.049)	(0.046)	(0.082)	(0.045)
Age	0.005***	0.005***	0.003***	0.005***
	(0.001)	(0.001)	(0.001)	(0.001)
Borrowers' income	0.237***	0.274***	-0.030*	0.274***
	(0.021)	(0.021)	(0.018)	(0.021)
Average income	0.114	0.023	0.061	0.039
	(0.127)	(0.138)	(0.066)	(0.138)
Net real estate wealth (log)	0.001	0.005***	0.002***	0.004***
	(0.001)	(0.001)	(0.001)	(0.001)
Other wealth (log)	0.002	0.006**	0.005***	0.005*
	(0.003)	(0.003)	(0.002)	(0.003)
Couple	0.190***	0.197***	0.095***	0.198***
	(0.021)	(0.022)	(0.018)	(0.022)
Existing housing	-0.036*	-0.039**	0.006	0.003
	(0.019)	(0.020)	(0.012)	(0.024)
Observations	7,242	7,242	7,242	7,242
ZIP-code FE	yes	yes	yes	yes
EA*Time FE	yes	yes	yes	yes
Cluster	ZIP-code	ZIP-code	ZIP-code	ZIP-code
R2 within	0.291	0.222	0.735	0.219
# ZIP code	1452	1452	1452	1452

Table 9- House prices and credit: reduced forms

*Note: The dependent variable is the growth rate of house prices. Regressors are: the credit volume, the number of loans, the average credit size, the IFL amount, the share of existing housing in the ZIP-code, the down payment rate (relative to house value), the average borrowers' age and income (log), the average income of all households in the ZIP code (log) and the borrowers' wealth (net real estate wealth and other wealth) and the share of couple borrowers. The sample includes all metropolitan France ZIP-codes bordering housing policy areas limits for which housing loans data are available for the period 2009-2011. All regressions include ZIP code and employment area specific time fixed effects. Standard errors are clustered by ZIP code. Standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1).*

We do the same exercise in column 2 considering credit volumes. The first stage R-square is high and the IV F-stat is 9.6. Again, results are unchanged if using a LIML estimator. We find a positive and significant relationship between credit volumes and house prices. exogenous increasing credit volume growth rate by 1 percentage point increases house prices growth rate by 0.3 percentage point. In column 3, we turn to the number of loans. As the IFL amount is not a good predictor of the number of loans (Table 7), it is a weak IV (F-stat is 3.3). As a result, we fail to find a significant relationship with house prices.

	(1) House prices	(2) House prices	(3) House prices
Average credit size	0.754***		
	(0.205)		
Credit volume		0.299**	
		(0.134)	
Number of loans			0.575
			(0.423)
Down payment	0.924***	0.620***	0.380***
	(0.113)	(0.073)	(0.099)
Age	0.002**	0.006***	0.010**
	(0.001)	(0.001)	(0.004)
Borrowers' income	-0.042	0.175***	0.285***
	(0.097)	(0.053)	(0.032)
Average income	0.062	0.244	0.234
	(0.067)	(0.175)	(0.264)
Net real estate wealth (log)	0.002**	-0.005	-0.013
	(0.001)	(0.004)	(0.013)
Other wealth (log)	0.005***	-0.003	-0.010
	(0.002)	(0.005)	(0.012)
Couple	0.091***	0.177***	0.239***
	(0.029)	(0.024)	(0.047)
Existing housing	0.008	-0.030	-0.058
	(0.015)	(0.021)	(0.038)
Observations	7,242	7,242	7,242
ZIP-code FE	yes	yes	yes
EA*Time FE	yes	yes	yes
Cluster	ZIP-code	ZIP-code	ZIP-code
R2 first	0.541	0.448	0.414
F stat	7.047	9.616	3.280
# ZIP code	1452	1452	1452

Table 10 – House prices and credit: IV estimation

*Note: Second stages ZIP code level regressions of an IV specification of the growth rate in house prices on the growth rate of average housing credit, credit volumes or the number of loans. Measures of credit activity are instrumented by the IFL amount. Controls (not reported) include: the share of existing housing in the ZIP-code, the down payment rate (relative to house value), the average borrowers' age and income (log), the average income of all households in the ZIP code (log and the borrowers' wealth (net real estate wealth and other wealth)and the share of couple borrowers. The sample includes all metropolitan France ZIP-codes bordering housing policy areas limits for which housing loans data are available for the period 2009-2011. All regressions include ZIP code and employment area specific time fixed effects. Standard errors are clustered by ZIP code. Standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1).*

Our estimate of the elasticity of house prices to average credit size is big. For the US, Favara and Imbs (2015) estimate the housing prices growth rate elasticity to the growth rate of credit is 0.12 at impact

and peaks two-year after the shock at 0.2.[11] They include lagged house price in their estimation, which we cannot do due to the reduced time dimension of our sample. As lagged and contemporaneous values of house prices growth are positively correlated, this may bias our estimation upward. But these differences are consistent with differences in housing supply elasticity. Sánchez and Johansson (2011) compare this parameter across OECD countries and conclude it is higher in North America than in Europe. France has amongst the lowest housing supply elasticity (about 0.3 when it is higher than 2 for the US - about 7 times higher). This is consistent with a bigger effect on prices of a given credit-induced housing demand shock.

We observe house price but not housing hedonic characteristic. We use house price data from our loan-level datasets. There are no publicly available ZIP-code level house prices series holding quality constant in France that we could use instead. As we do not correct for hedonic characteristics of the house purchased, part of the price increase could be attributed to quality effects. The marginal house purchased by the marginal borrower would be a better quality one than the average. But we have shown in section 3 that the IFL policy affected the marginal borrower characteristics. She is a relatively lower income borrower. So we rather expect that everything else equal she buys a lower quality house.

The difference between IFL eligible and non-eligible borrowers could bias the estimate. The estimate would be biased if the whole distribution of borrower types is included in the credit and price measures but not in the instrument and the elasticity of prices to credit is not homogenous across the population. We would be estimating a local effect (Local Average Treatment Effect) that would differ from the whole population effect. But eligibility conditions suggest the difference between the eligible and the whole population is negligible. First, for the whole year 2011, there is no income related eligibility condition. So there is no difference between IFL eligible and non-eligible borrowers. In the previous IFL regime, households were eligible until their income represented 130% of average fiscal income in zones B/C and 150% in zone A (see appendix 1). On average in our dataset, borrowers' income is 45% higher than average fiscal income. Thus, the average borrower is IFL eligible. A sizeable share of the income distribution is thus IFL eligible.

One could worry about house location being marginally affected by the IFL subsidy. Borrowers can easily choose to prefer the bordering ZIP code with higher subsidy. This demand effect would increase further house prices in higher-subsidy ZIP codes and bias our estimations. But it is unlikely borrowers choose a different region because of the subsidy. They will cross a border, not the country. To verify our results are not driven by house location choices, we exclude from our estimation sample *inside* ZIP codes. For each border between two IFL areas, we thus use only bordering ZIP codes in the lowest subsidy zone (*outside* ZIP codes). Estimation can still rely on IFL variation across IFL areas, but only for lowest subsidy zones for each border. Estimation is still possible because we have different types of borders (between A and B1, between B2 and C…). Results are presented in Appendix A.6. As when using the whole sample of bordering ZIP-codes, we find that increasing the IFL subsidy increases credit market activity and house prices. The point estimate of the elasticity of house prices to the IFL subsidy is higher in this sample than the one obtained in Table 8. Bias from house location choice adjustment thus seems negligible.

[11] Kelly *et al.* (2015) find reduced-form loan-level elasticities of between 0.15 and 0.2 for Ireland.

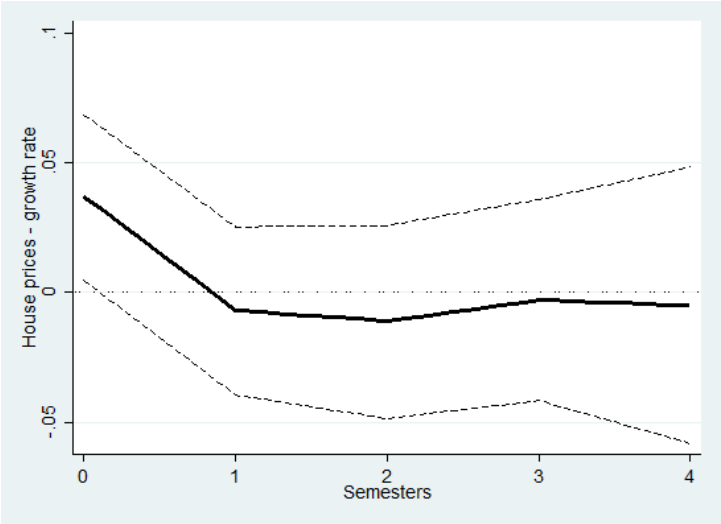

Figure 9 – House prices and IFL subsidies: Impulse Response.
Note: Dashed lines are 95 percent confidence bands. Impulse response function of the growth rate of house prices to the growth rate of IFL amounts.

The high elasticity we document is anyway a short-term one. We follow Jordà (2005) and estimate impulse response function from local projections. We estimate sequential regressions of the endogenous variable shifted forward. We estimate the following equations, for j between 0 and 4:

$$P_{z,t+j} = \beta_j^{(1)} IFL_{z,t} + \gamma_j^{(1)} X_{z,t} + \mu_z^i + \lambda_{EA,t}^i + \varepsilon_{z,t}^i \qquad (7)$$

The collection of estimates is represented in Figure 9. The effect of the IFL policy on house prices is only visible at impact. It is negligible after 6 months. After two years, the effect on the growth rate on house prices is zero. Growth effects of the policy on house prices growth rates are thus temporary.

5. Conclusion

We use the IFL policy variations across housing policy areas and time as an instrument for credit to trace its impact on homeownership and house prices. We handle endogeneity between housing prices and policy by sampling ZIP codes bordering administratively defined housing policy areas. The policy-making process enables to abstract from demand-induced shocks via the local political lobbying channel.

We first verify IFL subsidies do relax credit conditions. We measure credit conditions by the loan-to-value (LTV) ratio. This simple risk measure is commonly used by bank to assess the loan file creditworthiness. We find that bigger IFL subsidies are associated with higher loan-to-value ratios, controlling for both borrowers and loan characteristics.
We then test if IFL subsidies change borrowers' characteristics. We approximate credit market selection by the difference between borrowers' and average household income in each ZIP-code. In our sample of bordering ZIP-codes, higher IFL subsidies reduce credit market selection - make borrowers' income closer to the average income.
Our third step is instrumenting the LTV by the IFL subsidy to identify how a credit supply shift affects borrowers' characteristics. We find an exogenous – IFL induced – increase in LTV reduces credit selection. We also find this increase to raise the loan-to-income ratio. Softer credit conditions allow lower income borrowers on the market and the credit they draw down is a higher share of their incomes.

We also consider secondary effects of the IFL policy. We compute estimations at the ZIP-code level so we can work with more robust growth rates of house prices. IFL subsidies growth increase total credit

volumes, the number of loans and the average credit size. Growth in IFL subsidies also favors house prices growth.
We then instrument growth in average credit size by IFL growth to trace the effect of exogenous shifts in credit supply into house prices. Positive credit supply shifts spur house prices growth. We find a high short-term elasticity of housing prices to housing credit when we instrument the latter variable by the IFL (close to 0.7). But this effect is only temporary and fades out after one semester.

In terms of welfare, the IFL subsidies credit hence allows new households into the credit market. But it also feeds housing prices. It means that interest payments are higher than in a situation without IFL, because of the higher house prices on the one hand and the higher level of indebtedness on the other hand. The IFL has a net positive effect if the amount of zero-interest loan is higher than the IFL-induced increase in the amount borrowed. Our estimations point to a small but positive net effect of the IFL for eligible households. But non-eligible households also have to face the price increase. A sizeable portion of the economic surplus created by the policy is captured by sellers. Households selling their houses benefit from the higher valuation of their assets.

Further research could consider the role of banks in the transmission of the IFL subsidy. With interest rates data, it would be possible to test whether banks can capture part of the subsidy. With default history, we could test if subsidised loans are riskier than average loans. On the housing sector side, further research could assess the effect on homebuilders in zones where land is available. Indeed, the IFL favours new over existing housing. Home building is very interesting to favour economic activity. This sector is labour intensive, cannot be outsourced and uses inputs mostly locally produced. Construction data would allow testing how homebuilders benefit from the subsidy depending on land availability.

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Appendix

A.1. Prêt à Taux Zéro

Prêt à Taux Zéro : general framework

First-time buyers are defined as households that have not owned their residence during the last two years. Eligibility depends on the resources of the persons that will live in the residence, the number of persons to live in the residence and its location (see table A.1.1). Households' resources are measured by the sum of reference fiscal income of people that will live in the house, capped by 10% of the total cost of operation. The reference fiscal income (*revenu fiscal de référence*) is computed by fiscal administration using declared net income and capital gains for income taxes of the precedent year. Income and capital gains are increased by some exempted revenues, rebates or deductible charges. The cost of operation includes the costs of the house, the land, negotiation fees except registration fees (*acte notarié*), refurbishment costs, construction taxes and insurance costs.

The amount of the loan is the minimum of 20% of the cost of the operation and 50% of the amount of other loans used for the financing of this operation. The 20% of the cost of the operation are themselves capped by an amount function of the number of persons to live in the residence, location of the residence and its being new or existing. Maximum amounts are higher for new housing than for existing ones. One IFL only can be granted per operation.

# people	Zone A	Zones B and C
1	31 250 €	23 688 €
2	43 750 €	31 588 €
3	50 000 €	36 538 €
4	56 875 €	40 488 €
5 +	64 875 €	44 425 €

Table A.1.1 – Households' size and resources conditions for IFL eligibility 2005-2010

Source: Article R318-29 livre 3-1-VIII du code de la construction et de l'habitation, modifié par décret 2007-464 du 27/3/2007 - article 1 JORF, mars 2007.
Note: Two-person households buying in Zone A are eligible to IFL if their reference fiscal income is lower than 43 750 €.

The 2011 reform builds on former versions of the IFL while suppressing the fiscal deduction of housing loans interest and the possibility to separate the loan for the house and the land (Pass-Foncier). The two main characteristics of the 2011 reform are the suppression of any resource condition for eligibility and the increase of the maximum loan amount (see Table A.2.1). A penalty for housing with poor energetic performance is also created.

The 2011 version of the IFL has been heavily modified for 2012 by the reintroduction of resources conditions for eligibility[12], detailed in table A.1.2[13].

Prêt à Taux Zéro : successive reforms

Prêt à Taux Zéro reforms can shape its characteristics along three types of criteria, detailed for each reform in table A.1.4:

1. **Eligibility conditions**: the shares of the income distribution below the maximum income and how it varies with the ABC zones and the size of the household, existing or new housing eligible
2. **Loans financial characteristics for the borrower**: the share of the operation that can be funded by the IFL, the maximum amount of the IFL, how the loan has to be insured, its repayment scheme
3. **Loans financial characteristics for the bank**: the bank is compensated for the absence of interests by fiscal deductions indexed on a rate depending on the French bond rate

# people	Zone A	Zone B1	Zones B2 and C
1	43 500 €	30 500 €	26 500 €
2	60 900 €	42 700 €	37 100 €
3	73 950 €	51 850 €	45 050 €
4	87 000 €	61 000 €	53 000 €
5	100 050 €	70 150 €	60 950 €
6	113 100 €	79 300 €	68 900 €
7	126 150 €	88 450 €	76 850 €
8+	139 200 €	97 600 €	84 800 €

Table A.1.2 - Resources conditions for IFL eligibility in 2012

Source: JO 31/12/2011, décret 2011-2059 relatif aux prêts ne portant pas intérêt consentis pour financer la primo-accession à la propriété
Note: Households living in Zone A constituted by 2 persons are eligible to IFL if their reference fiscal income is lower than 60 900 €

Contrary to other tool based on the ABC areas such as rental investment policy, the IFL policy covers the whole territory, although with different conditions across zones. The highest are the tensions on the housing market, the less restrictive are the eligibility conditions based on income and the more generous is the tool. Making conditions an increasing function of the size of the household can be justified by two elements. This is a way to proxy the housing needs of each household, that do increase with household's size. This is also consistent with family policy.
Deciding to consider existing housing depends on whether the policy-maker wants to spur only home-ownership or also to favor construction. Opening to existing housing was done in 2005 and stopped in 2012. In France, the accent is generally put on housing construction deficit (500 000 housing units per year[14]). Hence, even when the tool is opened to both existing and new housing, subsidies are bigger for the latter type. This ensures credit-worthy demand for housing builders. For the period 2008-2011,

[12] Code de la construction et de l'habitation, partie législative, livre III, titre 1er, chapitre 10, section 1, article L31-10-3 modifié par loi n°2011-1977 du 28 décembre 2011.
[13] After this reform, resource conditions are further reinforced in December 2012. Further modifications are minor and focus mainly on energetic performance. A more important reform was implemented in end 2014.
[14] The last policy to spur building is names '*Objectifs 500 000'*, 'Objective 500 000'.

between 30 and 37% of operations funded by a IFL were for new housing (see table A.1.3)[15]. The 2009 reform and the emphasis it laid on new housing (both increase in maximum amounts and on the share of the operation that can be covered by the IFL) increased this share by 2.5 ppt the first year and 3.2 ppts the second year, even though conditions were less generous then. It was effective in raising the subsidy rate in each zone (see table A.1.5). For example, it increased by 11 ppts in zone A and 10 ppts in zone C.

The interest-free loan policy is not targeted at the poorest households. In 2009, the average income by tax home was 25 000 € considering both zones B and C and 30 000 € in zone A[16]. Considering the condition for a two-person household, households were eligible in 2009 until they made 146% of average income by tax home in zone A and 126% in zones B/C. In 2011, the average income by tax home was 33 000 € in zone A, 32 000€ in zone B1 and 26 000 € in zones B2 or C. In 2012, households were eligible until 185% of the average income in zone A, 133% in zone B1 and 143% in zone B2/C. Income eligibility conditions are thus not responsible for the sharp decrease of the number of IFL in 2012 but rather the restriction to new housing.

	2008	**2009**	**2010**	**2011**	**2012**
Average IFL	15 400€	21 810€	22 380€	25 000€	32 700€
New housing in IFL	30.7%	33.3%	36.5%	26.4%	99.5%
Average income	28 920€	30 120€	30 000€	35 400€	34 700€
IFL in operation cost	10.5%	14.6%	14.9%	13.6%	17.1%

Table A.1.3 - Summary statistics for the Prêt à Taux Zéro (IFL) between 2008 and 2012, on the whole territory.

Source: SGFGAS and authors' computations
Lecture: In 2008, the average IFL granted was 15 400€, the average borrower had an income of 28 920€ and its IFL accounted for 10.5% of its operation cost. 30.7% of transactions were for new housing.

We notice the 2009 reform on new housing was not homogenous across zones (table A.1.4). Before 2009, B and C zones received the same maximum amount but when doubling this amount for new housing, the policymakers have chosen to favor zone B over zone C. The former maximum amount was increased by 2.3% when in the latter zone the increase was only by 1.9% (83% of the increase in zone B). This can be understood in a cost management perspective, as zone C represented about 50% of transactions before the reform (2008, see table A.1.5).

The 2011 reform did not increase amounts homogenously neither. In zone A, with represented about 17% of IFLs in 2010, the maximum loan for existing housing increased by 70% and was almost doubled for new housing. In zone B1, with represented another 17% of IFLs in 2010, amounts were almost doubled for both existing and new housing. In zone B2 and C, the distinction between new and existing housing has been removed. By construction, the increase of the subvention is then much more important for existing than for new housing (about 80% for existing housing in both zones, 35% for new housing in zone B2 and 35% in zone C).

As the 2011 reform of the maximum amounts is combined with a reform of the constraints on the share of the operation costs that can be covered by the IFL its impact on the effective subsidy rate is not straightforward. Before 2011, the IFL parameters took into account the urban policy objective through the subsidy rate. Indeed, the maximum share of operation cost covered by the IFL was raised in tax-free zones and sensitive urban areas, both types of municipalities being considered as priorities. Since 2011, this parameter accounts rather for the energetic policy and varies across ABC zones. Consequently, the effective subsidy rate (tables A.1.3. A.1.4.) did not necessarily increase for all market segments. In zone C for example, the subsidy rate increased by more than 2 ppts for existing housing but sharply decreased

[15] In our database, about 25% of operations are in new housing. But this cannot be used to argue the IFL distorts operations towards new housing because IFL is targeted at first-time buyers and eligibility conditions are less restrictive for new housing.
[16] These data are not available for 2008 and not yet for 2012.

for new housing, as 76% of transactions could not benefit from the maximum subsidy because of energetic conditions (SGFGAS (2012)).

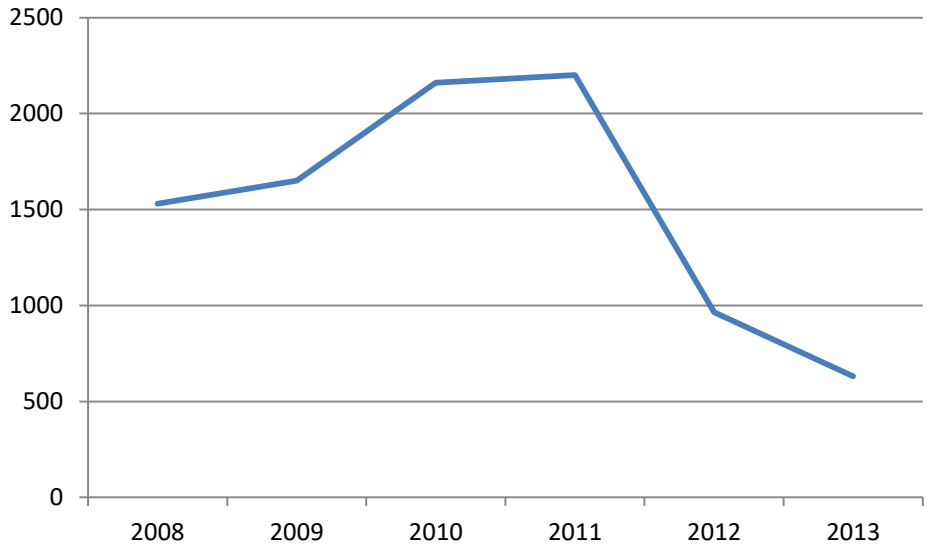

Figure A.1.1 – IFL subsidies (million €) Source: SGFGAS

IFL characteristics				2008	2009 - 2010h1	2010 h2	2011	2012-2014
Eligibility conditions	**Income condition:**		**A**	43 750 €			No condition	60 900 €
			B1	31 588 €				42 700 €
			B2					37 100 €
			C					
	Household size			The bigger is the household, the less restrictive eligibility conditions based on income are.				
	Housing type			Both new and existing housing are covered.				New housing (existing only social
Financial characteristics for the borrower	**Subsidy rate**	**Maximum share of operation cost**		20% 30 % for tax-free zones and sensitive urban areas	Existing: 20% - New: 30% In tax-free zones and sensitive urban areas : Existing: 30% - New: 40%		Existing: 20% New: between 25 and 40% according to ABC zones Lowered if energetic conditions not met	New: between 24 and 38% according to ABC zones Lowered if energetic conditions not met on new housing
		Max. share of amount of other loans		50%	50% for existing housing 100% for new housing		100%	
	Max. amount (E = existing, N = new)	**A**	**E**	101 250€	101 250€	101 250€	174 000€	
			N	112 500€	150 000€	112 500€	218 000€	
		B1	**E**	66 000€			130 000€	
			N	82 500€	126 500€	82 500€	164 000€	
		B2	**E**	66 000€			120 000€	
			N	82 500€	126 500€	82 500€		
		C	**E**	61 875€			111 000€	
			N	82 500€	103 000€	82 500€		
	Repayment schemes			The repayment scheme allows a deferred payment for a fraction of the loan that is decreasing in the household's income	The repayment scheme allows a deferred payment for a fraction of the loan that is decreasing in the household's income but increases with the ABC zone and is higher for new than for existing housing.			
Financial characteristics for the bank				Fiscal deductions compensate for the loss of earnings and its opportunity cost using a rate indexed on the French government bond rate.				

Table A.1.4 – Key points of each *Prêt à Taux Zéro reform*. Maximum amounts and income condition are for a two-person household.

Source: Code de la construction et de l'habitation
Lecture: In 2008, in zone A, two-person households were IFL eligible until an income of 43 750€ per year. The maximum amount they could be granted was 101 250€ for existing housing and 112 500€ for new housing. The IFL could not cover more than 50% of the amount of their other loans to finance the house or 20% or their operation cost.

			2008	2009	2010	2011	2012
A	New	% of transactions	2,0%	3,2%	3,3%	3,3%	14,5%
		Operation cost	204 275	207 090	214 490	242 107	237 882
		IFL size	22 051	45 210	46 650	72 930	72 922
		IFL share	10,8%	21,8%	21,7%	30,4%	31,2%
	Existing	% of transactions	14,8%	15,0%	13,4%	14,2%	0,1%
		Operation cost	183 182	184 340	192 480	222 771	166 526
		IFL size	19 057	19 290	19 150	27 521	15 573
		IFL share	10,4%	10,5%	9,9%	12,9%	9,6%
B1	New	% of transactions	7,1%	4,7%	5,3%	4,5%	17,5%
		Operation cost	164 350	170 590	177 930	206 417	199 986
		IFL size	17 987	39 380	40 480	45 499	45 586
		IFL share	11,0%	23,1%	22,8%	22,8%	23,4%
	Existing	% of transactions	27,4%	13,7%	12,1%	16,9%	0,1%
		Operation cost	135 352	144 420	148 390	179 890	111 086
		IFL size	12 734	12 770	12 440	22 289	10 670
		IFL share	9,4%	8,8%	13,3%	13,2%	9,8%
B2	New	% of transactions	B1 / B2 = B	5,1%	6,3%	4,2%	15,9%
		Operation cost		159 910	169 990	186 756	180 598
		IFL size		40 290	40 140	26 553	26 792
		IFL share		25,2%	23,6%	14,7%	15,2%
	Existing	% of transactions		13,2%	14,0%	16,1%	0,1%
		Operation cost		12 770	129 460	148 307	97 057
		IFL size		12 890	12 790	18 473	9 382
		IFL share		10,1%	9,9%	13,1%	9,8%
C	New	% of transactions	21,5%	20,2%	21,6%	14,5%	51,7%
		Operation cost	147 992	150 020	156 690	167 713	166 194
		IFL size	18 252	34 300	33 830	19 722	19 060
		IFL share	12,4%	22,9%	21,6%	12,2%	11,7%
	Existing	% of transactions	27,0%	24,8%	24,1%	26,3%	0,1%
		Operation cost	127 521	127 190	127 810	150 894	85 116
		IFL size	12 693	12 720	12 560	17 253	8 329
		IFL share	10,0%	10,0%	9,8%	12,0%	9,8%
Total	# IFL		211 478	216 503	286 256	351 932	79 116
	Operation cost		146 500	149 180	153 480	171 884	184 371
	IFL size		15 400	21 810	22 380	23 256	32 696
	IFL share		10,5%	14,6%	14,6%	14,0%	17,1%

Table A.1.5. - Summary statistics for the Prêt à Taux Zéro (IFL) between 2008 and 2012, by zone and for new or existing housing

Source: SGFGAS and authors' computations
Lecture: In 2008, existing housing in zone A represented 14.8% of transactions. In this market segment, the average operation cost was 183 182€ and the corresponding IFL 19 057€. The share of the IFL in the operation cost was 10.8%.

A.2. ZIP code sampling

IFL is defined at the municipality level, so we define borders between two IFL areas and adjacent units at the municipality level. Our data are available at the ZIP code level, but actually 6 000 ZIP-codes correspond to 36 000 municipalities. The problematic case we want to evict from our analysis sample is a ZIP-code containing municipalities from different IFL areas. So after defining bordering municipalities, we select the corresponding ZIP-codes and remove the ZIP-codes crossing IFL area borders from our sample (see figure A.2.1).

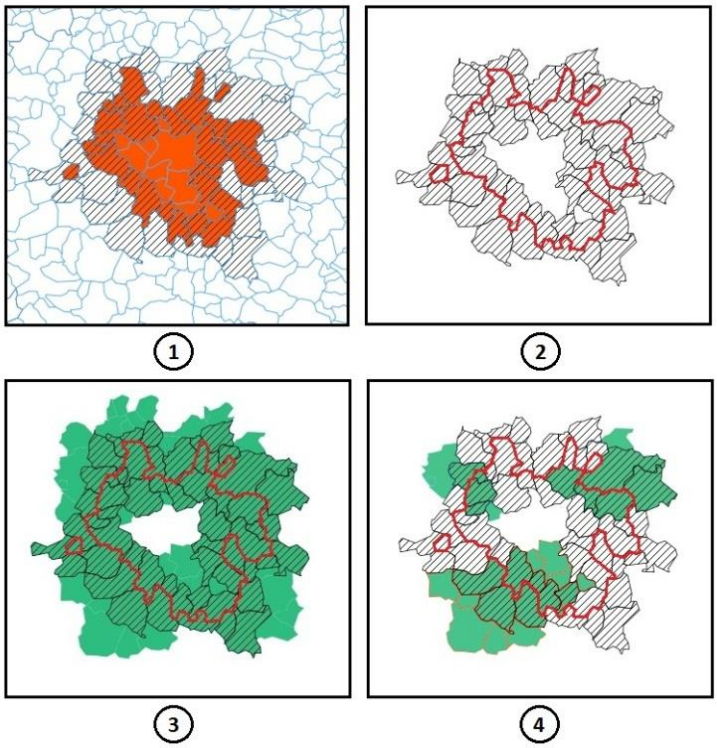

Figure A.2.1 - Definition of our ZIP-codes sample: example of Rennes area

Note: (1) we first delimit an urban area delimited by an IFL area border (in orange) and then select the municipalities on both sides of the border (hatched municipalities). We keep the bordering municipalities only (2) and then determine the ZIP codes associated (3). We finally remove all the ZIP codes crossing the IFL border (4) and only keep the ZIP codes in green in our sample.

Table A.2.1 shows selecting bordering ZIP-codes leads to keep almost half of ZIP-codes in areas B1 and B2, but only one fourth in areas A and C. As regards the number of operations (table 3), we keep about a quarter of them in areas B1 and C. We keep only around 16% of operations in area A but almost half of operations in area B2.

	A	B1	B2	C
Share of bordering municipalities	25%	45%	52%	21%
Share of operations in bordering municipalities	16%	31%	50%	26%

Table A.2.1 – Share of operations in bordering municipalities in the total available in whole territory

Note: On average, 25% of the municipalities from IFL area A are bordering ones, i.e. next to an IFL area border and 16% of operations in zone A take place in bordering municipalities.

A.3. Summary statistics

N= 117,614	Mean	Std.Dev.
Income difference	0.456	0.872
LTI	4.922	1.715
LTV	77.56	26.00
IFL amount	9.894	0.435
Existing housing	0.806	0.396
Couple	0.644	0.479
House price (log)	12.21	0.484
PD rating	1.634	0.822
Maturity at origination	19.59	5.995
Borrowers' age	36.26	9.600
Net real estate wealth (log)	3.722	5.551
Other wealth (log)	6.935	4.595

Table A.3.1 –Summary statistics, loan-level database
Note: On average, the loan-to-value is 78% and the loan has a maturity of 19.6 years at origination. Sample for estimation reported in table 5.

N = 7,242	Mean	Std.Dev.
House prices growth	0.0231	0.247
Credit size growth	0.0376	0.310
Credit volume growth	0.135	0.676
Nb of loans growth	0.0987	0.588
IFL grwoth	0.185	0.428
Down payment	0.214	0.144
Age	36.74	4.896
Income (log)	10.50	0.335
Average fiscal income (log)	10.13	0.222
Net real estate wealth (log)	9.585	3.826
Other wealth (log)	9.782	1.858
Couple	0.668	0.220
Existing housing	0.770	0.227

Table A.3.2 – Summary statistics for variables used in the estimation. *Sample for estimations reported in table 7.*

A.4. Housing prices in France, 1996-2014

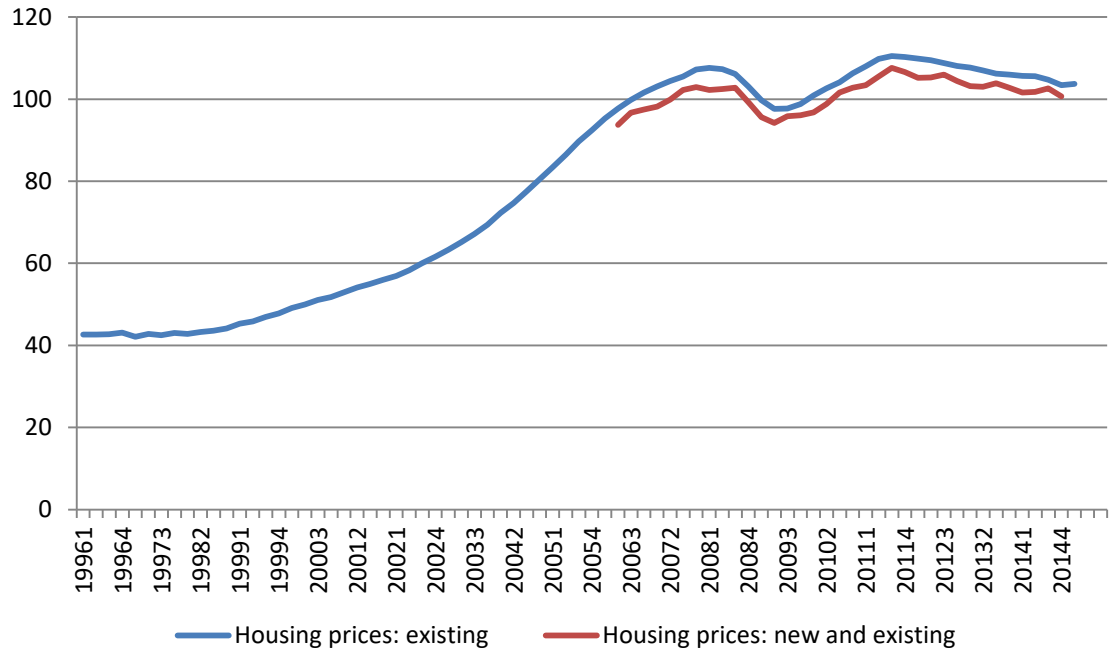

Figure A.4.1 – Housing prices in France, 1996-2014. Both series cover metropolitan France. The existing housing prices series is seasonally adjusted and uses 2010q1 as reference period. The existing and new housing series uses 2010 (annual average) as reference period. Source: INSEE.

A.5. Annual interest rate (%) on new housing loans to households, 2008-2012

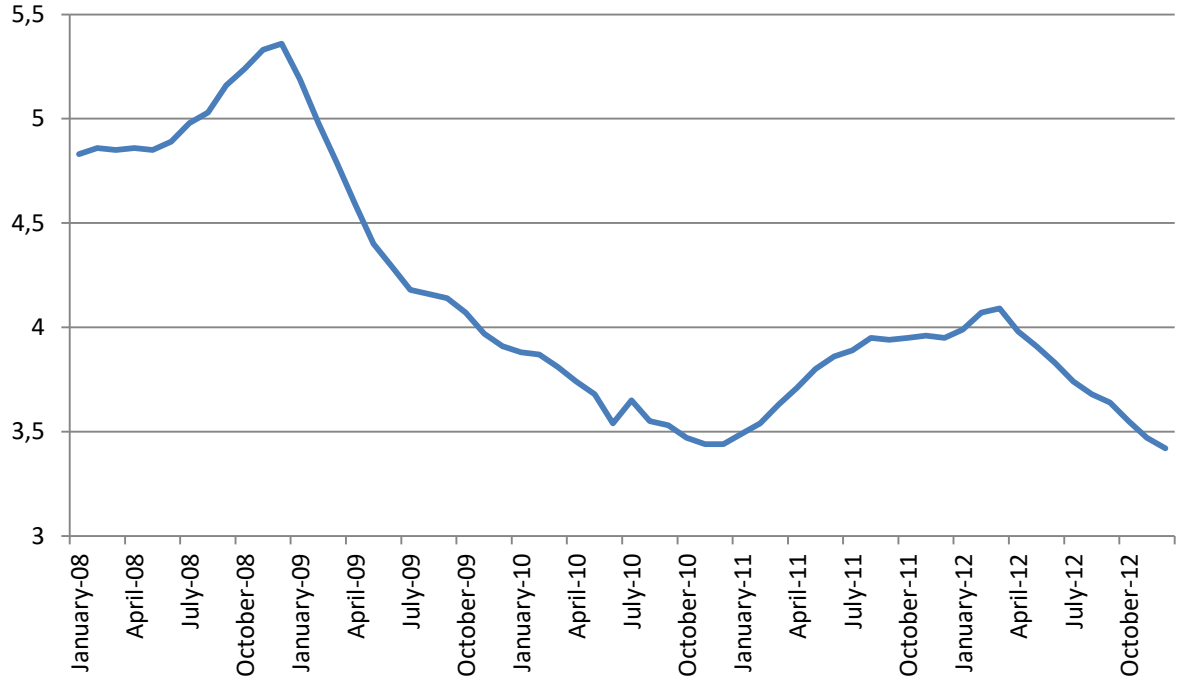

Figure A.5.1 – Annual interest rate (%) on new housing loans to households, 2008-2012. Source: Banque de France.

A.6. Estimations using *outside* ZIP-codes only

	(1) Income diff.	(2) LTI	(3) LTV
IFL amount	-0.128***	0.091***	0.841**
	(0.012)	(0.025)	(0.003)
Observations	60,898	60,898	60,898
R-square	0.323	0.282	0.446
ZIP-code FE	yes	yes	yes
EA*Time FE	no	no	no
Cluster	ZIP code	ZIP code	ZIP code
# ZIP code	1073	1073	1073

Table A.6.1 –Homeownership: reduced form using only *outside* ZIP-codes

*Note: The dependent variable is the income difference between borrowers and average household. Regressors are the loan-to-value ratio, the IFL amount, the borrowers' age, the aggregate interest rate, the borrowers' probability of default rating, the loan maturity at origination, the house price, the household wealth (net real estate wealth and other wealth, in logarithm), a dummy for existing housing and a dummy for the borrower being a couple. The sample includes all metropolitan France ZIP-codes bordering housing policy areas limits and outside of these limits, for which housing loans data are available for the period 2009-2011.. All regressions include ZIP code and employment area specific time fixed effects. Standard errors are clustered by ZIP code. Standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1).*

	(1) Credit volume	(2) Number of loans	(3) Average credit size	(4) House prices
IFL amount	0.289***	0.195***	0.075**	0.083***
	(0.074)	(0.066)	(0.032)	(0.031)
Observations	3,265	3,265	3,265	3,265
ZIP-code FE	yes	yes	yes	yes
EA*Time FE	yes	yes	yes	yes
Cluster	ZIP-code	ZIP-code	ZIP-code	ZIP-code
R2 within	0.106	0.0554	0.366	0.225
# ZIP code	685	685	685	685

Table A.6.2 –House prices and credit: reduced forms using only *outside* ZIP-codes

*Note: The dependent variable is the growth rate of house prices. Regressors are: the credit volume, the number of loans, the average credit size, the IFL amount, the share of existing housing in the ZIP-code, the down payment rate (relative to house value), the average borrowers' age and income (log), the average income of all households in the ZIP code (log) and the borrowers' wealth (net real estate wealth and other wealth) and the share of couple borrowers. The sample includes all metropolitan France ZIP-codes bordering housing policy areas limits and outside of these limits, for which housing loans data are available for the period 2009-2011. All regressions include ZIP code and employment area specific time fixed effects. Standard errors are clustered by ZIP code. Standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1).*