WORKING paper

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The Long-Term Impact of Housing Subsidies on the Rental Sector: the French Example

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ABSTRACT

In many countries, housing subsidies to tenants are one of the main tools for housing policy but have an inflationary impact in the short term. For the first time, by taking the French example, we assess the long-term impact of housing subsidies on price, quantity, and quality in the private rental sector. We show that housing subsidies have a long-term overall upward impact on rents, even for tenants who do not benefit from subsidies. This inflationary impact is accompanied by an increase in quantity; no impact on quality is detected. These effects are heterogeneous. For small dwellings, a few years after the extension of housing subsidies, rents stopped increasing significantly and the quantity of one-room dwellings, including new buildings, increased.[3]

Keywords: Public Policy Evaluation, Social Benefits, Housing Subsidies, Tax Incidence
JEL classification: H22, R21, R31

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NON-TECHNICAL SUMMARY

Housing subsidies are one of the main tools for housing policy in many developed countries. These subsidies aim to limit the budget share of housing for tenants and to improve their housing conditions for a given budget share. In theory, their introduction may result in an increasing aggregate demand for housing, and therefore rents, at least in the short term, when housing supply is considered as weakly elastic. Under these conditions, housing allowance would be partly captured by landlords. In the long run, rents and more generally the equilibrium depend on the elasticity of supply. The supply can increase in an extensive way by a growing number of dwellings or in an intensive way by their increased quality. Rental housing supply can, however, remain partly inelastic, for example if local authorities implement restrictive land use policies.

In many countries, several concordant empirical studies have already highlighted and measured the short-term inflationary impact of housing subsidies targeting tenants. The aim of this paper is to test the assumption of the inelasticity of rental housing supply by measuring the long-term impact of housing subsidies on rents, quantity, and quality of private rental dwellings by taking the French example.

To measure the long-term impact of housing subsidies, we compare similar agglomerations receiving higher or lower subsidies since the reform of housing subsidies in the 1990s, which strongly increased the number of beneficiaries. We find no significant impact of housing subsidies on rents in the 1980s, when the expenditure for housing benefit were lower, while we highlight that housing subsidies caused an increase in the rents in the two decades following the reform (from 1995 to 2016), with a stronger impact in the short run (in the 1995-1999 period). Between 2000 and 2016, we show that housing subsidies have an overall positive impact on rents, even for tenants who do not benefit from subsidies. This positive impact on rents holds with a constant magnitude when subdividing the 2000-2016 study period in two sub-periods (2000-2008 and 2009-2016). This inflationary impact is accompanied by an increase in the quantity of private rentals; no impact on quality is detected (see Table 1 for a summary of results).

Table 1. Effect of housing subsidies over the period 2000-2016 (unless otherwise specified) on rents, quality, and quantity: overall impact and impact for specific market segments

<table>
<tr><th>Effect of housing subsidies on</th><th>Rents</th><th>Quality</th><th>Quantity(*)</th></tr>
<tr><td>Overall impact</td><td>Significant over 2000-2016</td><td rowspan="4">Non-significant over 2000-2016</td><td>Significant in 2006</td></tr>
<tr><td rowspan="2">1 or 2 room dwellings</td><td rowspan="2">Non-significant over 2000-2016 (whereas significant over 1995-1999)</td><td>For one room dwellings: significant in 1999, 2006, and 2016; driven by new buildings</td></tr>
<tr><td>For two room dwellings: non-significant in 1999, 2006, or 2016</td></tr>
<tr><td>3 or more room dwellings</td><td>Significant over 2000-2016</td><td>Non-significant in 1999, 2006, or 2016</td></tr>
</table>

(*) Data allow to measure the impact on quantity only in 1999, 2006, and 2016.

We show that this long-term inflationary impact is heterogeneous and accompanied by different reactions on the housing market, depending on market segments. For dwellings with three or more rooms, the rental housing supply remained inelastic in quality and in quantity and higher housing subsidies led to a lasting increase of rents between 2000 and 2016. For one or two room dwellings on the contrary, rents stopped increasing significantly between 2000 and 2016 (after their rise between 1995 and 1999) and the quantity of private one-room rentals increased in 1999, 2006, and 2016, driven by new buildings. Our finding could be due to the entry of a greater number of students in housing markets where subsidies are higher. For small dwellings, the housing market responded to this increase of demand by an increase of supply in quantity. The supply of one-room rentals is probably the most elastic one, as landlords who opt for rental investment are more easily solvent to buy a small dwelling or prefer diversify their risks by buying several small dwellings if they are wealthy enough to do so.

L'impact à long terme des aides au logement sur le secteur locatif : l'exemple français

RÉSUMÉ

Dans de nombreux pays, les aides au logement versées aux locataires sont l'un des principaux outils de la politique du logement mais ont un impact inflationniste à court terme. Pour la première fois, en prenant l'exemple français, nous évaluons l'impact à long terme des aides au logement sur le prix, la quantité et la qualité dans le secteur locatif privé. Nous montrons que les aides au logement ont un impact global à la hausse sur les loyers à long terme, même pour les locataires qui ne bénéficient pas des subventions. Cet impact inflationniste s'accompagne d'une augmentation de la quantité de logements locatifs ; aucun impact sur la qualité n'est détecté. Ces effets sont hétérogènes. Pour les petits logements, quelques années après l'extension des aides, les loyers ont cessé d'augmenter significativement et la quantité de logements d'une pièce, y compris des nouvelles constructions, a augmenté.

Mots-clés : évaluation de politiques publiques, prestations sociales, aides au logement, incidence fiscale

1 Introduction

Housing subsidies are one of the main tools for housing policy in many developed countries. These subsidies aim to limit the budget share of housing for tenants and to improve their housing conditions for a given budget share. Economic theory predicts that their introduction may result in an increasing aggregate demand for housing, and therefore rents, at least in the short term, when housing supply is considered as little elastic. Under these conditions, housing allowance would be partly captured by landlords. In the long run, rents and more generally the equilibrium depend on the elasticity of supply. The supply can increase in an extensive way by a growing number of dwellings or in an intensive way by their increased quality. Rental housing supply can however remain partly inelastic, for example if local authorities implement restrictive land use policies (Gyourko and Molloy 2015).

The aim of this paper is to test the assumption of the inelasticity of rental housing supply by measuring the long-term impact of housing subsidies on rents, quantity, and quality of private rental dwellings by taking the French example. Indeed, in many countries, several concordant empirical studies have already highlighted and measured the short-term inflationary impact of housing subsidies targeting tenants.[1]

In the United States, Susin (2002) finds a positive impact of rent vouchers on rents for recipients but also for unsubsidized low-income households in 1993, at the end of a first period of increase in rent vouchers started in the early 1980s. More recently, Eriksen and Ross (2015) show that increases in the number of housing vouchers between 2000 and 2002 rise rents in 2003 not for the overall price of rental housing but for units with rents near the maximum voucher payment standard; they find largest price increases in cities with an inelastic housing supply. Still in the United States, Collinson and Ganong (2018) show that a national increase of one dollar in the rental assistance ceiling raises voucher rents by roughly 46 cents over the next six years with no commensurate improvements in housing or neighborhood quality.[2] In the United Kingdom similarly, Gibbons and Manning (2006) show that a reduction in housing benefits in 1996 and 1997 decreases rents until 2000 and that 60–66% of these benefits were captured by landlords. More recently, Braakmann and McDonald (2020) confirm this result by showing that major cuts to housing subsidies in England in 2011 lower property prices until 2013, predominantly for types of property typically rented by recipients of subsidies and in areas where demand for housing is low relative to supply. For Finland, using the 2001-2002 and 2005-2006 large changes in allowances, Viren (2013) shows that an additional one euro of allowance provided to low-income households in the private housing sector increases the following years the rent

[1] Subsidies can also target building suppliers. Molloy (2020) offers a detailed review of the effect of housing supply regulation on housing affordability in the United States; see Eriksen and Lang (2020) for an overview and proposed reforms of the low-income housing tax credit program. Besides, Eriksen and Rosenthal (2010) and Sinai and Waldfogel (2005) show that the impact of subsidized construction of low-income housing on the housing stock in the United States is limited, because this crowds out equivalent housing that otherwise would have been provided by the private sector. Anenberg and Kung (2020) present simulation-based evidence of the low elasticity of rent with respect to small changes in housing supply within metropolitan areas.

[2] See Ellen (2020) a review of impacts and limits of housing choice vouchers in the United States. McMillen and Singh (2020) show and analyze the impact of fair market rent, a key parameter in housing choice voucher program, on distribution of apartment rents in Los Angeles for 2007–2015.

of claimants between 33 and 50 cents until 2008, a lower impact than the one found by Kangasharju (2010) - 60-70 cents. In central Jerusalem, Sayag and Zussman (2020) find that rent subsidies provided to students between 2006 and 2011 led to a marked increase in the number of students renting apartments and a 20–30% increase in rent until 2012.

In France, Laferrère and Blanc (2004b) and Fack (2006) find a positive effect of housing subsidies on rents in the 1990s.[3] These two articles use the natural experiment provided by the reform of housing subsidies in the early 1990s, which aimed at increasing the number of beneficiaries from housing subsidies. Laferrère and Blanc (2004b) highlight that the significant impact of housing subsidies on rents is only slightly explained by an increase in dwelling quality, using the Rents and Charges survey between 1984 and 1999. Fack (2006) determines the impact of housing subsidies on rents for French low-income households. By comparing the evolution of rents for households belonging to the first quartile of standard of living and households belonging to the second one, the author finds that the reform of housing subsidies in the early 1990s led to an increase of rents that represented 78% of subsidies. She also finds that the rent increase does not appear to be due to increases in quality. Her results are established by applying a method of difference-in-differences and using the Housing survey between 1973 to 2002.

We offer here the first evaluation of the long-term impact of housing allowance on the French private housing market,[4] extending this way the results established by Laferrère and Blanc (2004b) and Fack (2006) about the short-term impact of the previously cited reform on the housing sector in the 1990s. Using data from 1984 to 2016, we find no significant impact on rents in the 1980s, when the expenditure for housing benefit were lower, while we highlight that tenant-based subsidies caused an increase in the rents in the next two decades (from 1995 to 2016, with a stronger impact in the 1995-1999 period). Between 2000 and 2016, we show that housing subsidies have an overall positive impact on rents, even for tenants who do not benefit from subsidies. This positive impact on rents holds with a constant magnitude when subdividing the study period 2000-2016 in sub-periods (2000-2008 and 2009-2016). We show that this inflationary impact is accompanied by an increase in the proportion of private rentals among primary homes; no impact on quality is detected.

Our main contribution is to reveal an heterogeneous elasticity of rental housing supply. For dwellings with three or more rooms, higher housing subsidies have led to an increase of rents and the rental housing supply has been inelastic. For one or two room dwellings on the contrary, rents have stopped increasing significantly and the quantity of private one-room rentals, including new buildings, has increased. This type of dwelling is actually more likely to be occupied by the beneficiaries of housing assistance, especially students. Laferrère and Blanc (2004a) show that the extension of housing allowance to students in the 1990s, regardless of their parents' income, allowed some of them to move out of the parental home. Our finding could be due to the entry into the housing market of a greater number of students looking for small dwellings. For this market segment of small dwellings, the housing market has responded to this increase of demand by an increase of supply. The supply of one-room rentals is probably the most elastic one when compared to other market segments. Indeed, landlords who opt for rental investment are more

[3] See Laferrère and Blanc (2002) and Fack (2005) for companion papers in French of these two articles.

[4] A former version in French draws initial basic and robust qualitative conclusions on the period 2005-2012 using the Rents and Charges survey (Grislain-Letremy and Trevien 2014).

easily solvent to buy a small dwelling or prefer diversify their risks by buying several small dwellings if they are wealthy enough to do so.

To measure the long-term impact of housing subsidies, we offer a new identification strategy. Our study is based on a fuzzy geographic discontinuity in the calculation of housing subsidies. In France, subsidies are approximately 15 to 40 euros per month higher in agglomerations of more than 100,000 inhabitants. This population threshold has not been strictly used to determine the zones with higher subsidies. Some agglomerations with less than 100,000 inhabitants can receive higher subsidies, but they have specific features. Thus, treatment, namely, receiving higher housing subsidies, is endogenous and we use as an instrument a dummy for agglomerations with more than 100,000 inhabitants. More precisely, we estimate a local average treatment effect of housing subsidy on rents in agglomerations relatively close to the discontinuity, that is between 50,000 and 180,000 inhabitants.[5] Given that we estimate our model on a small sample of agglomerations, we use two different surveys to obtain a sufficient number of observations, that are the Rents and Charges survey and the Housing survey, that we set together between 1984 and 2016. These data are supplemented with other numerous variables relative to municipalities.

Besides, to test the assumption of an impact on the rental housing supply in its extensive and intensive margins, we assess the effect of housing allowance on the quantity and the quality of private rentals.[6] We analyze the evolution of the share of the private rental sector (all rentals, furnished ones, one-room rentals, two-room rentals, three or more room rentals, and depending on the completion period) among primary homes. The housing quality as measured by our data is relatively detailed and includes in particular the dwelling surface, the number of rooms, the number of dwellings in the building, the building completion period, the type of dwelling (house or apartment), the presence of an elevator, furniture, running water, bathroom, bath, indoor toilets, garden, balcony, reinforced doors, safety device (alarm or monitoring), heating. Some of these characteristics can be easily improved by the landlord. These quality indicators do not however capture some other minor improvements such as painting or repairing.

The paper is organized as follows. Section 2 describes the French housing benefit policy and especially its spatial heterogeneity. Section 3 explains the empirical method. Section 4 presents the data. Section 5 details the results and Section 6 concludes.

2 Housing subsidy in France

In France as in many countries, public spending for housing aims to ease the burden of housing spending and to improve housing conditions. It targets either housing suppliers or consumers. The share of public spending for housing in the French GDP varies around

[5]The potential spillover effect from the treated area to the control one is here negligible because no geographic mobility (associated with high transaction costs) could be caused by the seeking out of slightly higher housing subsidies.

[6]We analyze here the impact on housing quality and not on neighborhood quality as no geographic mobility (associated with high transaction costs) could be caused by the seeking out of slightly higher housing subsidies. See Carlson et al. (2012) and Horn et al. (2014) for an estimation of the impact of low-income housing vouchers on neighborhood quality in the United States.

2% in the last three decades, for example 41.7 billions of euros in 2016.[7] Housing benefit accounts for half of the spending, namely 20.9 billions of euros in 2016. Housing subsidies to tenants constitute the most important tool, as they represent in 2016 16.7 billions of euros, of which 8.5 billions of euros for the private rental sector (CGDD 2017).

In France, housing policy had already started in the twentieth century. During the First World War, it mainly relied on rent control. In the 1920s, first building programs were launched but they were really deployed after the Second World War and the implied destruction and mostly under the pressure of baby boom and rural exodus. In parallel with the government funded constructions ("*Habitations à Loyers Modérés*"), direct allowances to tenants or landowners were introduced in the 1950. They were greatly expanded and increased in two stages, in the 1970s and 1990s (see Laferrere (2004) for a comprehensive history of housing policy in French).[8] The two pursued aims were to make demand solvent while supporting supply.

In particular, housing allowance to tenants, which was created in the post-war years, was massively extended since 1977. After this pivotal year in the French housing policy, public finance was directed in the favor of subsidies to households to the expense of building subsidies, which used to prevail. Consequently, the budget weight of subsidies to tenants has kept increasing since 1977,[9] mainly driven by the growing number of eligible tenants, as illustrated by Figures 1 and 2 in the private sector. Indeed, from the 1990s, all low-income households, including students, become eligible for housing subsidies, which were previously restricted to specific categories of households. In the privately-rented sector, the share of subsidized households rose from 27% in 1989 to 44% in 1998 and is almost constant since the 2000s (Figure 2).

Despite the rising spending allocated to housing subsidies since the 1990s, the proportion of household income devoted to rent by low-income tenants has continued to increase, in particular in the private rental sector, reaching for example in 2013 28% and more than 40% in the first quartile of standard of living (INSEE 2017). The rents have certainly increased - by 38% between 2000 first quarter and 2016 third quarter (INSEE 2017). However, despite the growing cost of housing subsidies, the share of housing subsidies in rents has decreased since 2004 (Figure 2), suggesting a potential incidence of housing subsidies on the level of the rents, among other factors such as rising real estate prices.

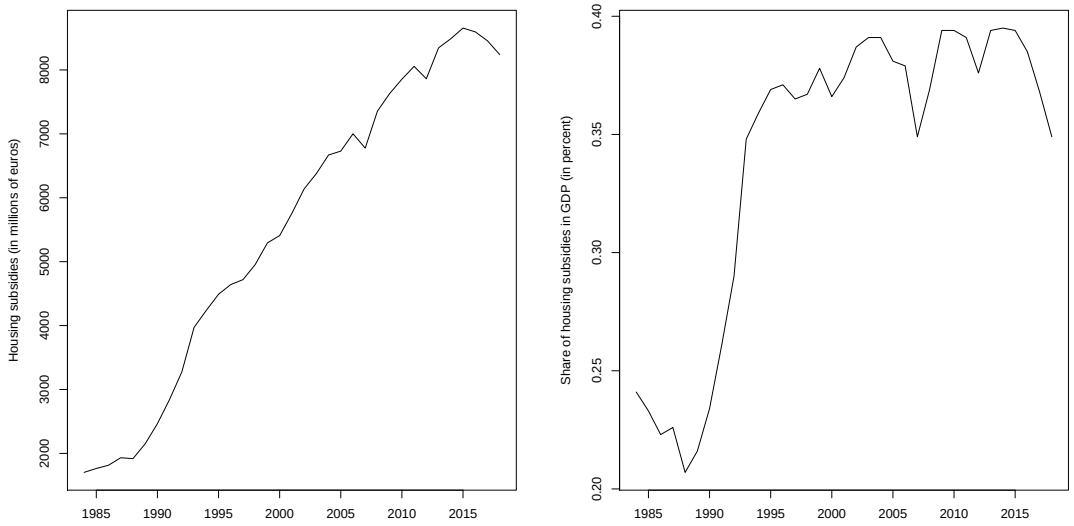
Three main housing subsidies target tenants: personal housing allowance ("*aide personnalisée au logement*", APL), mainly for social housing tenants; family housing allowance ("*allocation de logement familiale*", ALF); and social housing allowance ("*allocation de logement sociale*", ALS), given to students, childless couples, young, old or disabled people. Even though each subsidy is dedicated to some households or to some dwellings, their method of calculation is common since 2001. These subsidies benefit to

[7] We give here the data for 2016, which is the last year of the data we could exploit for econometrics. See Figure 1 for evolution from 1984 to 2018.

[8] Aid to landowners consist in fiscal advantages, such as deduction of loan interest from taxable income, capital gains tax exemptions for primary homes, interest free loan policy, or landlord subsidies for rental investment.

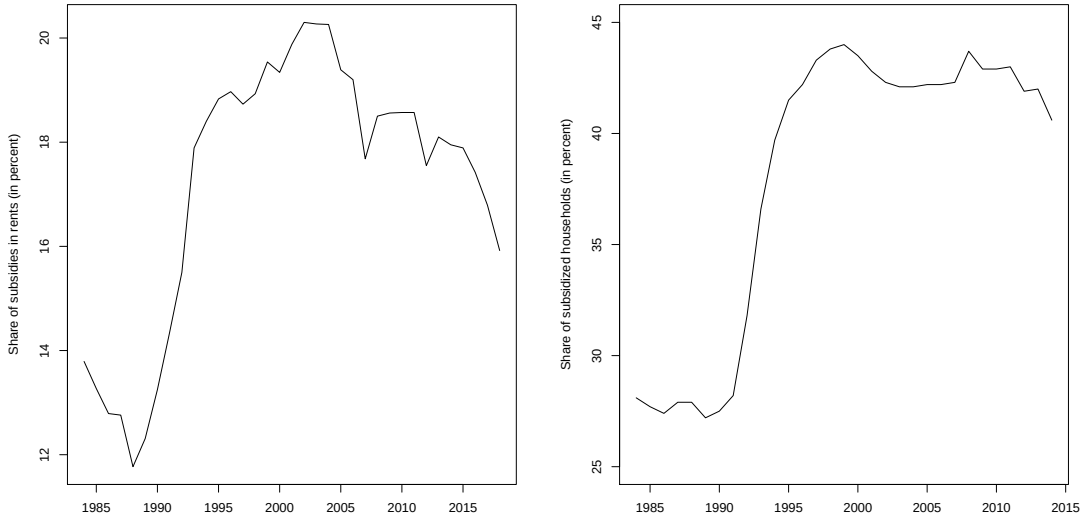
[9] To reduce the growing cost of housing subsidies (in the private and social sectors), in October 2017 was implemented a decrease of 5 euros for the three main housing subsidies target tenants. In 2018 the personal housing subsidy ("*aide personnalisée au logement*", APL) was decreased in the social sector concomitantly to the introduction of a solidarity rent reduction.

Figure 1: Housing subsidies to tenants in the private sector – amounts and weight in the GDP



Source: CGDD, Housing accounts, 2018

Figure 2: Share of housing subsidies in rents and share of subsidized households in the private rental sector



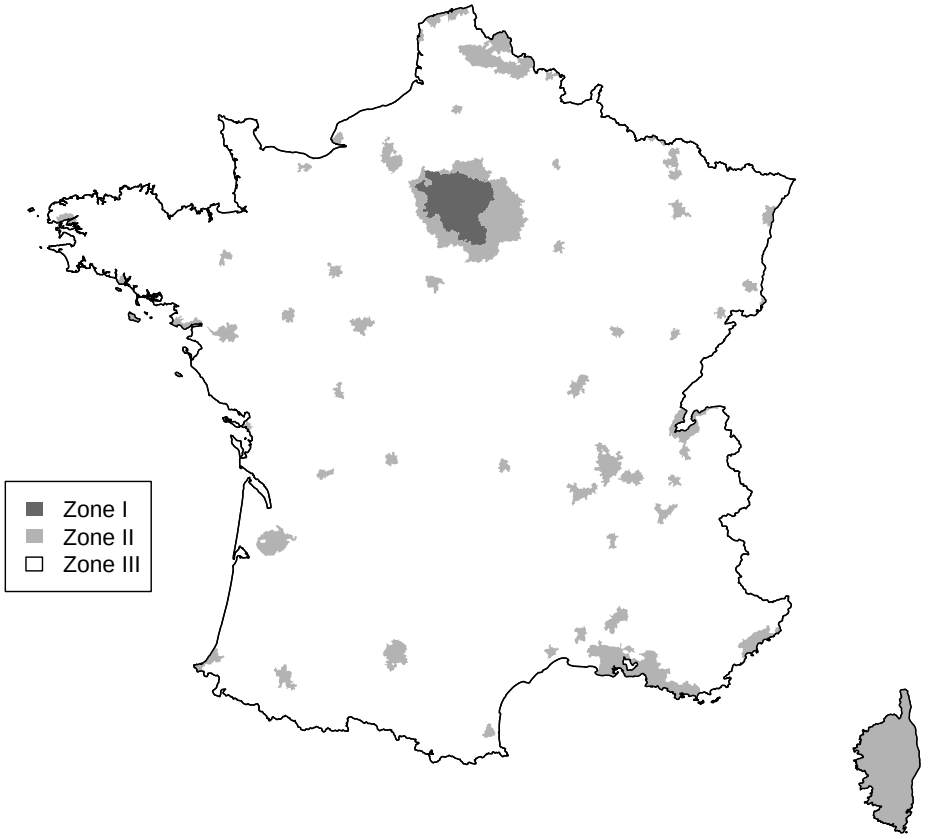
Source: CGDD, Housing accounts, 2014 and 2018

the tenants of social or private dwellings, to some homeowners with outstanding loans. The subsidies can be paid to the tenant or directly to the landlord. The calculation of the amount of housing subsidies, which is quite complex (Ministère de l'égalité des territoires et du Logement (2012) and Trannoy and Wasmer (2013), Box 12 pp. 51-52), takes into account household characteristics and resources, as well as, to a very limited extent, the rent level. The result of these different criteria is that there are more recipients among one-room private rentals than among other private rentals, likely because their income is much lower (Table 2).

The amount of subsidy also depends on the location in one of three zones. Zone I

comprises Paris agglomeration and the new towns in Paris region. Zone II comprises agglomerations of more than 100,000 inhabitants, fringes of Paris region, and some agglomerations with a specific housing market (especially tight, such as coastal or border zones, or especially depressed, such as areas affected by industrial decline). Zone III corresponds to the rest of the country (Figure 3). The amount of housing subsidies is higher in zone II than in zone III, all other things being equal. In zone I, the amount is even higher. This zoning was determined in 1977 and has been little modified since then, mainly for budgetary reasons. The difference in subsidies between the three zones is not constant and depends on the characteristics of the household. It amounts approximately from 15 to 40 euros per month between zone II and zone III (Table 1 for an example).

Figure 3: Housing subsidy zones in France



Source: authors' map.

Table 1: Example of housing subsidy amounts depending on location and income

Annual household income	0	5,000	10,000	15,000	20,000	25,000	30,000
Monthly subsidy in zone II	425	425	388	268	148	27	0
Monthly subsidy in zone III	398	398	361	244	126	0	0
Difference in monthly subsidy	27	27	27	24	22	27	0

Note: housing subsidy amount for a single-parent family with two children, for a monthly rent of 500 euros, according to the 2012 scheme. Authors' calculations.

Table 2: Share of housing subsidy recipients among tenants depending on housing type

Number of rooms	Percentage of recipients among tenants
One	71
Two	47
Three	40
Four	39
Five or more	35

Notes: households in our sample, i.e. located in agglomerations between 50,000 and 180,000 inhabitants. Sources: Rents and Charges survey, Housing survey.

3 Evaluation method

3.1 Evaluation strategy

Method. We apply a method of instrumental variable that relies on the link between the subsidy amount and the dwelling's location detailed in the previous section. We only use the discontinuity between the two last zones. Indeed, zone I includes the Paris region which is too specific to be compared with agglomerations of the other zones. On the contrary, we argue that there are relatively comparable agglomerations in zones II and III, that mainly differ by the amount of received subsidies. These agglomerations are the ones of which population is just below or just above the population limit between these two zones, i.e. 100,000 inhabitants.

Besides, other housing policies could not bias our estimation because the zoning for other housing subsidies, that are landlord subsidies for rental investment (in particular, the *Périsol*, *Scellier*, or *Pinel* programs, among several others) or interest free loan policy, both based on the same zoning, does not match with this housing subsidies zoning (Table 15 in Appendix A).[10] The zoning for the solidarity and urban renewal law, that imposes social housing and could so destabilize the private housing market, does not match either (Table 15 in Appendix A). Table 4 also confirms that the shares of the social rental housing in zones II and III are very close.

Finally, performing the estimation on previous periods confirms that the impact of location in zone II on housing markets is not due to the preexisting differences between

[10]Results are robust when including this zoning.

zone II and III housing markets (see Table 6 for the treatment impact on rents between 1984 and 1994 and Tables 10 to 13 for its impact on quantity in the market segments in 1990). As confirmed by placebo tests in Subsection 5.4, other thresholds at 50,000 or 200,000 inhabitants are non significant and a population trend (here the logarithm of the agglomeration population) is non significant either.

Comparing the agglomerations that are just below or just above the population limit between these two zones, i.e. 100,000 inhabitants, makes it possible to determine the impact of the payment of housing subsidies on the level of rents. As we compare here distant agglomerations, potential spillover effect from the treated area to the control one is likely negligible.[11] Besides, no geographic mobility (associated with high transaction costs) could be caused by the seeking out of slightly higher housing subsidies (the difference being of about 30 euros).

Population limit. The population limit of 100,000 inhabitants between zones II and III has not been strictly used to determine the outlines of the two zones, as some less populated agglomerations were included in zone II (Table 3).[12] In this framework, being located on one side or on the other side of the threshold modifies the probability to be assigned to zone II or III (and so to receive or not higher housing subsidies), without fully determining this assignment.

Zone delineation has not been modified much in the forty last years; in our sample, no zoning modification was performed after 1991. Consequently, treatment assignment does not rely on the present population but on the population in the 1970s. It thus can be considered as independent of recent demographic changes in the population of the metropolitan areas. However, agglomerations in which the housing subsidy zoning was modified between 1977 and 1991 are excluded; they represent 6% of the observations. Besides, agglomerations in border areas also are excluded, because they belong to a wider international metropolitan area, about which we have no information.

Agglomeration delineation. To our knowledge, the delineation of targeted areas refers neither to existing administrative nor to statistical zoning. Thus, we observe the exact border of the agglomeration only for the treatment group. We need to assess what this zone would have been in the control group to compare similar treated and untreated agglomerations and to provide unbiased estimates.

[11] This would not be the case for municipalities across a geographical border. For example, Bono and Trannoy (2019) estimate the impact of a rental investment subsidy scheme (the *Scellier* program) on building land prices by using the boundary between municipalities which are eligible for the Scellier scheme and municipalities which are not. However, they compare the evolution of building land prices for bordering municipalities between which real estate markets are potentially interdependent. This is why Chapelle et al. (2018) divide their treated and control areas into 1km-wide rings from the treatment boundary and drop the rings that present evidence of spillover effects.

[12] More precisely, in our sample, four types of municipalities with less than 100,000 inhabitants were included in zone II: some close to a large metropolis (Arles, Creil), some located in a coastal area (Menton - Monaco, Bastia), some located in a less-favoured area (in particular former mining areas) (Boulogne-sur-Mer, Calais, Montceau-les-Mines, Longwy, Armentières), and some located in a border area (Geneva - Annemasse, Cluses). Only these very last ones were excluded from our sample, because they belong to a wider international metropolitan area, about which we have no information. Indeed, Annemasse (Haute-Savoie) is fully part of the metropolitan area of Geneva; Cluses is only 45 km from Geneva, which enables its inhabitants to easily commute.

The French National Institute of Statistics and Economics Studies provides a delineation of *urban areas* (*"aires urbaines"*) that are similar to the metropolitan statistical areas in the United States. These urban areas are divided into a central part, called *urban unit* (*"unités urbaines"*), and a peripheral part.

We notice that the urban unit often coincides with the zone II for housing, the outskirts being classified in zone III. In fact, in treated urban areas, the urban unit correctly predicts the treatment assignment for 98,4% dwellings of our sample. Consequently, we use the urban unit as defined by the French National Institute of Statistics and Economics Studies in 2010 for the central part in the control group.[13] Figure 4 provides an example for the Valence agglomeration.

Thus, we define agglomerations as urban units, treated or not, and we compare them just below or just above the population limit of 100,000 inhabitants. All population variables at the agglomeration level, including the 100,000 inhabitants threshold, are computed according to this zoning of urban units.

Window. The treatment effect estimator δ is computed by using the rents of dwellings located in the agglomerations between 50,000 and 180,000 inhabitants (Figure 5). This window can be considered as wide but reducing it would lead to keep too few agglomerations in the estimations. Our sample represents 60 agglomerations, that is around 3% of the total number of agglomerations, and their population weights for 9% of the total French population in 2014 (in metropolitan France).

Descriptive statistics support the idea of relative similarity from both sides of the discontinuity. Even if the average rent per square meter is always higher in the treatment group, its level in each group does not increase with population, which suggests that there is no population trend in the rent level here (Table 3). Zones II and III have comparable shares of private or social rental housing and population trend (Table 4).

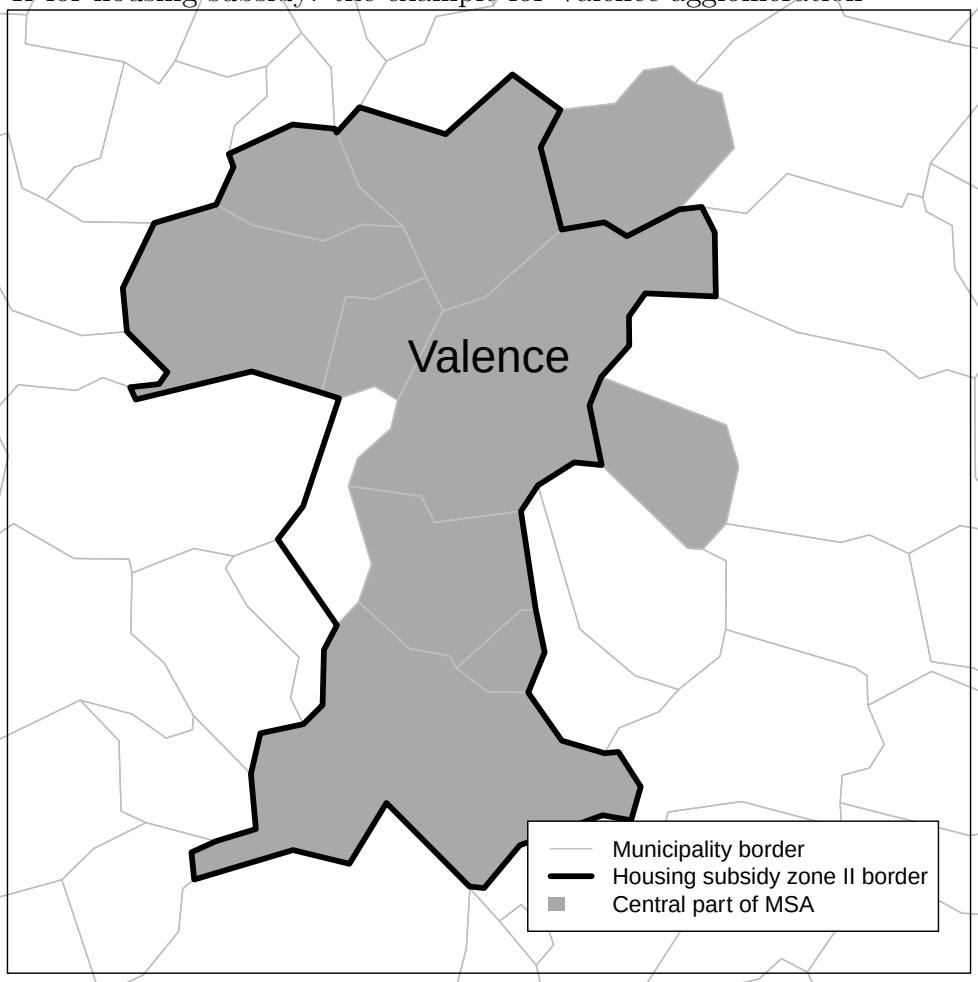
Additional tests confirm that results are robust when using wider or larger windows (Section 5.4). These robustness tests validate our identification strategy as the estimated impact is stable and does not consequently depend on the population size of the agglomeration on either side of the discontinuity.

Study period. The reform of housing subsidies took place in the early 1990s and its short-term impacts had been established by literature (Section 1) until the end of 1990s or the very early beginning of the 2000s. We focus here on the impact of housing subsidies over a long period. All regressions are established using data from 2000 to 2016, unless otherwise stated.

Model. We use the instrumental variable method in a standard linear hedonic model. We regress the logarithm of the rent per square meter R_{ijt} for each dwelling i, located in agglomeration j, whose tenants are interviewed at time t, on the treatment T_j (location

[13] We use the 2010 definition of urban units because we observe that is the one which provides the best prediction of the treatment assignment in our sample. We also tried two 1975 zonings from census, one defined in urban units and one defined in industrial or urban settlement areas. In treated urban areas, we use the central part as defined by housing policy makers (i.e., the part of the agglomeration where housing subsidies are higher).

Figure 4: Coincidence of the urban unit, that is the central part of the urban area, with the zone II for housing subsidy: the example for Valence agglomeration



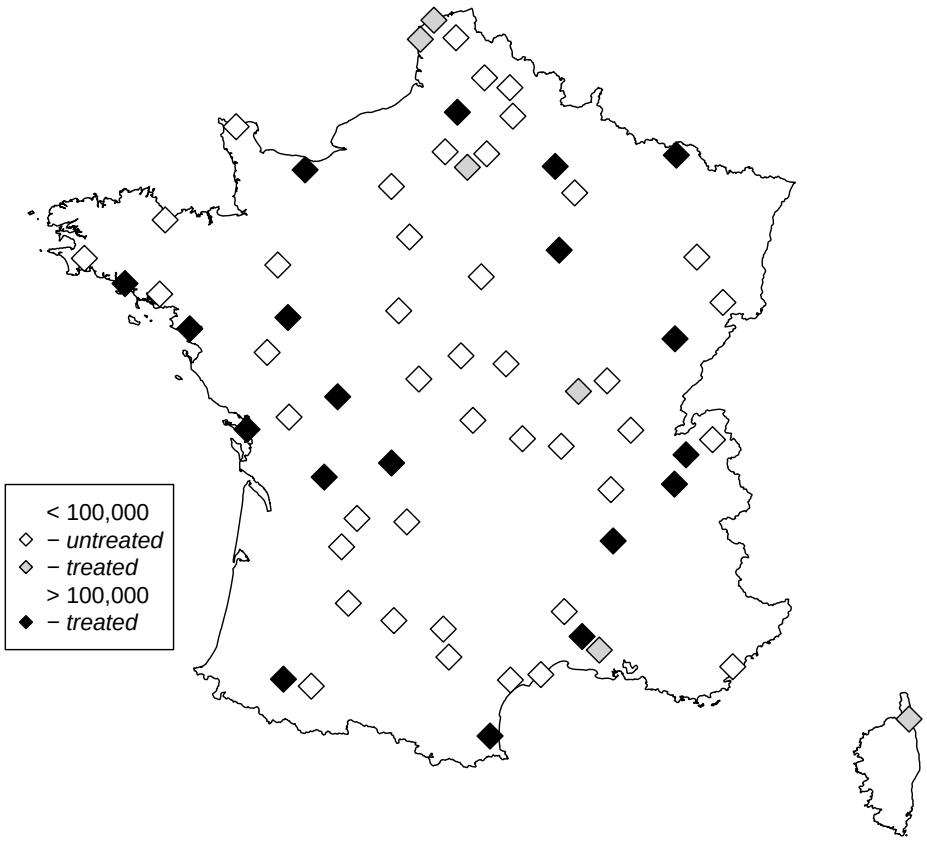
Note: The urban areas (*"aires urbaines"*) are similar to the metropolitan statistical areas (MSA) in the United States. An urban area is divided into a central part, called urban unit (*"unités urbaines"*), and a peripheral part. In treated urban areas, only the central part is classified in zone II. We use the urban unit as defined by the French National Institute of Statistics and Economics Studies in 2010 to predict the central part in the control group, here in Valence. Source: authors' map.

in zone II) and the characteristics X_{ij} of the dwelling.[14] X_{ij} comprises characteristics that are intrinsic to the dwelling (living area, completion year, etc.) and relative to its location (agglomeration population growth, municipal housing price per square meter, municipal share of rental housing, median fiscal income of the municipality, etc.).[15] We also add year fixed effects $\mathbb{1}_t$. Finally, we instrument the treatment T_j with the threshold $\underline{P_j}$ of 100,000 inhabitants, using a two stage least squares model.

[14] Results are robust when regressing the logarithm of the total rent.

[15] As unobservable variables could affect both the treatment and the rent, not only we instrument the location in zone II by the threshold of 100,000 inhabitants but we also test numerous geographic variables as control variables (Section 4).

Figure 5: Agglomerations used for estimations



Source: authors' map.

$$\begin{cases} T_j &= \eta \underline{P}_j + \gamma X_{ij} + \sum_t \theta_t \mathbb{1}_t + \nu_{ijt} \\ R_{ijt} &= \delta T_j + \beta X_{ij} + \sum_t \alpha_t \mathbb{1}_t + \epsilon_{ijt} \end{cases}$$

The threshold $\underline{P_j}$ of 100,000 inhabitants is relative to agglomeration size. As in our data observations are dwellings, residuals ϵ_{ijt} are clustered by agglomeration to take into account spatial autocorrelation of rents.

Similar regressions are performed at the dwelling level with quality variables as dependent variable. For regressions at the municipality level, the dependent variable is the proportion of private rentals among primary homes at a given time; regressions are performed with no year fixed effects and weighted by the number of primary homes.

4 Data

Given that we estimate our model on a small sample of agglomerations, we use two different surveys to obtain a sufficient number of observations, that are the Rents and Charges survey and the Housing survey. First, we use the Rents and Charges survey

Table 3: Frequency and average rent in function of the agglomeration population

Agglomeration population in 1975	Number of agglomerations		Rent per square meter	
	untreated (zone III)	treated (zone II)	untreated (zone III)	treated (zone II)
20,000-40,000	54	8	7.1	9.6
40,000-60,000	32	6	7.5	8
60,000-80,000	22	1	7.3	7.7
80,000-100,000	9	4	6.9	9.4
100,000-120,000	0	5	-	8.1
120,000-140,000	0	4	-	8.1
140,000-160,000	0	5	-	8.4
160,000-180,000	0	2	-	7.7
180,000-200,000	0	4	-	9.3
200,000-225,000	0	4	-	8.5
225,000-250,000	0	3	-	10.6
250,000-300,000	0	5	-	8.5

Source: Rents and Charges survey between 2000 and 2016.

Table 4: Population trend and shares of private and social housing in zones II and III – average value in percent by municipality

	Zone II	Zone III
Share of social rental housing 1982	19.5	20.2
Share of private rental housing 1982	27.9	30.2
Share of social rental housing 2014	19.6	20.6
Share of private rental housing 2014	26.9	30.4
Population growth 1982-2014	6.4	7.4

Sources: 1982 and 2014 Census, agglomerations between 50,000 and 180,000 inhabitants in our sample.

between 1987 and 2016 second quarter.[16] More than 4,000 households are questioned during five consecutive quarters and answer about their dwelling features, their renting conditions and the amount of their rents and charges.[17] Second, we use the Housing survey from 1984 to 2013.[18] Each four to seven years, more that 40,000 households are interviewed accurately about their own characteristics and the characteristics of their housing.[19] We set together the Rents and Charges survey and the Housing survey between

[16] In July 2016, the Rents and Charges survey was significantly modified. In France, there is for now no comprehensive recording of rents (contrary to dwellings sales, which are recorded by solicitors).

[17] We use the data collected during the last quarter as we are not interested in the variations between the following quarters but in the variations between more or less subsidized areas.

[18] More precisely, the 1984, 1988, 1992, 1996, 2002, 2006 and 2013 Housing Surveys.

[19] Given that we use different datasets corresponding to different years of two different surveys, we do not include survey weights in our regressions. However, we do not find significant differences between weighted and unweighted estimation using only the Rents and Charges survey.

1984 and 2016. To measure the dwelling quality, we use the following variables provided by both surveys: the dwelling surface, the number of rooms, the number of dwellings in the building, the building completion period, the type of dwelling (house or apartment), the presence of an elevator, furniture, running water, bathroom, bath, indoor toilets, garden, balcony, reinforced doors, safety device (alarm or monitoring), heating.

The characteristics of the dwellings at the municipality level are given by the population Census between 1982 and 2016:[20] the tenancy status (rented or not, distinguishing between private and public rentals), the type of dwelling (house or apartment), and characteristics of the dwelling (area, number of rooms, presence of a bathroom, furnished or empty rentals, completion period). These data enable us to measure the dwelling quantity at the municipal level.[21]

These data are supplemented with other variables relative to municipalities (coming from French Ministries of Housing, of Culture, Corine Land Cover, French National Geographic Institute, French fund for family allowances) : the zoning for housing subsidies, the median income in the municipality, the agglomeration population in 1975 and the population trends between 1975 and 2014, the share of open space in the land cover, as a proxy for natural amenities, the shares of social housing, vacant units, students, landowners, or the population density, and the average housing price. We also build the distance to the city center,[22] geographic variables suggested by Saiz (2010) such as standard deviation of the topography in the urban unit. We collect other variables such as average duration of annual sunshine, number of hotel rooms, of historical monuments, or of building permits. The aim of including those geographic control variables is to fully take into account the differences in local housing markets.

5 Results

5.1 A global and heterogeneous impact of housing subsidy zoning on rents

Housing subsidy zoning has a significant and positive impact on rents in the private sector. Location in zone II, where housing subsidies are higher, significantly increases the level of rents, which was already the case in an ordinary least square regression (Table 5). Adding then either variables that control for the dwelling quality or geographic control variables significantly reduces the effect of the treatment (Table 5), as instrumental method does not fully control for disparities between zones, which is expected when comparing cities of different size.[23]

[20] More precisely, the 1982, 1990, 1999, 2006, 2011, 2014 and 2016 Census. It is not possible to include previous census releases as social and private rental sectors are not distinguished before 1982.

[21] Census data provide only detailed information about primary homes. Indeed, harmonized data between censuses of different dates focus on primary homes. Besides, unharmonized available data on secondary homes consist in the number of secondary homes only, without key information such as the number of rooms.

[22] As the dwellings are located by municipality, this variable is built as the distance of the municipality center to the urban area center.

[23] All the numerous geographic variables listed in Section 4, including many characteristics of municipalities, have been tested as control variables; the regressions here presented include the set with the ones that were significant at least in one regression reproduced in the paper. The key geographic variables

Table 5: Effect of housing subsidy zoning on rents

Zone II for housing subsidies	0.096^{**}	0.05^{***}	0.115^{***}	0.074^{***}	0.05^{**}	0.052^{***}
	0.038	0.018	0.043	0.029	0.024	0.019
Number of rooms		0.07^{***}		0.074^{***}		0.07^{***}
		0.01		0.009		0.01
log(size)		-0.7^{***}		-0.724^{***}		-0.7^{***}
		0.029		0.027		0.029
House		0.019		0.022		0.019
		0.024		0.026		0.024
Tenancy duration		-0.006^{***}		-0.007^{***}		-0.006^{***}
		0.0009		0.0009		0.0009
Bathroom		0.059^{**}		0.053^{*}		0.059^{**}
		0.029		0.03		0.029
Bath		0.046^{***}		0.052^{***}		0.046^{***}
		0.011		0.011		0.011
Home safety device		0.111^{***}		0.108^{***}		0.111^{***}
		0.039		0.04		0.04
Elevator		0.036^{***}		0.046^{***}		0.036^{***}
		0.014		0.016		0.014
Without heating		-0.116^{***}		-0.086^{**}		-0.116^{***}
		0.038		0.042		0.038
Balcony		0.039^{***}		0.04^{***}		0.039^{***}
		0.012		0.012		0.012
Furnished dwelling		-0.101^{***}		-0.11^{***}		-0.101^{***}
		0.019		0.02		0.019
Garden		0.065^{***}		0.06^{***}		0.065^{***}
		0.023		0.022		0.023
Completion year $<$ 1949		-0.105^{***}		-0.123^{***}		-0.105^{***}
		0.016		0.018		0.016
Completion year 1949-1974		-0.119^{***}		-0.133^{***}		-0.119^{***}
		0.012		0.012		0.012
Completion year 1975-1990		-0.073^{***}		-0.082^{***}		-0.073^{***}
		0.025		0.024		0.025
Mun. housing price (K€per sqm)$_{2010}$		0.1^{***}			0.106^{***}	0.099^{***}
		0.031			0.032	0.031
Mun. share of PR in PH$_{2014}$		0.214^{*}			0.852^{***}	0.213^{*}
		0.112			0.171	0.113
Δ agglomeration pop.$_{1975-2014}$		0.071			0.21^{***}	0.072
		0.053			0.061	0.052
log(Median mun. income$_{2013}$)		0.103			0.545^{***}	0.105
		0.096			0.119	0.096
log(Mun. population density$_{2014}$)		-0.021			-0.026^{*}	-0.021
		0.013			0.014	0.013
Mun. share of PuHsg in PH$_{2014}$		0.453^{***}			1.127^{***}	0.453^{***}
		0.118			0.164	0.118
Observations	3967	3967	3967	3967	3967	3967
Agglomerations			60	60	60	60
Estimator	OLS	OLS	IV	IV	IV	IV

Notes: significance levels: *** 1%, ** 5%, * 10%. PR = private rentals; PH = primary homes; PuHsg = public housing. All regressions are run using the IV method and year fixed effects; standard errors are clustered by agglomeration. The regression does not include an intercept but keeps all year dummies. The dependent variable is the logarithm of the rent per square meter. The sample includes 3,967 privately rented dwellings located in 60 agglomerations with a population between 50,000 and 180,000 inhabitants. The time period extends from 2000 to 2016.
Sources: Rents and Charges survey, Housing survey, Population Census and other municipal data.

The impact of the housing subsidy zoning on rents is of important magnitude, as

that are municipal housing price per square meter and municipal shares of private rentals and of public housing in primary homes are potentially endogenous. Table 19 in Appendix B shows that they are not significantly explained by the location in zone II for housing subsidies.

location in zone II increases the rents by 5%. Given that the average rent is 454 euros in our study sample, it means that being located in zone II where monthly housing subsidy amounts are approximately from 15 to 40 euros higher increases the rent approximately by 20-25 euros.[24] This impact of important magnitude had already been evidenced in the context of a rapid increase in the total amount of aid during the 1990s (Fack 2006; Laferrère and Blanc 2004b). Our results show that the impact of higher housing subsidies is significant and stronger in the short run (1995-1999) and holds over a long period, that is between 2000 and 2016, and with a constant magnitude when subdividing this study period in sub-periods (2000-2008 and 2009-2016) (Table 6). These results suggest that rental housing supply remains partly inelastic.

Performing the estimation on previous periods confirms that the impact we find is only due to the preexisting differences between zone II and III housing markets. Indeed, before the rapid increase of housing subsidies in the early 1990s (Figures 1 and 2), the effect of the treatment is found to be not significant (between 1984 and 1994).

If no geographic mobility (associated with high transaction costs) could be caused by the seeking out of slightly higher housing subsidies, the number of recipients in zone II is likely to be slightly higher than in zone III, since for some income levels it is possible to receive (a low amount of) subsidies in the former zone and not in the latter, all other characteristics being equal (Table 1). This scale effect is probably too small to be detected here, as housing subsidy zoning has no significant impact on the share of housing recipients in 2016 (Table 18 in Appendix B).[25] Thus, housing subsidies have a significant impact on the intensive margin, the level of rents, but no detectable effect on the extensive margin, the share of recipients.

The instrumental variable method relies on a first stage equation, which explains the treatment (being located in zone II for housing subsidies) with respect to the location in an agglomeration of more than 100,000 inhabitants. The threshold of 100,000 inhabitants significantly explains the treatment (Table 16 in Appendix B); indeed, it is the main predictor for location in zone II for housing subsidies. Besides, the F-test of joint nullity of coefficients in this first step equals 144, which guarantees that the threshold of 100,000 inhabitants is not a weak instrument.

‘

[24] We cannot quantify this impact more precisely, as our data provide neither a reliable housing subsidy amount nor information, such as income or family composition, that would enable to compute this amount.

[25] This regression is performed in 2016 only, because data on the number of recipients are not available in 1990, 1999, or 2006.

Table 6: Effect of housing subsidy zoning on rents during different periods

Zone II for housing subsidies	0.038	0.074***	0.058**	0.05**
	0.034	0.027	0.029	0.022
Number of rooms	0.091***	0.084***	0.084***	0.059***
	0.018	0.013	0.016	0.01
log(size)	−0.765***	−0.728***	−0.784***	−0.624***
	0.04	0.038	0.048	0.023
House	0.064	0.023	−0.014	0.039**
	0.086	0.028	0.053	0.018
Tenancy duration	−0.021***	−0.019***	−0.004***	−0.011***
	0.003	0.002	0.0009	0.001
Bathroom	−0.079***	0.052*	0.5***	0.04*
	0.03	0.028	0.176	0.022
Bath	0.167**	0.073**	0.052***	0.033**
	0.066	0.03	0.016	0.014
Home safety device	−0.158	−0.061	0.147**	0.097**
	0.29	0.094	0.069	0.045
Elevator	0.0008	0.054***	0.046**	0.031**
	0.039	0.018	0.022	0.014
Without heating	−0.135***	−0.149***	−0.099**	−0.084**
	0.051	0.033	0.042	0.043
Balcony	0.062*	−0.002	0.045*	0.04***
	0.034	0.015	0.026	0.013
Furnished dwelling	−0.093**	−0.057*	−0.092***	−0.065
	0.038	0.03	0.019	0.099
Garden	0.02	0.065***	0.089*	0.052***
	0.028	0.024	0.05	0.012
Completion year < 1949	−0.174***	−0.161***	−0.131***	−0.071***
	0.061	0.023	0.025	0.015
Completion year 1949-1974	−0.123**	−0.111***	−0.161***	−0.077***
	0.053	0.022	0.022	0.012
Completion year 1975-1990	−0.089	−0.017	−0.13**	−0.031*
	0.066	0.031	0.053	0.016
Mun. housing price (K€per sqm)$_{2010}$	0.082**	0.117***	0.065	0.132***
	0.035	0.018	0.049	0.026
Δ agglomeration pop.$_{1975-2014}$	0.269***	0.023	0.049	0.121*
	0.096	0.079	0.069	0.069
Mun. share of PR in PH$_{1982}$	0.149			
	0.306			
Mun. share of PuHsg in PH$_{1982}$	0.405**			
	0.172			
log(Median mun. income$_{2002}$)	0.142	0.088		
	0.129	0.091		
log(Mun. population density$_{1982}$)	0.006			
	0.016			
Mun. share of PR in PH$_{1999}$		0.092		
		0.162		
Mun. share of PuHsg in PH$_{1999}$		0.283**		
		0.129		
log(Mun. population density$_{1999}$)		−0.023*		
		0.012		
Mun. share of PR in PH$_{2014}$			0.155	0.151
			0.16	0.152
log(Median mun. income$_{2013}$)			0.208*	−0.018
			0.112	0.142
log(Mun. population density$_{2014}$)			−0.006	−0.023**
			0.023	0.01
Mun. share of PuHsg in PH$_{2014}$			0.279*	0.516***
			0.148	0.148
Observations	1053	1523	1747	2220
Agglomerations	42	42	55	59
Period	1984-1994	1995-1999	2000-2008	2009-2016

Notes: significance levels: *** 1%, ** 5%, * 10%. PR = private rentals; PH = primary homes; PuHsg = public housing. All regressions are run using the IV method and year fixed effects; standard errors are clustered by agglomeration. The regression does not include an intercept but keeps all year dummies. The dependent variable is the logarithm of the rent per square meter. The samples include privately rented dwellings.

Sources: Rents and Charges survey, Housing Survey, Population Census and other municipal data.

Treatment heterogeneity. We find that the raise in rents is equivalent among housing subsidy recipients and among households who do not receive the allowance (Table 7).[26] Given the standard errors, the differences in magnitude of the treatment effect are not significant. The impact among households who do not receive the allowance is important in itself and is in line with the finding of Susin (2002) in the United States. In France, the private rental sector is quite competitive and the rent could be set without legal constraint at the tenant's arrival, until 2012. However, the annual rent increase is controlled, once the tenant moved in. Substantial rises in rents should thus occur at the start of the tenancy. Considering that more of 40 percent of private sector tenants are subsidized (Figure 2), a landlord looking for a tenant is likely to receive applications from subsidized households. Thus, he might demand for a rent taking into account the level of the housing subsidy, before knowing whether the tenant benefits from housing allowance. All in all, this policy increases the willingness to pay of a large part of tenants and might consequently increase the equilibrium rent of all dwellings, including those that are not occupied by subsidy recipients.

The impact of location in zone II on rents is also highly heterogeneous depending on the housing characteristics (Table 8). The treatment is significant for apartments.[27] Interestingly, the treatment is also more significant for the dwellings with three or more rooms than for one or two-room dwellings,[28] whereas the impact of housing subsidies on rents was particularly important for one or two-room dwellings between 1995 and 1999 (Table 17 in Appendix B). One or two-room dwellings are likely occupied by young couples, single workers, or students. On a short-term period (until 2002) following the 1990s reform, Fack (2006) finds comparable impacts of housing subsidies on rents when running regressions on data including or excluding students and shows that the students newcomers have contributed to the rent increase in the areas where they have moved in.

[26] Because of the size of the subsamples, we cannot estimate the impact on rents or on quality depending on the tightness of housing market, that is when restricting the sample to agglomerations with at least a given population growth.

[27] Regarding houses, it is difficult to conclude about the treatment significance because the sample is much smaller. Besides, given the standard errors, the differences in magnitude of the treatment effect between apartments and houses are not significant.

[28] Because of the size of the subsamples, we cannot estimate the impact on rents or on quality for dwellings with a specific number of rooms.

Table 7: Effect of housing subsidy zoning on rents – Treatment heterogeneity depending on recipients characteristics

Subsamples	Housing subsidy recipients	
	No	Yes
Zone II for housing subsidies	0.055^{**}	0.052^{***}
	0.025	0.018
Number of rooms	0.074^{***}	0.065^{***}
	0.016	0.007
log(size)	-0.683^{***}	-0.722^{***}
	0.046	0.019
House	-0.018	0.052^{***}
	0.042	0.015
Tenancy duration	-0.008^{***}	-0.005^{***}
	0.001	0.001
Bathroom	0.078^{**}	0.042^{*}
	0.039	0.025
Bath	0.061^{***}	0.033^{**}
	0.015	0.013
Home safety device	0.092^{**}	0.117^{*}
	0.046	0.064
Elevator	0.05^{**}	0.007
	0.02	0.014
Without heating	-0.172^{***}	-0.066
	0.058	0.041
Balcony	0.033^{*}	0.04^{***}
	0.019	0.01
Furnished dwelling	-0.129^{***}	-0.088^{***}
	0.031	0.02
Garden	0.087^{**}	0.042^{***}
	0.042	0.013
Completion year $<$ 1949	-0.11^{***}	-0.083^{***}
	0.02	0.019
Completion year 1949-1974	-0.129^{***}	-0.085^{***}
	0.014	0.016
Completion year 1975-1990	-0.095^{***}	-0.036
	0.035	0.023
Mun. housing price (K€per sqm)$_{2010}$	0.087^{*}	0.101^{***}
	0.051	0.019
Mun. share of PR in PH$_{2014}$	0.366^{**}	-0.034
	0.152	0.111
Δ agglomeration pop.$_{1975-2014}$	0.078	0.088
	0.07	0.056
log(Median mun. income$_{2013}$)	0.116	0.077
	0.138	0.097
log(Mun. population density$_{2014}$)	-0.026	-0.014^{*}
	0.018	0.008
Mun. share of PuHsg in PH$_{2014}$	0.457^{***}	0.401^{***}
	0.159	0.111
Observations	2149	1818
Agglomerations	60	60

Notes: significance levels: *** 1%, ** 5%, * 10%. PR = private rentals; PH = primary homes; PuHsg = public housing. All regressions are run using the IV method and year fixed effects; standard errors are clustered by agglomeration. The regression does not include an intercept but keeps all year dummies. The dependent variable is the logarithm of the rent per square meter. The full sample includes 3,967 privately rented dwellings located in 60 agglomerations with a population between 50,000 and 180,000 inhabitants. The time period extends from 2000 to 2016.

Sources: Rents and Charges survey, Housing survey, Population Census and other municipal data.

Table 8: Effect of housing subsidy zoning on rents – Treatment heterogeneity depending on housing type

Subsamples	≤2 rooms	≥3 rooms	House	Apartment
Zone II for housing subsidies	0.041^{*}	0.057^{**}	0.095^{*}	0.043^{**}
	0.021	0.023	0.056	0.018
Number of rooms			0.089^{***}	0.06^{***}
			0.026	0.007
log(size)	-0.643^{***}	-0.563^{***}	-0.783^{***}	-0.676^{***}
	0.021	0.025	0.09	0.019
House	-0.007	0.026		
	0.032	0.033		
Tenancy duration	-0.004^{***}	-0.008^{***}	-0.013^{***}	-0.004^{***}
	0.001	0.001	0.003	0.0008
Bathroom	0.088^{**}	0.064^{**}	0.127^{**}	0.021
	0.043	0.033	0.062	0.023
Bath	0.025^{*}	0.072^{***}	0.057^{*}	0.037^{***}
	0.014	0.017	0.032	0.012
Home safety device	0.135^{***}	0.081^{*}	0.016	0.161^{***}
	0.043	0.049	0.071	0.05
Elevator	0.024^{*}	0.043^{**}		0.045^{***}
	0.013	0.02		0.011
Without heating	-0.091^{**}	-0.166^{**}	-0.168^{*}	-0.075^{**}
	0.035	0.07	0.096	0.033
Balcony	0.033^{***}	0.049^{***}	0.096^{***}	0.02^{**}
	0.012	0.017	0.035	0.01
Furnished dwelling	-0.079^{***}	-0.129^{***}	-0.141^{**}	-0.09^{***}
	0.022	0.031	0.068	0.018
Garden	0.004	0.103^{***}	0.111^{*}	0.04^{**}
	0.025	0.04	0.064	0.017
Completion year < 1949	-0.088^{***}	-0.117^{***}	-0.156^{***}	-0.083^{***}
	0.022	0.019	0.032	0.019
Completion year 1949-1974	-0.099^{***}	-0.126^{***}	-0.12^{***}	-0.118^{***}
	0.017	0.015	0.03	0.013
Completion year 1975-1990	-0.034^{*}	-0.115^{**}	-0.137	-0.056^{***}
	0.02	0.045	0.083	0.016
Mun. housing price (K€per sqm)$_{2010}$	0.158^{***}	0.059	-0.01	0.145^{***}
	0.03	0.044	0.091	0.023
Mun. share of PR in PH$_{2014}$	0.103	0.288^{**}	0.538^{**}	0.031
	0.191	0.132	0.262	0.12
Δ agglomeration pop.$_{1975-2014}$	0.073	0.086	-0.014	0.068
	0.077	0.06	0.178	0.067
log(Median mun. income$_{2013}$)	-0.148	0.232^{**}	0.279	-0.023
	0.127	0.102	0.242	0.093
log(Mun. population density$_{2014}$)	-0.026^{**}	-0.01	-0.029^{*}	-0.015
	0.011	0.018	0.016	0.014
Mun. share of PuHsg in PH$_{2014}$	0.546^{***}	0.398^{***}	0.379^{*}	0.422^{***}
	0.14	0.145	0.206	0.127
Observations	1725	2242	982	2985
Agglomerations	60	60	58	60

Notes: significance levels: *** 1%, ** 5%, * 10%. PR = private rentals; PH = primary homes; PuHsg = public housing. All regressions are run using the IV method and year fixed effects; standard errors are clustered by agglomeration. The regression does not include an intercept but keeps all year dummies. The dependent variable is the logarithm of the rent per square meter. The full sample includes 3,967 privately rented dwellings located in 60 agglomerations with a population between 50,000 and 180,000 inhabitants. The time period extends from 2000 to 2016.

Sources: Rents and Charges survey, Housing survey, Population Census and other municipal data.

5.2 An heterogeneous impact on housing quantity

A demand subsidy should lead not only to an increase in rents but also to an increase in the number of rental dwellings or in the quality of dwellings, unless rental housing supply is fully inelastic. When using data at the municipality level, we measure the impact of higher housing subsidies on the size of the private rental housing sector.[29] The housing subsidy zoning has a significant but heterogeneous impact on the proportion of private rentals among primary homes in 2016, depending on the considered market segments in terms of housing types (Table 9). Indeed, we do find a significant treatment impact on the shares, among primary homes, of private furnished rentals and private one-room rentals. The treatment impact on the share of more spacious dwellings is not significant (Table 9). This suggests that private local housing markets in zone II experienced a quantity shift, in particular toward furnished rentals and one-room rentals.

The share of all private rentals among primary homes has significantly increased in 2006 and 2016 (but is statistically significant in 2016 at the 0.1 level only (Table 10)). Among private rentals, the significant shift in the quantity of private furnished rentals had already started in 1999. At first thought, one might think that empty rented dwellings have been furnished by their owners, which is easier than building a new dwelling. However, there is no reallocation of unfurnished dwellings to offer additional furnished ones, as there is no negative significant treatment impact on the quantity of private unfurnished rentals (Table 11). Thus, the increase of furnished dwellings is likely due to the increase of private one-room rentals, most of them being furnished.

[29] The instrumental variable method relies on a first stage equation, which explains the treatment (being located in zone II for housing subsidies) with respect to the location in an agglomeration of more than 100,000 inhabitants. The threshold of 100,000 inhabitants significantly explains the treatment (Table 20 in Appendix B).

Table 9: Effect of housing subsidy zoning on the private rental sector in 2016 at the municipality level – Treatment heterogeneity depending on housing type

Dependent variables	Proportion among primary homes in 2016 of private rentals					
	total	furnished	unfurnished	1 room	2 room	≥3 room
Zone II for housing subsidies	0.022^{*}	0.013^{***}	0.01	0.016^{***}	0.01^{*}	-0.003
	0.012	0.004	0.009	0.006	0.005	0.005
(Intercept)	1.204^{***}	-0.053	1.424^{***}	0.293^{*}	0.32^{*}	0.959^{***}
	0.398	0.117	0.334	0.159	0.188	0.272
Mun. housing price (K€per sqm)$_{2010}$	0.001	0.006	-0.005	0.007^{*}	0.003	-0.007^{**}
	0.008	0.004	0.006	0.004	0.003	0.004
Δ agglomeration pop.$_{1975-2014}$	0.033	0.004	0.036^{**}	-0.003	0.029^{***}	0.009
	0.022	0.008	0.016	0.01	0.011	0.009
log(Median mun. income$_{2013}$)	-0.12^{***}	0.002	-0.139^{***}	-0.033^{**}	-0.035^{*}	-0.088^{***}
	0.04	0.012	0.034	0.016	0.019	0.027
log(Mun. population density$_{2014}$)	0.011^{**}	0.004^{**}	0.008^{**}	0.002	0.007^{***}	0.002
	0.005	0.002	0.004	0.002	0.002	0.002
Mun. share of PuHsg in PH$_{1982}$	0.001	0.045^{***}	-0.052^{*}	0.053^{***}	0.02	-0.1^{***}
	0.037	0.017	0.029	0.02	0.016	0.019
Mun. share of PR in PH$_{1982}$	0.616^{***}					
	0.049					
Mun. share of furnished PR in PH$_{1982}$		0.96^{***}				
		0.164				
Mun. share of unfurnished PR in PH$_{1982}$			0.558^{***}			
			0.041			
Mun. share of 1 room PR in PH$_{1982}$				0.725^{***}		
				0.091		
Mun. share of 2 room PR in PH$_{1982}$					0.72^{***}	
					0.065	
Mun. share of $\geq$ 3 rooms PR in PH$_{1982}$						0.446^{***}
						0.029
Observations	745	745	745	745	745	745
Agglomerations	74	74	74	74	74	74

Notes: significance levels: *** 1%, ** 5%, * 10%. PR = private rentals; PH = primary homes; PuHsg = public housing. All regressions are run using the IV method and weighted by the number of primary homes; standard errors are clustered by agglomeration. The sample includes 745 municipalities located in 74 agglomerations with a population between 50,000 and 180,000 inhabitants.

Sources: Population Census and other municipal data.

Table 10: Effect of housing subsidy zoning on the private rental sector in 1990, 1999, 2006 and 2016 at the municipality level for rentals

Dependent variables	Proportion among primary homes of private rentals			
	1990	1999	2006	2016
Zone II for housing subsidies	-0.003	0.011	0.025^{**}	0.022^{*}
	0.006	0.009	0.011	0.012
(Intercept)	-0.52^{**}	-0.245	0.969^{**}	1.204^{***}
	0.247	0.316	0.426	0.398
Mun. housing price (K€per sqm)$_{2010}$	-0.003	-0.0005	0.0004	0.001
	0.003	0.005	0.007	0.008
Δ agglomeration pop.$_{1975-2014}$	0.017	0.026	0.02	0.033
	0.013	0.025	0.024	0.022
log(Median mun. income$_{2002}$)	0.054^{**}	0.023		
	0.026	0.032		
log(Mun. population density$_{1999}$)	0.001	0.008^{**}		
	0.003	0.004		
Mun. share of PuHsg in PH$_{1982}$	0.043	0.008	0.002	0.001
	0.031	0.03	0.033	0.037
Mun. share of PR in PH$_{1982}$	0.885^{***}	0.772^{***}	0.72^{***}	0.616^{***}
	0.03	0.041	0.045	0.049
log(Median mun. income$_{2013}$)			-0.099^{**}	-0.12^{***}
			0.043	0.04
log(Mun. population density$_{2014}$)			0.009^{*}	0.011^{**}
			0.005	0.005
Observations	745	745	745	745
Agglomerations	74	74	74	74

Notes: significance levels: *** 1%, ** 5%, * 10%. PR = private rentals; PH = primary homes; PuHsg = public housing. All regressions are run using the IV method and weighted by the number of primary homes; standard errors are clustered by agglomeration. The sample includes 745 municipalities located in 74 agglomerations with a population between 50,000 and 180,000 inhabitants.
Sources: Population Census and other municipal data.

Table 11: Effect of housing subsidy zoning on the private rental sector in 1990, 1999, 2006 and 2016 at the municipality level for furnished rentals and unfurnished rentals

Dependent variables	Proportion among primary homes of private rentals							
	furnished				unfurnished			
	1990	1999	2006	2016	1990	1999	2006	2016
Zone II for housing subsidies	−0.000006	0.006**	0.01***	0.013***	−0.003	0.006	0.015*	0.01
	0.001	0.002	0.003	0.004	0.005	0.008	0.009	0.009
(Intercept)	−0.057	0.013	0.138	−0.053	−0.42*	−0.161	0.927**	1.424***
	0.035	0.05	0.092	0.117	0.238	0.294	0.392	0.334
Mun. housing price (K€per sqm)$_{2010}$	0.0004	0.004**	0.008***	0.006	−0.004	−0.005	−0.007	−0.005
	0.0009	0.002	0.003	0.004	0.003	0.004	0.006	0.006
Δ agglomeration pop.$_{1975-2014}$	0.008***	0.001	0.003	0.004	0.013	0.031	0.021	0.036**
	0.002	0.006	0.006	0.008	0.012	0.021	0.02	0.016
log(Median mun. income$_{2002}$)	0.005	−0.003			0.044*	0.016		
	0.003	0.005			0.025	0.03		
log(Mun. population density$_{1999}$)	0.002**	0.002**			0.002	0.008**		
	0.0007	0.001			0.003	0.003		
Mun. share of PuHsg in PH$_{1982}$	0.003	0.006	0.025**	0.045***	0.032	−0.007	−0.03	−0.052*
	0.005	0.008	0.01	0.017	0.029	0.027	0.029	0.029
Mun. share of furnished PR in PH$_{1982}$	0.762***	0.852***	0.754***	0.96***				
	0.066	0.104	0.108	0.164				
log(Median mun. income$_{2013}$)			−0.016*	0.002			−0.092**	−0.139***
			0.009	0.012			0.039	0.034
log(Mun. population density$_{2014}$)			0.002*	0.004**			0.008**	0.008**
			0.001	0.002			0.004	0.004
Mun. share of unfurnished PR in PH$_{1982}$					0.862***	0.726***	0.687***	0.558***
					0.03	0.036	0.041	0.041
Observations	745	745	745	745	745	745	745	745
Agglomerations	74	74	74	74	74	74	74	74

Notes: significance levels: *** 1%, ** 5%, * 10%. PR = private rentals; PH = primary homes; PuHsg = public housing. All regressions are run using the IV method and weighted by the number of primary homes; standard errors are clustered by agglomeration. The sample includes 745 municipalities located in 74 agglomerations with a population between 50,000 and 180,000 inhabitants.

Sources: Population Census and other municipal data.

The shift in the quantity of private one-room rentals had also already started in 1999 (Table 12). For private two-room rentals, the treatment impact is statistically significant at the 0.1 level since 2006 (Table 13). The treatment impact on private rentals with three rooms or more is not significant (Table 13). For all market segments, the absence of treatment impact in 1990 allows to reject the hypothesis that the impact we find is only due to the preexisting differences between zone II and III housing markets (Tables 10 to 13).

We show that the increase of the proportion of one-room rentals since 1999 among primary homes is partly driven by new constructions. Indeed, to determine how housing subsidies increase only the quantity of one-room private rentals, three channels can be considered: the subdivision of large dwellings into several small ones, new buildings, and the use of dwellings from other sectors (second homes, vacant dwellings).

First, there is no subdivision of large dwellings to create several small ones, since the quantity of large dwellings does not decrease due to housing subsidies (Table 13). Indeed, the cost of subdividing a dwelling into several smaller ones is high, because each dwelling needs to get load-bearing walls, water points, or evacuations.

Second, the increase of the proportion of one-room rentals since 1999 among primary homes is, at least partly, driven by the building of new dwellings, as shown by the significant treatment impact on the proportion of one-room private rentals with a completion year after the beginning of the increase of housing subsidies (Table 14). The treatment has no impact on the quantity of one-room primary homes other than private rentals - that is occupied by owners, frees of charge, or social rentals - and built after the beginning of the increase of housing subsidies (Table 14). The treatment effect is not significant for other primary homes with two rooms or with three or more rooms, either private rentals or other.

Third, the increase of the proportion of one-room rentals since 1999 among primary homes could also be party due to the reallocation of secondary homes, or vacant dwellings. This assumption cannot be tested by our data which cover primary homes only (Section 4).

How to explain why housing subsidies increase only the quantity of one-room private rentals and not the quantity of larger dwellings? One can argue that renting small dwellings is more profitable as the rent per square meter decreases with the size of the dwelling. However, this higher rental yield for small dwellings also reflects a higher building cost per square meter for these dwellings because of fixed costs per dwelling (due for example to load-bearing walls, water points, or evacuations).

Actually, the increase of the proportion of one-room primary homes since 1999 is the result of a demand shift and a higher supply elasticity, two phenomenons that our data do not enable to disentangle. On the demand side, our finding is likely due to the entry of a greater number of students in housing markets belonging to zone II. Indeed, Laferrère and Blanc (2004a) show that the extension of housing allowance to student in the 1990s, regardless of their parents' income, allowed some of them to move out of the parental home. Indeed, Laferrère and Blanc (2004a) estimate that as much as half of the housing subsidies came as a windfall gain to students and their parents as subsidies provide an increased opportunity for students to move out from their parents' home in to their own apartment, often better located. This is why the authors find that the short-term inflationary effect does not imply a strong long-term effect by which landlords

Table 12: Effect of housing subsidy zoning on the private rental sector in 1990, 1999, 2006 and 2016 at the municipality level for one-room rentals

Dependent variables	Proportion among primary homes of private 1 room rentals			
	1990	1999	2006	2016
Zone II for housing subsidies	0.003	0.015^{***}	0.02^{***}	0.016^{***}
	0.002	0.006	0.006	0.006
(Intercept)	-0.113^{**}	-0.181^{*}	0.205	0.293^{*}
	0.057	0.105	0.166	0.159
Mun. housing price (K€per sqm)$_{2010}$	-0.000002	0.001	0.005	0.007^{*}
	0.001	0.003	0.004	0.004
Δ agglomeration pop.$_{1975-2014}$	0.011^{**}	0.005	-0.0009	-0.003
	0.005	0.012	0.011	0.01
log(Median mun. income$_{2002}$)	0.011^{*}	0.016		
	0.006	0.011		
log(Mun. population density$_{1999}$)	0.0008	0.003^{*}		
	0.001	0.002		
Mun. share of PuHsg in PH$_{1982}$	0.021^{***}	0.044^{***}	0.051^{***}	0.053^{***}
	0.008	0.016	0.018	0.02
Mun. share of 1 room PR in PH$_{1982}$	0.844^{***}	0.846^{***}	0.831^{***}	0.725^{***}
	0.037	0.102	0.094	0.091
log(Median mun. income$_{2013}$)			-0.023	-0.033^{**}
			0.016	0.016
log(Mun. population density$_{2014}$)			0.001	0.002
			0.002	0.002
Observations	745	745	745	745
Agglomerations	74	74	74	74

Notes: significance levels: *** 1%, ** 5%, * 10%. PR = private rentals; PH = primary homes; PuHsg = public housing. All regressions are run using the IV method and weighted by the number of primary homes; standard errors are clustered by agglomeration. The sample includes 745 municipalities located in 74 agglomerations with a population between 50,000 and 180,000 inhabitants.
Sources: Population Census and other municipal data.

would have captured the whole rent increase due to housing allowances.

For this market segment of small dwellings, the housing market has responded to this increase of demand by an increase of supply. The supply of one-room rentals is probably the most elastic one when compared to other market segments. Indeed, landlords who opt for rental investment are more easily solvent to buy a small dwelling. If they are wealthy enough to buy a large one or several dwellings, they may prefer a diversification of their risks (unpaid rents, potential downgrades, neighborhood impoverishment). In France, a quarter of households living in France own several dwellings (most of the time, one being their principal residence). These multi-owner households hold two-thirds of the housing stock for individuals; among them, the households holding at least 5 dwellings (that is 3.5% of French households) hold half of the housing stock for individuals (André et al. 2021).

Table 13: Effect of housing subsidy zoning on the private rental sector in 1990, 1999, 2006 and 2016 at the municipality level for two-room rentals, and more than three room rentals

Dependent variables	Proportion among primary homes of							
	private 2 room rentals				private $\geq$ 3 room rentals			
	1990	1999	2006	2016	1990	1999	2006	2016
Zone II for housing subsidies	-0.003	0.002	0.008^{*}	0.01^{*}	-0.003	-0.005	-0.002	-0.003
	0.002	0.003	0.005	0.005	0.004	0.003	0.004	0.005
(Intercept)	-0.146^{**}	-0.139	0.191	0.32^{*}	-0.002	0.5^{***}	1.016^{***}	0.959^{***}
	0.062	0.099	0.18	0.188	0.181	0.158	0.241	0.272
Mun. housing price (K€per sqm)$_{2010}$	-0.002	0.002	0.003	0.003	-0.002	-0.003	-0.007^{**}	-0.007^{**}
	0.001	0.002	0.003	0.003	0.003	0.002	0.003	0.004
Δ agglomeration pop.$_{1975-2014}$	0.018^{***}	0.019^{**}	0.018^{*}	0.029^{***}	-0.001	0.008	0.005	0.009
	0.005	0.009	0.011	0.011	0.008	0.006	0.008	0.009
log(Median mun. income$_{2002}$)	0.013^{**}	0.012			0.003	-0.047^{***}		
	0.006	0.01			0.019	0.016		
log(Mun. population density$_{1999}$)	0.003^{***}	0.004^{***}			0.002	0.004^{**}		
	0.001	0.002			0.003	0.001		
Mun. share of PuHsg in PH$_{1982}$	0.014^{*}	0.023^{**}	0.022	0.02	-0.021	-0.096^{***}	-0.105^{***}	-0.1^{***}
	0.008	0.01	0.014	0.016	0.023	0.016	0.019	0.019
Mun. share of 2 room PR in PH$_{1982}$	0.842^{***}	0.818^{***}	0.796^{***}	0.72^{***}				
	0.031	0.04	0.054	0.065				
log(Median mun. income$_{2013}$)			-0.022	-0.035^{*}			-0.096^{***}	-0.088^{***}
			0.018	0.019			0.024	0.027
log(Mun. population density$_{2014}$)			0.005^{**}	0.007^{***}			0.003^{**}	0.002
			0.002	0.002			0.002	0.002
Mun. share of $\geq$ 3 rooms PR in PH$_{1982}$					0.757^{***}	0.571^{***}	0.531^{***}	0.446^{***}
					0.038	0.031	0.028	0.029
Observations	745	745	745	745	745	745	745	745
Agglomerations	74	74	74	74	74	74	74	74

Notes: significance levels: *** 1%, ** 5%, * 10%. PR = private rentals; PH = primary homes; PuHsg = public housing. All regressions are run using the IV method and weighted by the number of primary homes; standard errors are clustered by agglomeration. The sample includes 745 municipalities located in 74 agglomerations with a population between 50,000 and 180,000 inhabitants.

Sources: Population Census and other municipal data.

Table 14: Effect of housing subsidy zoning on the private rental sector in 2006 and 2016 at the municipality level for one-room dwellings depending on the completion year

Dependent variables	Proportion among primary homes of 1 room dwellings					
	private rentals			other		
	2006	2016	2016	2006	2016	2016
Built	since 1991	1991-2005	since 2006	since 1991	1991-2005	since 2006
Zone II for housing subsidies	0.01^{***}	0.006^{**}	0.004^{***}	0.009	0.008	0.011
	0.003	0.003	0.0009	0.006	0.005	0.007
(Intercept)	−0.089	−0.023	−0.014	0.083	0.225	0.182
	0.094	0.078	0.03	0.173	0.148	0.185
Mun. housing price (K€per sqm)$_{2010}$	0.001	0.003	0.001	0.001	0.002	0.003
	0.003	0.003	0.0008	0.003	0.003	0.004
Δ agglomeration pop.$_{1975-2014}$	0.004	−0.002	0.002	0.02^{**}	0.023^{**}	0.024^{**}
	0.007	0.006	0.002	0.01	0.009	0.011
log(Median mun. income$_{2013}$)	0.008	0.002	0.0009	−0.017	-0.032^{**}	−0.028
	0.009	0.008	0.003	0.017	0.014	0.018
log(Mun. population density$_{2014}$)	0.0001	−0.0001	0.0006	0.015^{***}	0.014^{***}	0.016^{***}
	0.001	0.0009	0.0005	0.002	0.002	0.003
Mun. share of PuHsg in PH$_{1982}$	0.028^{***}	0.022^{***}	0.012^{***}	0.03	0.031	0.041^{*}
	0.009	0.008	0.004	0.021	0.02	0.025
Mun. share of 1 room PR in PH$_{1982}$	0.132^{**}	0.16^{***}	0.014			
	0.053	0.046	0.02			
Mun. share of 1 rooms NOT PR in PH$_{1982}$				0.989^{***}	0.863^{***}	0.911^{***}
				0.18	0.151	0.209
Observations	745	745	745	745	745	745
Agglomerations	74	74	74	74	74	74

Notes: significance levels: *** 1%, ** 5%, * 10%. PR = private rentals; PH = primary homes; PuHsg = public housing. Among primary homes, other dwellings than private rentals include dwellings occupied by owners, frees of charge, and social rentals. All regressions are run using the IV method and weighted by the number of primary homes; standard errors are clustered by agglomeration. The sample includes 745 municipalities located in 74 agglomerations with a population between 50,000 and 180,000 inhabitants.

Sources: Population Census and other municipal data.

5.3 No detected impact on housing quality

Location in zone II, where housing subsidies are higher, has no significant impact on housing quality, as measured by some characteristics of the dwelling (number of dwellings in the building, number of rooms, size of the living area, presence of a bathroom, home safety device, reinforced doors, indoor toilets, running water, heating) (Table 21), even though some of these characteristics can be easily improved by the landlord. Similarly, among one or two-room dwellings, or among dwellings with three or more rooms, there is no significant impact on quality, as measured by our data.

5.4 Robustness checks

Window. Results are provided for a sample including dwellings located in agglomerations between 50,000 and 180,000 inhabitants and rented between 2000 and 2016 (Tables 5 to 11): the samples include 3,967 dwellings or 745 municipalities located in agglomerations with a population between 50,000 and 180,000 inhabitants.[30] Results are robust when using different windows (Table 22 in Appendix B). A wider window of less than 250,000 inhabitants (13,334 dwellings located in 463 agglomerations) provides a comparable and significantly positive impact of location in zone II on rents. Reducing the window to 70,000-140,000, which corresponds to a sample contains 1,704 dwellings located in 25 agglomerations only, gives a similar and significant impact. Thus, the estimated impact is stable and does not depend on the population size of the agglomeration on either side of the discontinuity, which validates our identification strategy.

Placebo tests. Placebo tests do not reveal any unexpected impact (Table 23). We test two alternative thresholds at the round numbers closest to the 100,000 population threshold, which we believe are the most likely alternatives for public policymakers. These two discontinuities at 50,000 or 200,000 inhabitants are non significant. Indeed, when restricting the sample to the untreated agglomerations of less than 100,000 inhabitants, the threshold of 50,000 has a non significant impact on rents. Similarly, when restricting the sample to the treated agglomerations of more than 100,000 inhabitants, the threshold of 200,000 is non significant.

Besides, reassuringly, the point estimate of the 100,000-inhabitant dummy variable is very similar to the treatment effect.

Finally, the population trend (here the logarithm of the agglomeration population) is non significant.[31] All these four tests confirm that the estimated treatment effect is not due to a non modeled population trend effect.

[30] This corresponds to 60 agglomerations when using the Rents and Charges and Housing surveys for dwelling scale data and to 74 agglomerations when using the exhaustive Population Census for municipal data.

[31] Our estimation strategy does not include enough agglomerations to tests a polynomial adjustment of a function of the agglomeration population but only to test thresholds or a simple trend.

6 Conclusion

We measure the impact of housing subsidies on the private rental sector. To do so, we use an instrumental variable method based on a spatial discontinuity in the subsidy scheme. We find no significant impact of housing subsidies on rents in the 1980s, when the expenditure for housing benefit were lower, while we highlight that tenant-based subsidies caused an increase in the rents in the next two decades (from 1995 to 2016, with a stronger impact in the 1995-1999 period). Between 2000 and 2016, we show that housing subsidies have an overall positive impact on rents, even for tenants who do not benefit from subsidies. This positive impact on rents holds with a constant magnitude when subdividing the study period 2000-2016 in sub-periods (2000-2008 and 2009-2016). This inflationary impact is accompanied by an increase in the quantity of private rentals; no impact on quality is detected.

We show that this inflationary impact is heterogeneous and accompanied by different reactions on the housing market, depending on market segments. For dwellings with three or more rooms, the rental housing supply has been inelastic in quality and in quantity and higher housing subsidies have led to an increase of rents. For one or two room dwellings on the contrary, rents have stopped increasing significantly and the quantity of private one-room rentals, including new buildings, has increased. Our finding could be due to the entry of a greater number of students in housing markets where subsidies are higher (Laferrère and Blanc 2004a). The housing market has responded to this increase of demand for small dwellings by an increase of supply in quantity. The supply of one-room rentals is probably the most elastic one, as landlords who opt for rental investment are more easily solvent to buy a small dwelling or prefer diversify their risks by buying several small dwellings if they are wealthy enough to do so.

Previous findings by Fack (2006), Laferrère and Blanc (2004b), Chapelle et al. (2018), or Labonne and Welter-Nicol (2015) establish the significant reduction of different housing policies efficiency because of the low elasticity of supply in the short run. Our results confirm and complete them by establishing that housing supply has reacted in the long run for some market segments and, this way, has reduced the long-term inflationary impact of housing subsidies for these segments.

Our results are of particular importance as the inflationary impact of housing subsidies due to the inelastic housing supply consists in a major argument for reforming housing subsidies in France (Trannoy and Wasmer (2013), Bozio et al. (2015)). Discussions about the establishment of a universal activity income, which could integrate housing subsidies, were ongoing at the end of 2019, before Coronavirus pandemic. Such an integration would prevent from the labelling effect of social benefits, which encourages beneficiaries to consume more of the targeted good. For example, Bozio et al. (2017) offer a relevant proposition to combine housing benefits with the social inclusion benefit and the earned income tax credit. Trannoy and Wasmer (2013) offer another very interesting proposition to integrate housing subsidies into the income tax system.

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A Comparison of housing subsidies zones crossed with other zones

Table 15: Number of dwellings in our sample located in the housing subsidies zones (zones II and III) crossed with the zones used for landlord subsidies and for solidarity and urban renewal respectively

	Zone II	Zone III
Landlord subsidies zone A	0	10
Landlord subsidies zone B1	127	69
Landlord subsidies zone B2	1728	1910
Landlord subsidies zone C	12	111
SRU law applied	1834	1976
SRU law not applied	33	124

Notes: landlord subsidies concern rental investment or interest free loan policy. SRU = *solidarité et renouvellement urbain*, i.e. solidarity and urban renewal. The full sample includes 3,967 privately rented dwellings located in 60 agglomerations with a population between 50,000 and 180,000 inhabitants. Sources: Population Census.

B Supplementary estimates

Table 16: First stage of the instrumental variable method – regression on dwellings

Number of rooms	-0.0006
	0.006
log(size)	-0.009
	0.022
House	0.02
	0.014
Tenancy duration	-0.0002
	0.0004
Bathroom	-0.054^{*}
	0.031
Bath	0.006
	0.011
Home safety device	0.024
	0.029
Elevator	0.004
	0.014
Without heating	-0.013
	0.032
Balcony	0.004
	0.014
Furnished dwelling	-0.001
	0.013
Garden	0.001
	0.013
Completion year $<$ 1949	0.014
	0.017
Completion year 1949-1974	0.027^{**}
	0.013
Completion year 1975-1990	0.015
	0.016
Mun. housing price (K€per sqm)$_{2010}$	0.199^{**}
	0.087
Mun. share of PR in PH$_{2014}$	-0.802
	0.698
Δ agglomeration pop.$_{1975-2014}$	-0.241
	0.178
log(Median mun. income$_{2013}$)	-1.578^{**}
	0.635
log(Mun. population density$_{2014}$)	-0.085
	0.09
Mun. share of PuHsg in PH$_{2014}$	0.219
	0.532
$\mathbb{1}$(Agglomeration pop.$_{1975} \geq 100000$)	0.956^{***}
	0.044
Observations	3967
Agglomerations	60

Notes: significance levels: *** 1%, ** 5%, * 10%. PR = private rentals; PH = primary homes; PuHsg = public housing. The regression does not include an intercept but keeps all year dummies. The sample includes 3,967 privately rented dwellings located in 60 agglomeration with a population between 50,000 and 180,000 inhabitants. The time period extends from 2000 to 2016.

Sources: Rents and Charges survey, Housing survey, Population Census and other municipal data.

Table 17: Effect of housing subsidy on rents for private one or two-room rentals between 1995 and 1999

Zone II for housing subsidies	0.095^{***}
	0.029
log(size)	-0.66^{***}
	0.036
House	-0.124^{**}
	0.056
Tenancy duration	-0.022^{***}
	0.004
Bathroom	0.0002
	0.038
Bath	0.057^{*}
	0.031
Home safety device	-0.007
	0.126
Elevator	0.072^{***}
	0.024
Without heating	-0.08^{**}
	0.04
Balcony	0.012
	0.022
Furnished dwelling	-0.032
	0.046
Garden	0.091^{***}
	0.034
Completion year $<$ 1949	-0.105^{***}
	0.034
Completion year 1949-1974	-0.088^{***}
	0.027
Completion year 1975-1990	-0.028
	0.042
Mun. housing price (K€per sqm)$_{2010}$	0.141^{***}
	0.028
Δ agglomeration pop.$_{1975-2014}$	-0.091
	0.099
Mun. share of PR in PH$_{1999}$	-0.138
	0.214
Mun. share of PuHsg in PH$_{1999}$	0.279
	0.186
log(Median mun. income$_{2002}$)	-0.034
	0.119
log(Mun. population density$_{1999}$)	-0.015
	0.016
Observations	644
Agglomerations	42

Notes: significance levels: *** 1%, ** 5%, * 10%. PR = private rentals; PH = primary homes; PuHsg = public housing. All regressions are run using the IV method and weighted by the number of primary homes; standard errors are clustered by agglomeration. The regression does not include an intercept but keeps all year dummies. The sample includes 644 privately rented dwellings with one or two rooms located in 42 agglomerations with a population between 50,000 and 180,000 inhabitants. The time period extends from 1995 to 1999.
Sources: Rents and Charges survey, Housing survey, Population Census and other municipal data.

Table 18: Extensive margin: effect of housing subsidy on the share of housing subsidy recipients in 2016

Zone II for housing subsidies	0.026
	0.018
Number of rooms	0.005**
	0.002
log(size)	−0.016**
	0.007
House	−0.005
	0.005
Tenancy duration	−0.0002
	0.0001
Bathroom	0.005
	0.007
Bath	−0.003
	0.002
Home safety device	−0.008
	0.011
Elevator	−0.0004
	0.004
Without heating	0.007
	0.008
Balcony	−0.004
	0.005
Furnished dwelling	−0.011***
	0.004
Garden	0.002
	0.003
Completion year < 1949	−0.008
	0.005
Completion year 1949-1974	−0.001
	0.005
Completion year 1975-1990	0.002
	0.005
Mun. housing price (K€per sqm)$_{2010}$	−0.011
	0.013
Mun. share of PR in PH$_{2014}$	0.42***
	0.08
Δ agglomeration pop.$_{1975-2014}$	−0.058
	0.056
log(Median mun. income$_{2013}$)	−0.48***
	0.072
log(Mun. population density$_{2014}$)	−0.005
	0.008
Mun. share of PuHsg in PH$_{2014}$	−0.013
	0.1
Observations	3967
Agglomerations	60

Notes: significance levels: *** 1%, ** 5%, * 10%. PR = private rentals; PH = primary homes; PuHsg = public housing.
All regressions are run using the IV method and year fixed effects; standard errors are clustered by agglomeration. The regression does not include an intercept but keeps all year dummies. The sample includes 3,967 privately rented dwellings located in 60 agglomerations with a population between 50,000 and 180,000 inhabitants. The time period extends from 2000 to 2016.
Sources: Rents and Charges survey, Housing survey, Population Census and other municipal data.

Table 19: Effect of housing subsidy on key geographic variables

Dependent variables	Mun. housing price (K€ per sqm)$_{2010}$	Mun. share of PR in PH$_{2014}$	Mun. share of PuHsg in PH$_{2014}$
Zone II for housing subsidies	0.263^{*} 0.14	0.015 0.014	-0.029^{*} 0.016
(Intercept)	-18.935^{***} 6.24	3.527^{***} 0.558	3.592^{***} 0.861
Mun. share of PR in PH$_{2014}$	0.673 0.441		-0.463^{***} 0.079
Mun. share of PuHsg in PH$_{2014}$	0.742 0.549	-0.427^{***} 0.069	
Δ agglomeration pop.$_{1975-2014}$	1.409^{***} 0.387	0.086^{***} 0.022	-0.042 0.041
log(Median mun. income$_{2013}$)	2.013^{***} 0.611	-0.368^{***} 0.055	-0.383^{***} 0.084
log(Mun. population density$_{2014}$)	0.052 0.059	0.062^{***} 0.008	0.071^{***} 0.01
Mun. housing price (K€per sqm)$_{2010}$		0.008 0.009	0.017 0.013
Observations	749	749	749
Agglomerations	74	74	74

Notes: significance levels: *** 1%, ** 5%, * 10%. PR = private rentals; PH = primary homes; PuHsg = public housing.
All regressions are run using the IV method and weighted by the number of primary homes; standard errors are clustered by agglomeration. The sample includes 749 municipalities located in 74 agglomerations with a population between 50,000 and 180,000 inhabitants. The time period extends from 2000 to 2016.
Sources: Population Census and other municipal data.

Table 20: First stage of the instrumental variable method – regression on municipalities explaining the proportion of private rentals among primary homes in 2016

(Intercept)	1.966 5.134
Mun. housing price (K€per sqm)$_{2010}$	0.069 0.064
Δ agglomeration pop.$_{1975-2014}$	0.069 0.255
log(Median mun. income$_{2013}$)	-0.227 0.506
log(Mun. population density$_{2014}$)	0.034 0.063
Mun. share of PuHsg in PH$_{1982}$	0.123 0.343
Mun. share of PR in PH$_{1982}$	0.096 0.357
$\mathbb{1}$(Agglomeration pop.$_{1975} \geq 100000$)	0.756^{***} 0.065
Observations	745
Agglomerations	74

Notes: significance levels: *** 1%, ** 5%, * 10%. PR = private rentals; PH = primary homes; PuHsg = public housing.
The sample includes 745 municipalities located in 74 agglomerations with a population between 50,000 and 180,000 inhabitants. The time period extends from 2000 to 2016.
Sources: Population Census and other municipal data.

Table 21: Effect of housing subsidy zoning on housing quality

Dependent variables	Number of dwellings in the building	Number of rooms	Living area	Presence of a bathroom	Home safety device	Reinforced door	Indoor toilets	Heating	Running water
Zone II for housing subsidies	−0.051	−0.04	0.198	−0.009	0.006	0.019	0.005	0.026	0.003
	1.609	0.062	1.536	0.023	0.006	0.036	0.005	0.016	0.003
Mun. housing price (K€per sqm)$_{2010}$	−0.264	−0.055	−2.317*	−0.003	−0.003	−0.012	−0.008	−0.083***	−0.004
	1.138	0.068	1.355	0.025	0.005	0.022	0.006	0.032	0.003
Mun. share of PuHsg in PH$_{2014}$	29.616***	−2.416***	−59.049***	0.238	−0.039	−0.125	0.033	0.204**	0.009
	7.16	0.469	10.422	0.158	0.04	0.174	0.03	0.098	0.012
log(Median mun. income$_{2013}$)	19.031***	−0.914*	−10.085	0.334*	−0.034	−0.09	0.032	0.345***	0.027
	7.3	0.475	10.747	0.18	0.032	0.14	0.026	0.107	0.019
log(Mun. population density$_{2014}$)	1.647***	0.021	−1.128	0.006	0.0006	−0.002	−0.002	0.021**	−0.0001
	0.607	0.036	0.916	0.018	0.003	0.016	0.003	0.009	0.001
Δ agglomeration pop.$_{1975-2014}$	7.64*	−0.342*	−9.23**	0.06	0.023	0.188**	0.021	0.046	−0.002
	4.043	0.175	4.486	0.064	0.019	0.073	0.016	0.064	0.008
Mun. share of PR in PH$_{1982}$	18.871**	−2.294***	−44.871***	0.145	−0.038	−0.023	0.032	0.015	0.001
	8.153	0.436	9.771	0.193	0.036	0.17	0.025	0.072	0.011
Observations	3967	3967	3967	3967	3967	3967	3967	3967	3967
Agglomerations	60	60	60	60	60	60	60	60	60

Notes: significance levels: *** 1%, ** 5%, * 10%. PR = private rentals; PH = primary homes; PuHsg = public housing. All regressions are run using the IV method and year fixed effects; standard errors are clustered by agglomeration. The regression does not include an intercept but keeps all year dummies. The sample includes 3,967 privately rented dwellings located in 60 agglomerations with a population between 50,000 and 180,000 inhabitants. The time period extends from 2000 to 2016.

Sources: Rents and Charges survey, Housing survey, Population Census and other municipal data.

Table 22: Effect of housing subsidy zoning on rents – Robustness checks: window

Zone II for housing subsidies	0.047^{***}	0.042^{***}
	0.016	0.015
Number of rooms	0.067^{***}	0.075^{***}
	0.005	0.013
log(size)	-0.697^{***}	-0.68^{***}
	0.016	0.03
House	0.031^{***}	0.02
	0.01	0.026
Tenancy duration	-0.007^{***}	-0.008^{***}
	0.0005	0.002
Bathroom	0.077^{***}	0.037
	0.016	0.042
Bath	0.056^{***}	0.063^{***}
	0.006	0.018
Home safety device	0.031	0.078
	0.025	0.065
Elevator	0.016^{*}	0.041^{*}
	0.009	0.022
Without heating	-0.129^{***}	-0.124^{***}
	0.02	0.041
Balcony	0.039^{***}	0.022
	0.006	0.014
Furnished dwelling	-0.079^{***}	-0.07^{***}
	0.013	0.025
Garden	0.065^{***}	0.031^{*}
	0.01	0.018
Completion year $<$ 1949	-0.123^{***}	-0.095^{***}
	0.009	0.024
Completion year 1949-1974	-0.122^{***}	-0.129^{***}
	0.008	0.02
Completion year 1975-1990	-0.068^{***}	-0.052^{**}
	0.009	0.024
Mun. housing price (K€per sqm)$_{2010}$	0.096^{***}	0.104^{***}
	0.012	0.022
Mun. share of PR in PH$_{2014}$	0.306^{***}	0.065
	0.073	0.132
Δ agglomeration pop.$_{1975-2014}$	0.122^{***}	0.224^{**}
	0.015	0.095
log(Median mun. income$_{2013}$)	0.24^{***}	0.195^{**}
	0.074	0.099
log(Mun. population density$_{2014}$)	0.008	0.043^{***}
	0.009	0.016
Mun. share of PuHsg in PH$_{2014}$	0.4^{***}	0.242^{*}
	0.08	0.142
Observations	13203	1677
Agglomerations	463	25
Agglomeration population	$\leq$250,000	70,000-140,000

Notes: significance levels: *** 1%, ** 5%, * 10%. PR = private rentals; PH = primary homes; PuHsg = public housing. All regressions are run using the IV method and year fixed effects; standard errors are clustered by agglomeration. The regression does not include an intercept but keeps all year dummies. The dependent variable is the logarithm of the rent per square meter. The samples include privately rented dwellings. The time period extends from 2000 to 2016.

Sources: Rents and Charges survey, Housing Survey, Population Census and other municipal data.

Table 23: Effect of housing subsidy zoning on rents – Placebo tests

Subsamples	Untreated	All	Treated	All
Agglomeration population	≤100,000	50,000-180,000	100,000-300,000	50,000-180,000
Zone II for housing subsidies				0.121**
				0.047
Number of rooms	0.069***	0.07***	0.057***	0.07***
	0.006	0.01	0.008	0.01
log(size)	−0.724***	−0.701***	−0.633***	−0.699***
	0.02	0.029	0.017	0.029
House	0.029***	0.02	0.062***	0.016
	0.011	0.023	0.014	0.024
Tenancy duration	−0.007***	−0.006***	−0.005***	−0.006***
	0.0007	0.0009	0.0008	0.0009
Bathroom	0.082***	0.057**	0.045**	0.061**
	0.02	0.029	0.02	0.029
Bath	0.064***	0.046***	0.024**	0.046***
	0.007	0.011	0.011	0.011
Home safety device	0.006	0.112***	0.07***	0.107***
	0.033	0.039	0.026	0.04
Elevator	0.017	0.036***	0.025**	0.038***
	0.013	0.014	0.01	0.014
Without heating	−0.145***	−0.117***	−0.038	−0.117***
	0.022	0.038	0.028	0.038
Balcony	0.04***	0.04***	0.034***	0.039***
	0.008	0.012	0.008	0.012
Furnished dwelling	−0.071***	−0.101***	−0.089***	−0.102***
	0.016	0.019	0.017	0.019
Garden	0.065***	0.065***	0.06***	0.065***
	0.011	0.023	0.01	0.023
Completion year < 1949	−0.13***	−0.105***	−0.085***	−0.108***
	0.011	0.016	0.014	0.017
Completion year 1949-1974	−0.118***	−0.118***	−0.12***	−0.122***
	0.01	0.012	0.011	0.012
Completion year 1975-1990	−0.065***	−0.073***	−0.064***	−0.075***
	0.013	0.025	0.012	0.026
Mun. housing price (K€per sqm)$_{2010}$	0.092***	0.109***	0.127***	0.085***
	0.013	0.03	0.03	0.032
Mun. share of PR in PH$_{2014}$	0.294***	0.171	0.05	0.22*
	0.091	0.117	0.109	0.113
Δ agglomeration pop.$_{1975-2014}$	0.127***	0.059	0.156***	0.062
	0.016	0.054	0.049	0.054
log(Median mun. income$_{2013}$)	0.245**	0.022	0.103	0.151
	0.1	0.093	0.133	0.103
log(Mun. population density$_{2014}$)	−0.001	−0.025	0.018	−0.007
	0.012	0.017	0.017	0.013
Mun. share of PuHsg in PH$_{2014}$	0.471***	0.465***	0.159	0.369***
	0.095	0.122	0.177	0.125
$\mathbb{1}$(Agglomeration population$_{1975} \geq 50000$)	0.031			
	0.02			
$\mathbb{1}$(Agglomeration population$_{1975} \geq 100000$)		0.05***		
		0.018		
$\mathbb{1}$(Agglomeration population$_{1975} \geq 200000$)			0.008	
			0.013	
log(Agglomeration population$_{1975}$)				−0.096
				0.061
Observations	9584	3967	4799	3967
Agglomerations	441	60	27	60
Estimator	OLS	OLS	OLS	IV

Notes: significance levels: *** 1%, ** 5%, * 10%. PR = private rentals; PH = primary homes; PuHsg = public housing. All regressions are run using year fixed effects; standard errors are clustered by agglomeration. The regression does not include an intercept but keeps all year dummies. The dependent variable is the logarithm of the rent per square meter. The samples include privately rented dwellings. The time period extends from 2000 to 2016.

Sources: Rents and Charges survey, Housing Survey, Population Census and other municipal data.