

# MASTER THESIS

Erasmus School of Economics

Economics and Business: Policy Economics

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## **Does the Housing Allowance Policy Create a Poverty Trap in the Netherlands?**

a regression discontinuity analysis of the effect  
of housing allowance on household behavior

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### **Abstract**

This study examines the effect of the Dutch housing allowance policy on several household behaviors, which may be creating economic inefficiencies. The income limits for determining eligibility for housing allowance create discontinuities in housing allowance, which are used to implement a fuzzy regression discontinuity design. The results show that while housing allowance makes housing more affordable, it also raises concerns of a possible poverty trap via adverse effects of housing allowance on income and labour supply for working-age households and on savings behavior for single, pension households.

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# 1 Introduction

Globally, governments are switching their focus on welfare housing policies from supplying housing to subsidizing housing (Eerola & Lyytikäinen, 2017). The Netherlands is no different. While the Netherlands has a substantial social housing sector, the Dutch government has continued to increase its generosity of its housing allowance policy. Currently, almost half of renting Dutch households receive housing allowance, amounting to roughly €4 billion of welfare spending every year (Rijksoverheid, n.d.-a). As the Netherlands further increases housing allowance spending, this study investigates the efficiency of the policy by examining whether housing allowance unintentionally affects household decisions and behavior.

Several scholars have raised concerns that housing allowance policies possibly lead to several economic inefficiencies, particularly encouraging low-income households to overconsume housing (Priemus & Haffner, 2017; Haffner & Boelhouwer, 2006), keeping welfare recipients in a “rental trap” (Chen & Enström Öst, 2005), and create a poverty trap (Priemus & Haffner, 2017; Haffner & Boelhouwer, 2006; B. A. Jacob & Ludwig, 2012). By exploiting income eligibility rules of the Dutch housing allowance policy, this paper examines the effect of housing allowance on these factors via a fuzzy regression discontinuity (RD) design. The key advantages of this quasi-experimental design is that the RD design relies on mild assumptions and allows for the elicitation of the local average treatment effect of the policy. This is, to my knowledge, the first paper to attempt a quasi-experimental design to obtain the causal effect of the Dutch housing allowance policy on household behavior.

Using data from the WoonOnderzoek (WoOn) study of 2015 and 2018, this paper finds housing allowance to be associated with more affordable housing costs, although the study also suggests housing allowance may induce a poverty trap for non-pension households and discourage single, pension-age households from accumulating wealth. The paper finds no effect of housing allowance on rent, housing quality, or preferences for home ownership. However, due to sorting, the validity of the causal relationship between housing allowance and these factors is uncertain. Though, the evidence of sorting due to income manipulation itself raises concerns of a poverty trap caused by the housing allowance policy.

The paper is organised as follows. Section 2 explains the structure of the housing policy scheme. Section 3 provides an overview of related literature. Section 4 discusses the data used in this study. Section 5 explains how the RD design is implemented in this study as well as tests the internal validity of the RD design. Section 6 presents the results and robustness checks. Section 7 concludes the paper with limitations and policy implications.

## 2 The Dutch Housing Allowance Policy

Housing allowance is a key demand-side housing policy in the Netherlands (Turner & Elsinga, 2005). Beginning in the 1970s, the Netherlands introduced the housing subsidy to provide affordable housing for low-income Dutch households, exclusively for rental housing (Priemus & Haffner, 2017). In 2006, the ‘rent subsidy’ (*huursubsidie*) was replaced by ‘rent allowance’ (*huurtoeslag*) with the Housing Allowance Act of 2005 (*Wet op de huurtoeslag*) (Priemus & Haffner, 2017). Not only did the law change the name of the policy, but also transferred the management of the applications and payments for housing allowance from the Ministry of Housing and Spatial Planning (*Ministerie van Volkshuisvesting, Ruimtelijke Ordening en Milieu*) to the Tax and Customs Administration (*Belastingdienst*) (Priemus & Haffner, 2017). The aim of this reform was to make the policy more cost-effective and to facilitate the elimination of fraud and misuse of allowance since the tax authorities can verify whether households meet the income and wealth requirements (Priemus & Haffner, 2017).

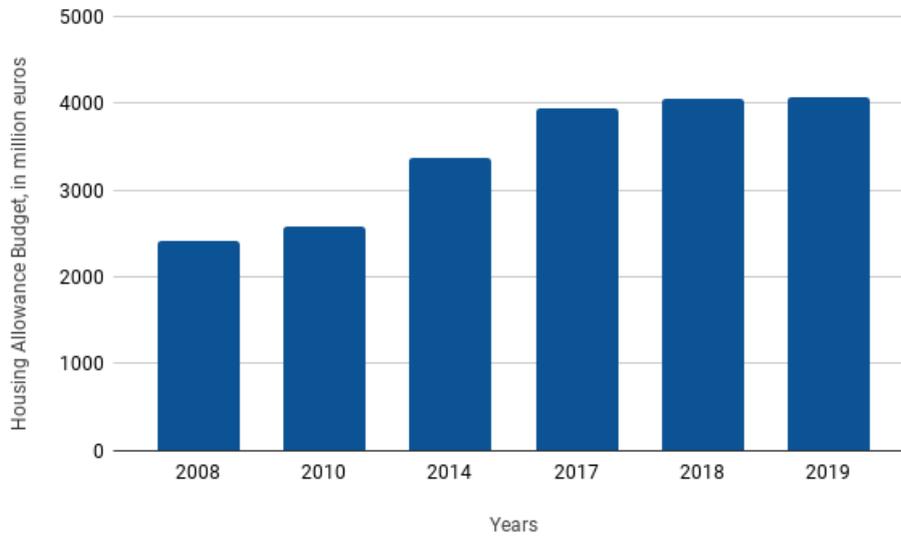
The Dutch rental sector is split into two segments: social and private housing. Social housing is a *supply-side* housing policy that provides affordable rental units for low-income families. At least 80% of social housing must be rented to low-income households and rent cannot surpass a certain level (Rijksoverheid, n.d.-b). These social rental units make up 75% of rental housing in the Netherlands (Rijksoverheid, n.d.-b). Originally, housing allowance only applied to social housing, but now the policy also includes private housing. This expansion of housing allowance makes the policy more focused on “horizontal equity”, where those facing the same conditions are all entitled to affordable housing (Priemus & Haffner, 2017).

To illustrate how housing allowance works, I provide a brief description of the budget for housing allowance as well as give an explanation of the eligibility rules for housing allowance.

### 2.1 Budgeting

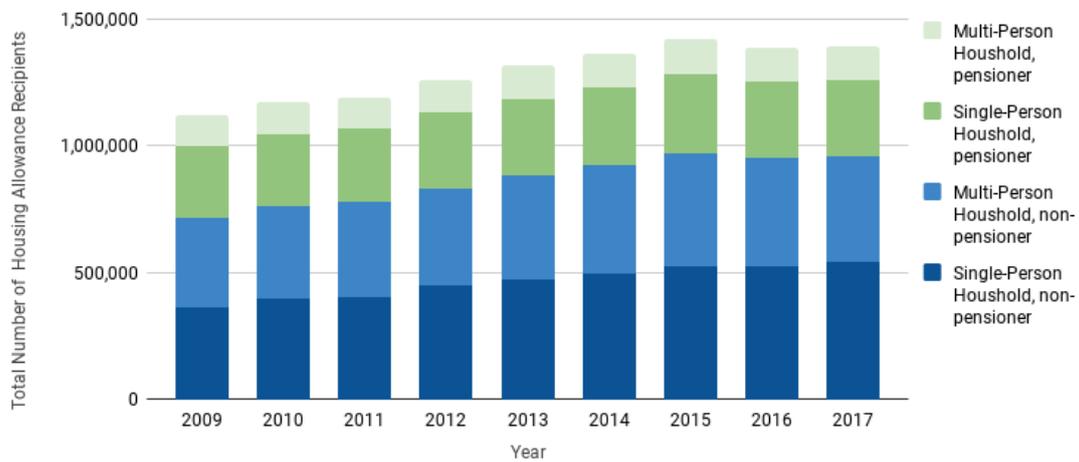
The budget for housing allowance over the past decade is illustrated in Figure 1. From 2008 to 2019, the budget has increased by roughly 60%. This upward trend is partially due to low-income households’ entitlement to the subsidy (Priemus & Haffner, 2017). Thus, the budget cannot be strictly limited. For instance, the 2017 budget was projected to be €3.1 billion (Priemus & Haffner, 2017), but surpassed this forecast by more than €800 million. Figure 2 provides some demographics of housing allowance recipients. Housing allowance is arguably a crucial welfare program for the elderly, with roughly one-third of housing allowance recipients being pensioners. Additionally, the program is greatly used by single-person households, with 60% of the recipients of housing allowance living alone.

Figure 1: Housing allowance budget, 2008-2019



Adapted from “Affordability” by Rijksoverheid, n.d. Retrieved from [https://vois.datawonen.nl/jive/jivereportcontents.ashx?report=cowb\\_framework\\_report\\_preview&chaptercode=2019\\_cowh5](https://vois.datawonen.nl/jive/jivereportcontents.ashx?report=cowb_framework_report_preview&chaptercode=2019_cowh5).

Figure 2: Number of housing allowance recipients per year, 2008-2019



Adapted from “Affordability” by Rijksoverheid, n.d. Retrieved from [https://vois.datawonen.nl/jive/jivereportcontents.ashx?report=cowb\\_framework\\_report\\_preview&chaptercode=2019\\_cowh5](https://vois.datawonen.nl/jive/jivereportcontents.ashx?report=cowb_framework_report_preview&chaptercode=2019_cowh5).

## 2.2 Eligibility Rules

Entitlement to housing allowance is based on means testing. While the policy has been altered throughout its history, this structure of means testing has remained relatively the same, albeit the income and savings limits are adjusted annually and some requirement rules have been slightly altered. Note, this procedural allocation of housing allowance is crucial for the RD design, since it provides a treatment assignment rule. To demonstrate the structure of the policy, the 2017 limits are explained.<sup>1</sup>

Housing allowance can be allotted on an individual basis or for an individual and his or her allowance partner (Belastingdienst, 2016b).<sup>2</sup> However, the means testing is based on the aggregate household income and wealth (Belastingdienst, 2016b). Thus, an individual applying for housing allowance must take the wealth and income of family members and roommates into account, with the exception of subtenants. Additionally, in order to receive the subsidy, the applicant must be older than 18 (Belastingdienst, 2016b).<sup>3</sup> Thus, if an applicant meets these requirements, then he or she is entitled to a certain amount of housing allowance.<sup>4</sup>

The requirements for each applicant differ, depending on household size and ages of the household members (Belastingdienst, 2016b). In total, there are four different categories of households, which are conditioned by two classifications: (i) whether the household consists of one or more person(s), and (ii) whether there is a household member of 65 years or older, i.e. the pension (AOW) age. In addition to differing requirements, each household categories' housing allowance is calculated differently, which will be further explained in section 2.2. Table 1 provides definitions for each household category in 2017.<sup>5</sup>

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<sup>1</sup>See Appendix A.1 for limits for 2014 scheme.

<sup>2</sup>an allowance partner is a a spouse or registered partner; it can also be someone living at the same address, depending on the situation. For details: [https://www.belastingdienst.nl/wps/wcm/connect/bldcontentnl/belastingdienst/prive/toeslagen/hoewerken/toeslagen/kan\\_ik\\_toeslag\\_krijgen/partner/mijn-toeslagpartner](https://www.belastingdienst.nl/wps/wcm/connect/bldcontentnl/belastingdienst/prive/toeslagen/hoewerken/toeslagen/kan_ik_toeslag_krijgen/partner/mijn-toeslagpartner)

<sup>3</sup>There are exemptions to the rule, such as for persons under 18 who live alone and those in assisted living (Belastingdienst, 2016b).

<sup>4</sup>Allowances that amount to less than €24 a month are not allocated (Belastingdienst, 2016b). Note, entitlement does not mean the individual automatically receives housing allowance. An eligible individual must apply for it online and receives the allowance directly.

<sup>5</sup>The 2017 household categories have an important change from household categories from previous years. Namely, before 2017, the multi-person household, with a state pensioner (MP65+) used to be defined as a household with two or more people where more than half of the income is from a household member is of or above the pension age. In 2017, this definition has been changed such that this category now includes all multi-person household where at least one of the members is of or above the pension age.

Table 1: Household categories, in 2017

Type of Household	Description
Single-person household, non-AOW (EP)	Household consists of one person who was younger than the state pension age (65 years) on 1 January 2017.
Multi-person household, non-AOW (MP)	Household consists of only household members who are younger than the state pension age (65 years) on 1 January 2017.
Single-person household, AOW (EP65+)	Household consists of one person who was or older than the state pension age (65 years) on 1 January 2017.
Multi-person household, AOW (MP65+)	Household consists of multiple members, with at least one member who was or older than the state pension age (65 years) on 1 January 2017.

Adapted from “Informatieblad Huurtoeslag 2017” by Belastingdienst, 2016.

### 2.2.1 Income and Wealth Requirements

In order to receive housing allowance, a recipient’s household’s total income and wealth cannot be too high. As of 2006, the household income is estimated as the aggregated taxable income of the coming year of all household members, including the applicant, his/her partner, and other household members as well as children (Priemus & Haffner, 2017).<sup>6</sup> Table 2 provides the income limits for each household category in 2017.

Table 2: Income limits for housing allowance eligibility, by household category in 2017

Household Category	Income Threshold
Single-person household, under 65 years old (EP)	€22,200
Single-person household, over 65 years old (EP65+)	€22,200
Multi-person household, under 65 years old (MP)	€30,150
Multi-person household, over 65 years old (MP65+)	€30,175

Adapted from “Informatieblad Huurtoeslag 2017” by Belastingdienst, 2016.

<sup>6</sup>In 2017, for children who are younger than 23 on 1 January 2017, only income that is above €4,788 is included (Belastingdienst, 2016b). If a household member has negative income, it is deducted from the rest of the household income or the income is 0 if there is only one household member (Belastingdienst, 2016b).

Since the income of the coming year can be underestimated, housing allowance can be wrongfully allocated to recipients above the income limits. However, since these misallocations can be verified by the tax authorities, wrongfully allotted housing allowances are claimed back (Belastingdienst, n.d.). Nevertheless, this yields a complication to the RD design, which assumes there are no individuals above the income limit who receive housing allowance. However, there are a few recipients above the income limit. Even though these recipients eventually are required to pay back the allowance, they are still considered ‘noncompliers’ in this study. Additionally, there is also noncompliance below the income limit since other requirements restrict income eligible households from receiving housing allowance, and some households do not apply for the subsidy. These problems will be further addressed in the methodology, in Section 4.

As mentioned, households also cannot have too much wealth in order to be eligible for housing allowance. Previously, the amount of wealth allowed was dependent on the household category and income. As of 2016, the amount of wealth allowed is only dependent on the number of household members. Table 3 illustrates the wealth limits in 2017.

Table 3: Wealth limits for housing allowance eligibility in 2017

Applicant Situation	Maximum wealth as of 1 January 2017
Applicant with no allowance partner	€25,000
Applicant with allowance partner	€50,000
Applicant with a roommate	€25,000 for applicant; €25,000 for roommate

Adapted from “Informatieblad Huurtoeslag 2017” by Belastingdienst, 2016.

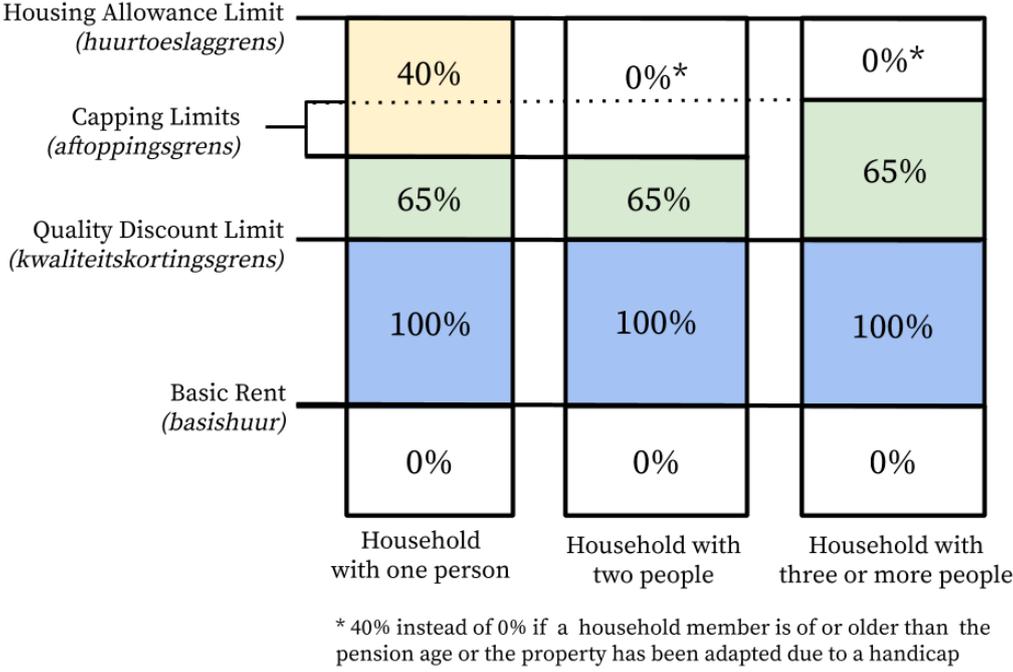
### 2.2.2 Rent Requirements and Amount of Allowance

Additionally, to be eligible for housing allowance, an applicant’s rent cannot be too low or too high. The amount of housing allowance allocated to an individual is estimated using a “gap formula”, where the housing allowance compensates the difference between the tenant’s actual rent and the rent that is considered sensible for the tenant (Turner & Elsinga, 2005). This is determined by a set of rent level limits.

Figure 3 illustrates how rent allowance is arranged. Firstly, the applicant’s rent must be above a basic rent level in order to receive housing allowance. This basic rent level (*basisshuur*) is calculated based on the household category and household income (Belastingdi-

enst, 2016a).<sup>7</sup> The following limit is the quality discount limit (*kwaliteitskortingsgrens*) (Belastingdienst, 2016a). Rent between the basic rent level and the quality discount limit is 100% reimbursed. The next limit is referred to as the capping limit (*aftoppingsgrens*) (Belastingdienst, 2016a). This limit depends on the number of people in the household, where the capping limit is slightly higher for households with three or more people. For rent between the quality discount limit and designated capping limit, the applicant can receive a reimbursement of 65%. Single-person households, households with a member of or older than the pension age, or households living on a property adapted for a handicap can receive a 40% reimbursement on rent between the designated capping limit and the housing allowance limit. The housing allowance limit is the same for all household types, except for individuals under 23 years old and without children, which have a lower maximal limit (Belastingdienst, 2016a). Individuals with a rent below the basic rent or above the housing allowance limit are not entitled to housing allowance. The total allowance is the sum of compensated amounts calculated between each level, which correspond to the shaded areas of a column in Figure 3.

Figure 3: Structure of housing allowance scheme



Adapted from “How to Redesign a Rent Rebate System? Experience in the Netherlands.” Priemus, H., Haffner, M., 2017. *Housing studies*, 32(2), 121–139.

<sup>7</sup>See Appendix A.2 for more detailed explanation of the housing allowance calculation

Since the basic rent is based on income, the calculation of housing allowance allows for a phasing out of subsidies as income increases. However, there is still a gap in benefits for individuals just above and just below the income limits. For instance, in theory, a single pension-aged individual with an income of €22,200 in 2017 and a rent of €700 would have a monthly allowance of €162.88, which would total to €1,954.56 per year. On the other hand, an individual, identical to the previous one except for having an income of €22,201, would not be entitled to any housing allowance. In principle, there is a discontinuity in housing allowance at the income limits that can be used in an RD design to elicit the effect of the policy on household behavior, which is further discussed in Section 4.

### **3 Literature Review**

Housing allowance is primarily intended to increase affordability and/or quality of housing for low-income households. However, this demand-side approach to housing policy can also have unintentional effects on the decision making of households and lead to economic inefficiencies. This study relates to the small international empirical literature concerning the effect of housing benefit policies on household decision making, and particularly provides novel insight on the impact of housing allowance on households in the Netherlands. This paper investigates household decisions that previous literature identify as possibly influenced by housing allowance schemes: housing consumption (Hyslop et al., 2018; Viren, 2013; Kangasharju, 2010; Eerola & Lyytikäinen, 2017; Laferrère & Le Blanc, 2004; Eriksen & Ross, 2015; Fack, 2006), home ownership (Chen & Enström Öst, 2005), and labour market decisions (Nordvik & Åhrén, 2005; B. A. Jacob & Ludwig, 2012; Ong, 1998). In addition to these factors, this study conducts a novel investigation of the effect of housing allowance on wealth. Notably, previous researchers have suggested the potential effect of housing allowance on these factors leads to economic inefficiencies, such as moral hazard, poverty trap, and inequality (Priemus & Haffner, 2017; Haffner & Boelhouwer, 2006).

#### **3.1 Housing Allowance and Housing Consumption**

Housing allowance affects housing consumption mainly by increasing the income of the recipient as well as making housing relatively cheaper. Thus, housing allowance has two main effects: income effect and substitution effect (Chen & Enström Öst, 2005; Öst, 2014). Additionally, housing allowance may affect housing consumption due to collusion between tenants and landlords (Priemus & Haffner, 2017).

### 3.1.1 Income and Substitution Effects

Firstly, given housing is a normal good, the income effect of housing allowance leads to more consumption of housing. In theory, since housing allowance makes the recipient richer, the recipient will increase all consumption, including housing. However, Fallis (1990) found that among low-income households in Canada, the income elasticity of housing demand is below one. Thus, an increase in income for low-income households does not tend to lead to a proportional increase in housing consumption. Additionally, since the amount of housing allowance received may change unexpectedly, households may not view it as a source of income (Öst, 2014). Thus, the strength of the income effect on housing consumption is uncertain. Secondly, the substitution effect of housing allowance also leads to more consumption of housing. A subsidy linked to housing consumption makes housing relatively cheaper to other consumption. Thus, the fall of the relative price of housing would lead to an increase in housing expenditure relative to consumption of other goods.

In sum, the income and substitution effect should both lead to allowance recipients consuming more housing, i.e. higher rent. The two effects, in theory, create a conflict between the intents of the policy: housing quality and housing affordability. On the one hand, increasing housing consumption could lead to higher quality housing. On the other hand, increasing housing consumption could lead to a higher proportion of the recipient's income spent on housing, thus reducing housing affordability. This can lead to "overconsumption" of housing, where households consume more housing than necessary (Priemus & Haffner, 2017). Therefore, it is important to know the impact of housing allowance on housing consumption to determine which, or if any, objective of the policy is being achieved.

The international empirical literature concerning the effect of housing allowance schemes on rents is small and ambiguous. However, it still can give possible insight to how housing allowance might affect rents in the Netherlands. Nevertheless, the external validity of these studies should be interpreted with caution since housing allowance policies and housing market environments differ greatly from country to country.

In the US, the government provides housing assistance for low-income families. Unlike the Dutch housing allowance, low-income families in the US are not entitled to the housing allowance. Instead, there are only a fixed number of housing vouchers per metropolitan area, which, for the most part, do not meet the demand for housing vouchers. Between 2000 and 2002, a large increase in the supply of vouchers created a significant variation of supply of vouchers between cities (Eriksen & Ross, 2015). Using this exogenous variation in supply of vouchers and individual unit and time fixed effects, Eriksen & Ross (2015) estimate the short-term effect of the housing voucher on individual rents. They find that the voucher increased

demand for higher-quality units, thus increasing housing consumption.

Furthermore, Hyslop et al.'s (2018) study of the New Zealand housing allowance policy uses a difference-in-difference method by taking advantage of an exclusive increase in the supply of housing benefits for one region to estimate the effect of the housing benefit on rents. They find that an increase in the rent subsidy leads to an increase in rental prices, especially at the top of the rent distribution and among families with children.

Studies considering the Finnish housing allowance scheme provide mixed results. Instrumenting housing allowance with a 2002 reform of the rent limits, Kangasharju (2010) finds that in the private sector, housing allowance led to an increase in rental prices. Using a Finnish panel data of 50,000 households and fixed effects, Viren (2013) also finds that housing allowance leads to higher rent prices. Other the other hand, using discontinuities in the amount of housing allowance per square meter, Eerola & Lyytikainen (2017) perform a Fuzzy RD and do not find discontinuities of rents near the allowance discontinuities.

### **3.1.2 Collusion between Landlord and Tenants**

While an increase in housing consumption could be due to the income and substitution effect, an increase in rents for recipients of housing allowance could also be due to collusion between tenants and landlords (Priemus et al., 2005). Since the government has imperfect information of what the reasonable rent should be for each individual situation, tenants and/or landlords may try to increase the rent to maximise the allowance. This is a moral hazard problem and can lead to landlords 'capturing' some of the allowance (Priemus & Haffner, 2017).

Studies concerning the French housing allowance scheme indicate that landlords do use housing allowances to maximize revenues (Laferrère & Le Blanc, 2004; Fack, 2006). Using French survey panel data of rental units, Laferrère & Le Blanc (2004) find that, on average, the growth of rent of a rental unit is higher in the case where the new renter receives housing allowance and the previous renter did not receive housing allowance.<sup>8</sup> Given that the quality of the rental unit does not change and the only difference between the previous and new renter is the housing allowance status, this study provides evidence that individual landlords in France secure part of the housing allowance. Fack (2006) uses a 1990s reform in France that extended housing allowance to previously non-eligible groups. Fack (2006) performs a difference-in-difference method to compare the difference in the change in rents before and after the reform between the group affected by the reform and the group not affected by the

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<sup>8</sup>compared to other cases where there is no change in receiving housing allowance or the new renter does not receive housing allowance.

reform. Fack (2006) finds that housing allowance does increase rents, where, *ceteris paribus*, for every additional euro of housing benefit, 78 cents is captured by the landlord as rent and 22 cents is kept by the household.

While housing associations in the Netherlands are suspected to maximize their revenues through rents (Priemus & Haffner, 2017), to my knowledge, there has not been an empirical study investigating this moral hazard problem concerning collusion between tenants and landlords in the Netherlands.

### **3.2 Housing Allowance and Home Ownership**

In the Netherlands, the income gap between renters and homeowners is increasing (Haffner & Boumeester, 2010). High income households are moving to the owning sector and lower income households are concentrating in the rental sector (Haffner & Boumeester, 2010). Consequently, the divergence of these two groups could be exacerbated by the housing allowance policy.

While the preference for home ownership depends on several non-financial and financial factors, the housing allowance policy may also influence ownership preferences. Low-income households may be motivated to prefer renting if they prefer to continue receiving housing allowance. This could create a “rental trap” (Chen & Enström Öst, 2005), where low-income households, who would have otherwise bought a home, continue renting to maintain housing allowance. This empirical analysis will investigate whether there is evidence for this postulation in the Netherlands.

To my knowledge, only one study has empirically analysed the interaction between housing allowance and tenure choice. Using Swedish administrative panel data, Chen & Enström Öst (2005) find that housing allowance increases the probability of a recipient being a homeowner. However, the Swedish housing allowance system provides housing allowance to both owner-occupied and rental housing. Whereas, the Dutch policy only targets rental housing. Additionally, their study only focuses on families with children and youths. Whereas, in the Netherlands, housing allowance is greatly administered to pensioners (Haffner & Boelhouwer, 2006). Therefore, the results of the Swedish system are not very indicative of the effect of the Dutch housing allowance on housing preferences.

Haffner & Boumeester (2010) suspect that housing policy instruments are affecting the choice of home ownership in the Netherlands. However, an empirical analysis is necessary to provide evidence of whether housing allowance affects home ownership preferences.

### 3.3 Housing Allowance and Labour Market Participation

The housing allowance program in the Netherlands is assumed to create a poverty trap (Priemus & Haffner, 2017; Ditch et al., 2001; Priemus & Kemp, 2004; Priemus et al., 2005). A poverty trap is when households strategically keep their income low because an increase in income would lead to a loss in welfare benefits. Since the housing allowance scheme relies on income limits, the policy is vulnerable to creating this poverty trap. There are several strategic ways for recipients to lower household income, such as choosing to work less, choosing to work part-time instead of full-time, and/or other household members, such as a partner or child, abstaining from employment. Additionally, evading taxes is another way for households to lower their income, however, this type of income manipulation is beyond the scope of this study.

If households are intentionally lowering their labour market participation, hence income, it also raises concerns for inefficiency, as funds are misallocated to households who should otherwise not be eligible for housing allowance. Such a misallocation of funds could lead to overspending (Priemus & Haffner, 2017). Since the government has imperfect information about a recipient's earnings ability, this is a moral hazard problem and individuals can potentially manipulate their situation to gain welfare benefits.

In addition, because this study uses an RD design, which relies on the random assignment of individuals just above and below the income limit, it is important to know whether individuals manipulate their income in order to be sorted below the income limit. Such sorting would make the RD estimates invalid since individuals being below or above the income limit would no longer be random. Thus, comparing the labour market participation of households as well as the distribution of households above and below the income limit provides some evidence of whether households are manipulating their income and thus sorting into the treatment group, i.e. receiving housing allowance.

There are a few empirical studies of the effect of housing allowance policies on labour supply. B. A. Jacob & Ludwig (2012) use a lottery for housing vouchers in Chicago, US as an instrument for the housing benefit. They find that housing vouchers decrease employment rates by roughly 4% and reduce quarterly earnings by \$329. Conversely, Ong (1998) finds a positive relationship between working hours and subsidized housing for female workers in California. However, Ong's (1998) study does not use exogenous variation in housing allowance and a causal interpretation cannot be elicited. Furthermore, Nordvik & Åhrén (2005) find a stable exit rate of 30 percent of housing allowance beneficiaries per year in Norway, indicating housing allowance does not create strong labour market disincentives.

It is ambiguous whether housing allowance has an effect on labour market participation in

the Netherlands. While van der Schaar & Kromhout (2007) find no negative association between the Dutch housing allowance on labour market participation, another study found that unemployed recipients of housing allowance do not search for work in fear of losing their housing allowance (Sociaal en Cultureel Planbureau & Centraal Bureau voor de Statistiek, 2001). Additionally, over a third of housing allowance recipients in the Netherlands are of pension age (Haffner & Boelhouwer, 2006). Thus, housing allowance may not have an extensive role on labour supply. Nevertheless, an identification strategy, such as an RD design used in this study, would provide a quasi-experimental evaluation of the causal effect.

### 3.4 Housing Allowance and Wealth

As mentioned, housing allowance also depends on a wealth limit. Similar to income, households may lower their savings in order to be eligible for housing allowance. There are numerous ways households can manipulate their wealth, such as choosing to consume more, donate, or gift money instead of save or invest. Such an effect on savings as well as home ownership would be unfavorable since it would imply that housing allowance creates a wealth gap between low-income households and high-income households. To my knowledge, this is the first study to analyze the effect of housing allowance on wealth.

## 4 Data

This study uses the 2015 and 2018 WoonOnderzoek (WoOn) datasets (2016; 2019), provided by the Ministry of Interior and Kingdom Relations (*ministerie van Binnenlandse Zaken en Koninkrijksrelaties*, BZK) and Statistics Netherlands (*Centraal Bureau voor de Statistiek*, CBS).<sup>9</sup> WoOn is primarily conducted to illustrate the state of the Dutch housing market as well as support housing policy evaluation (BZK/CBS, 2019). Every three years, the WoOn surveys a random sample of over 60,000 Dutch households with a questionnaire covering several topics, including housing affordability, moving behavior, and quality of life (BZK/CBS, 2019). Furthermore, the survey is linked with administrative registrations to provide detailed information about the current living environment as well as the household's finances, income, and housing costs (BZK/CBS, 2019).<sup>10</sup> This data provides sufficient information to employ

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<sup>9</sup>Data accessed via <https://easy.dans.knaw.nl/>, once permission granted.

<sup>10</sup>The WoOn links the survey data with: the Personal Records Database (*Basisregistratie Personen*, BRP), the tax authorities, WOZ registration, and basic registration of address (*Basisregistratie Adressen*, BAG) (BZK/CBS, 2019). These data sources provide household information on demographic characteristics, housing benefits, income, and wealth of the household as well as property characteristics. Note that for instance, the dataset is '2015 WoOn' but administrative data is from 2014, thus, the eligibility rules from 2014 are employed.

the RD design as well as to form outcome variables concerning household preferences and decisions.

Because this study considers a social benefit only applicable to renters, the sample is restricted to tenants only. Additionally, only single-person and family households are included in the sample for two reasons.<sup>11</sup> Firstly, the dataset only provides sufficient information about ages for the respondent, partner, and children. It is necessary to know the ages of the members of the household to distinguish whether there is a household member of or older than the pension age.<sup>12</sup> Secondly, the data is at the household level, while housing allowance is given at the individual level. Since families and single-person households only have one application for housing allowance, this ensures there is only one treatment assignment for each household. Therefore, the treatment assignment is effectively at the household level. After restricting the sample under these conditions, the subsample consists of 38,158 observations. Since this study uses a RD design, the subsample is further reduced to a sample of observations near the income limit.

In this section, there is a description of the outcome variables, as well as a description of the treatment and eligibility variables used in this study.<sup>13</sup> Lastly, a few descriptive statistics are provided.

## 4.1 Outcome Variables

There are four main household behavior outcomes: housing consumption, tenure choice, labour market participation, and wealth. Each outcome is measured with one or more indicators.

### 4.1.1 Housing Consumption

There are a few indicators of housing consumption that are considered in this study. Firstly, the amount spent on housing is considered, in terms of total rent and total housing costs (Eriksen & Ross, 2015; Hyslop et al., 2018). This will provide evidence of whether housing allowance causes overconsumption if, *ceteris paribus*, households with housing allowance tend to spend, overall, more on rent and/or housing expenses. Secondly, the quality of housing is examined, in terms of the number of rooms and the area of the current house in square meters (Viren, 2013). These indicators will provide evidence if housing allowance nudges recipients

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<sup>11</sup>Families are considered: couples, couples with children, or single-parent households.

<sup>12</sup>Note that households with a 65 year old household member at the time of the 2015 (2018) study are assumed to have turned 65 years old before the 1 January 2014 (2017). See Appendix B.3. for more details.

<sup>13</sup>Further detailed explanations of the variables are provided in Appendix B.

to rent higher quality living spaces. Lastly, the rent per square meter is evaluated (Laferrère & Le Blanc, 2004; Eerola & Lyytikäinen, 2017; Fack, 2006; Viren, 2013; Kangasharju, 2010), which may provide some evidence of whether housing allowance is shifted into the rent price, and possibly shifted to landlords.

#### **4.1.2 Preference for Home Ownership**

To elicit a household's preference for home ownership, this study uses survey questions concerning the respondent's preferred future accommodations.<sup>14</sup> Using questions related to the respondent's preferences for moving and future residence, a variable is created which indicates whether a family prefers to own a home or continue renting within the next two years. Figure B.1 describes the formulation of this preference for home ownership variable.

#### **4.1.3 Labour Market Participation**

Labour market participation of the household is measured with the aggregate number of working hours per week of the household as well as a binary variable for whether the household breadwinner's partner has a personal income. Working hours is calculated by summing the self-reported working hours of the respondent and partner. Naturally, as income increases, the number of working hours should increase as well. Meaning, households above the income limit will most likely have more working hours than households below the income limit. However, significant jumps in the supply of household labour at the income limit may indicate that households reduce their labour supply to be eligible for housing allowance. Additionally, examining the employment status of the main breadwinner's partner as an outcome variable may also be informative of whether housing allowance affects household labour supply.

#### **4.1.4 Wealth**

Administrative data concerning total assets and savings balances is used to measure the wealth of the household.<sup>15</sup> Total assets include all assets filed in the household's taxes, which is the same measure used by the tax authorities for allocating housing allowance. Furthermore, savings balances in the bank are analyzed to determine whether housing allowance affects saving behavior specifically. If housing allowance does affect wealth, one would expect totals

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<sup>14</sup>Note, this assumes that the preferences of the respondent match the preferences of the household.

<sup>15</sup>While this paper only considers this outcome to the extent of assets and savings, future research could also identify the effect of housing allowance on wealth accumulation by alternatively examining household consumption, donations, or money gifts. The data used in this study does not allow for this type of investigation.

assets and savings to be lower for housing allowance recipients, *ceteris paribus*, due to the eligibility rules.

## **4.2 Eligibility and Housing Allowance Variables**

To determine whether households are eligible for housing allowance, the household category of the household must be known to designate the correct income limit. Appendix B.3 illustrates how household categories are defined with the WoOn data. Using the taxable income of the household, households are classified as eligible and non-eligible depending if their taxable income is below or above their respective income limit.

To determine whether a household receives housing allowance, this study uses the survey questions linked to administrative data to determine whether the respondent received housing allowance or not (Janssen, 2019). Furthermore, the amount of housing allowance received per month is also used as a continuous treatment variable.

## **4.3 Sample Statistics**

Table 4 provides some sample statistics of renting households near the income limit in the study. Note, no causal interpretation can be drawn from these statistics, however, they do indicate that eligible households below the income limit on average have a significantly higher probability of receiving housing allowance, higher average amount of housing allowance, lower average total housing costs, lower average total household working hours per week, as well as slightly lower average savings in the bank compared to non-eligible households above the income limit.

Table 4: Sample statistics of renting households near the income limit

	Eligible	Not Eligible	p	N
<b>Housing allowance (HA)</b>				
<i>receiving HA (%)</i>	48.60	10.93	***	4,080
<i>amount of HA, per month (€)</i>	58.17	16.82	***	4,080
<b>Housing consumption</b>				
<i>rent per month, not incl. HA (€)</i>	534.27	540.08		4,080
<i>housing costs, incl. HA (€)</i>	641.13	688.77	***	4,080
<i>area of house (m<sup>2</sup>)</i>	86.46	87.18		4,304
<i>number of rooms</i>	3.34	3.39		4,274
<i>rent/m<sup>2</sup> (€)</i>	6.86	6.83		4,080
<b>Home ownership</b>				
<i>preference for home ownership (%)</i>	0.08	0.09		4,039
<b>Labour market participation</b>				
<i>working partner</i>	0.85	0.87		1,348
<i>working hours/week</i>	11.62	14.29	***	2,073
<b>Wealth</b>				
<i>total assets (€)</i>	27,643.51	28,738.90		4,300
<i>savings (€)</i>	19,445.64	21,819.75	**	4,283

Data Source: BZK/CBS (2016, 2019). Only observations with a relative income (household income - income limit) between  $\pm \text{€}2,000$ . p represents the statistical significance of the difference between the means of the eligible and non-eligible group. \*, \*\*, \*\*\* Statistically significant at the 10%, 5%, 1% level, respectively. *receiving HA* is 1 if household receives housing allowance, 0 if not. *preference for home ownership* is 1 if the respondent prefers home ownership and 0 if not. *working partner* is 1 if the partner of the household main breadwinner has an income, and 0 if not. *working hours/week* is the total working hours per week of the respondent and partner.

## 5 Empirical Methodology

As reported in Section 2, housing allowance is not randomly assigned and granted exclusively to low-income renting households. Thus, an ordinary least squares (OLS) regression is not an appropriate method to find the causal effect of housing allowance on household decision making because housing allowance is arguably endogenous to unobservable factors related to having a low-income. However, the eligibility rules, as described in Section 2, provide an opportunity to use a regression discontinuity (RD) design, an alternative identification strategy to extract the causal effect of housing allowance. This section provides an explanation of this identification strategy and checks whether the use of an RD design in this study is internally valid.

### 5.1 Regression Discontinuity Design

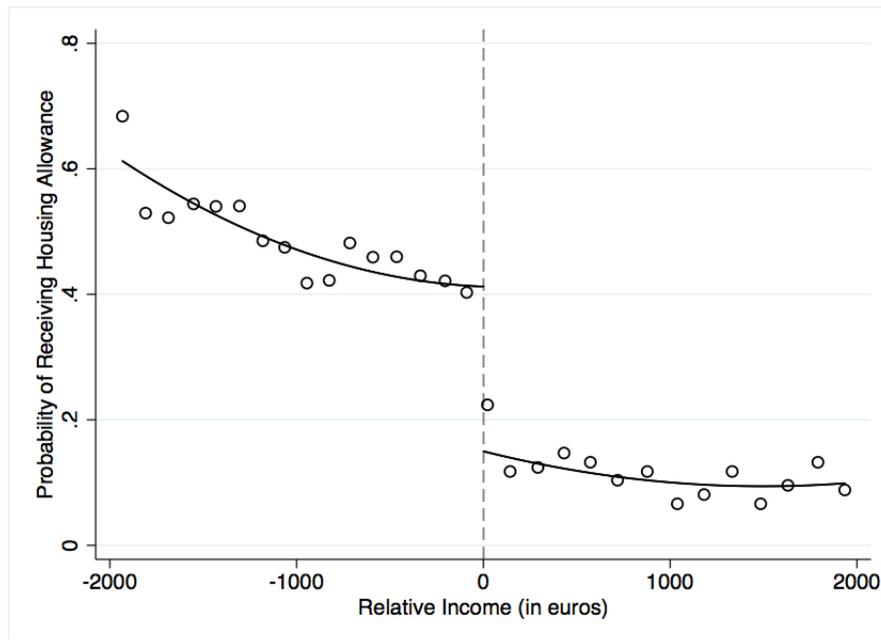
A regression discontinuity design is a quasi-experimental design developed by Thistlethwaite & Campbell (1960) that exploits a cut-off assignment rule to compare individuals just above and below a cut-off, which assigns treatment. This cut-off assignment rule restricts treatment to a certain group based on a rating or level, such as test scores or income (Lee & Lemieux, 2010). Thus, the RD design is a credible and useful method to elicit welfare program effects since the cut-off rule makes the treatment exogenous to unobservables (Lee & Lemieux, 2010). Because the Dutch housing allowance policy uses a cut-off, i.e. income limits, to assign housing allowance, the policy is a candidate for an RD design.

The RD design is an appealing strategy to elicit causal effect because it relies on relatively “mild” assumptions, compared to other empirical approaches (Lee & Lemieux, 2010). Firstly, in order for the RD approach to be valid, being above or below the cut-off for individuals near the cut-off is effectively random. Meaning, households can have some control over their income, but they cannot *precisely* manipulate their income to be exactly below the income limit. If this is the case, then being assigned housing allowance is no longer random near the income limit, and the RD estimates are no longer valid. This study tests the validity of the RD, in this respect, in Section 5.2 as well as in Section 6 when examining labour market participation near the income limit.

Secondly, there must be a discontinuity in the probability of receiving housing allowance at the income limit. Meaning, individuals under the income limit have a different probability of receiving housing allowance than individuals above the income limit. Ideally, if all individuals below the limit receive allowance, and all individuals above the limit do not, one would use a Sharp RD design. However, as illustrated in Figure 4, there are households below the limit

who do not receive allowance and a few households above the limit that do. The probability of receiving housing allowance gradually declines up to the limit. This is most likely due to some households below the limit either not being eligible under the other criteria or not applying for the allowance. Above the limit, the probability of receiving housing allowance drops significantly but not to zero, which is probably due to a few households above the limit underestimating their income when applying for housing allowance. Nevertheless, there is still a visible discontinuity of probability of receiving housing allowance at the income limit.

Figure 4: Discontinuity in receiving housing allowance at income limit



Data Source: BZK/CBS (2016, 2019). Figure 4 uses a subsample of 4,080 observations with a relative income (difference between household income and the income limit of the individual's household category) between -2000 and 2000, which are contained in 30 equally-sized averaged bins. The quadratic fitted lines are estimated separately: (i) for the observations below the cut-off and (ii) for the observations above the cut-off.

### 5.1.1 Fuzzy Regression Discontinuity Design

Because the probability of housing allowance does not exactly jump from 1 to 0 at the income limit, a Fuzzy RD design, developed by Hahn et al. (2001), is more appropriate for this study because this method accommodates for individuals in the sample who do not follow the eligibility rules. The Fuzzy RD design, allows for the discontinuity to deviate from the one for Sharp RD design. For instance, the probability of receiving housing allowance is (Lee

& Lemieux, 2010):

$$Pr(A_{iht} = 1 | R_{iht} = r) = \eta + \gamma E_{iht} + g(r - 0), \quad (1)$$

where  $A_{iht} \in \{0, 1\}$  equals 1 if household  $i$  in household category  $h$  from survey year  $t$  receives housing allowance and is 0 otherwise,  $R_{iht}$  is relative income, i.e. the running variable,<sup>16</sup> and  $E_{iht} \in \{0, 1\}$  is income eligibility, as defined as:

$$E_{iht} = \begin{cases} 1 & : R_{iht} \leq 0 \\ 0 & : R_{iht} > 0 \end{cases}; \quad (2)$$

the Sharp RD design only works if  $\eta$  and  $g(\cdot)$  are 0 and  $\gamma$  is 1 in Equation 1, such that  $Pr(A_{iht} = 1 | R_{iht} = r) = E_{iht}$  (Lee & Lemieux, 2010). Whereas, the Fuzzy RD design allows  $\eta$  and  $g(\cdot)$  to deviate from 0 and  $\gamma$  to deviate from 1 in Equation 1. For the Fuzzy RD design, it is only necessary that the probability of receiving housing allowance differs across the income limit (Lee & Lemieux, 2010), such that:

$$\lim_{e \uparrow 0} Pr(A_{iht} = 1 | R_{iht} = 0 + e) \neq \lim_{e \downarrow 0} Pr(A_{iht} = 1 | R_{iht} = 0 + e). \quad (3)$$

One caveat of the Fuzzy RD design is that the estimation does not elicit the average treatment effect (ATE), but the *local* average treatment effect (LATE). Firstly, the ATE is local because the RD design only focuses on a sample of individuals near the cut-off. Therefore, the RD estimates are not the ATE of the whole sample population, but only of the sample near the cut-off. Secondly, the ATE is local because not all individuals in the sample follow the treatment assignment, so the estimated effects only affect a portion of the sample that comply to the assignment treatment, i.e. the compliers. Thus, the Fuzzy RD design is similar to the instrumental variable (IV) approach (Lee & Lemieux, 2010), as the LATE derived from the fuzzy RD design is only for *compliers* near the income limit. To estimate the LATE, a two-stage least square (2SLS) regression is estimated, which consists of two main components: the first and second stage.

The first stage is essentially the relationship between the observed treatment (receiving housing allowance) and the treatment assignment (income eligibility), written as:

$$A_{iht} = \alpha_1 + \lambda E_{iht} + f(R_{iht}) + \rho_1 X'_{iht} + \tau_1 C'_{ht} + \gamma_1 T_t + \mu_{1ih}, \quad (4)$$

where  $\alpha_1$  is a constant,  $f(R_{iht})$  is a function of relative income,  $X'_{iht}$  is a vector of background

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<sup>16</sup>Relative income is the difference between the income limit  $L_{ht}$  and the household income  $I_{iht}$ ,  $L_{ht} - I_{iht}$ . This allows the household categories to be aggregated since they use different income limits.

characteristics,<sup>17</sup>  $C'_{ht}$  is a vector of binary controls for the household categories<sup>18</sup>,  $T_t$  is a binary control for year, and  $\mu_{1ih}$  is the error term. Ideally, one would use different estimate relationships between relative income and receiving allowance for each side of the cut off by including an interaction term between eligibility and relative income,  $E_{iht} \cdot f(R_{iht})$ . However, to employ the 2SLS method, the same functional form of  $R_{iht}$  is used on both sides (R. Jacob et al., 2012).

The second stage is the relationship between the outcome variable,  $Y_{iht}$ , and the treatment variable,  $A_{iht}$ , written as:

$$Y_{iht} = \alpha_2 + \beta \hat{A}_{iht} + f_r(R_{iht}) + \rho_2 X'_{iht} + \tau_2 C'_{ht} + \gamma_2 T_t + \mu_{2ih}, \quad (5)$$

where  $\alpha_2$  is a constant,  $\hat{A}_{iht}$  is receiving housing allowance,  $A_{iht}$ , instrumented by income eligibility,  $E_{iht}$ ,  $f_r(R_{iht})$  is a function of relative income, and  $\mu_{2ih}$  is the error term. If income eligibility is a valid instrument for receiving housing allowance, then  $\beta$  is the LATE of housing allowance on the outcome variable, i.e. the treatment effect of housing allowance for compliers near the income limit.

Additionally, the reduced form is estimated. The reduced form is a component of the 2SLS regression, which is the relationship between the outcome variable,  $Y_{iht}$ , and the treatment assignment,  $E_{iht}$ , written as:

$$Y_{iht} = \alpha_0 + \theta E_{iht} + g(R_{iht}) + \rho_0 X'_{iht} + \tau_0 C'_{ht} + \gamma_0 T_t + \mu_{0ih}, \quad (6)$$

where  $\alpha_0$  is a constant,  $g(R_{iht})$  is a function of relative income, and  $\mu_{0ih}$  is the error term.  $\theta$  is also known as the ‘intent-to-treat’ (ITT) effect, which in the case of full compliance, it would be the treatment-on-the-treated (TOT) effect. Note,  $\theta = \beta\lambda$ , such that the LATE estimate,  $\beta$ , is the reduced form estimate,  $\beta\lambda$ , divided by the first stage estimate,  $\lambda$ .<sup>19</sup>

Like the IV estimate, the following assumptions must hold in order for the Fuzzy RD to be valid: (i) receiving housing allowance is determined by income eligibility (meaningful first stage), (ii) the assignment of treatment is as good as random (independence), (iii) income eligibility does not affect the outcome variables other than through housing allowance (exclusion restriction), and (iv) there are no defiers, i.e. individuals do not defy the assignment rule for the sake of defying the rule (monotonicity) (Lee & Lemieux, 2010).

<sup>17</sup>Background characteristic controls only included in the robustness check.

<sup>18</sup>There are 8 binary household category controls in total, four for each year. Include binary controls when aggregating household categories since household categories face different income limits

<sup>19</sup>see Appendix C for proof. Assumes the same bandwidth is used for Equation 4 and 6 and the same functional form is used for  $g(\cdot)$  and  $f(\cdot)$  (Lee & Lemieux, 2010).

### 5.1.2 Heterogeneous Effects

As mentioned in section 2, each household category has a different income limit and housing allowance is calculated using different parameters. This can lead to different effects of housing allowance on behavior for each household category. Therefore, each household category will also be analyzed individually.<sup>20</sup>

Illustrated in Figures D.1-D.4, the magnitude of the discontinuities in receiving housing allowance do indeed vary. Notably, in Figure D.1 and D.3, there seems to be more noncompliers above the income limit for the non-pension subsamples. A possible explanation for the differences in severity of noncompliance above the income limit could be that non-pension households do not as easily foresee what their income will be for the next year, assuming working wages are more volatile than pension earnings. Thus, when applying for housing allowance, non-pension households cannot estimate their income for the year accurately due to unexpected changes in earnings throughout the year, leading to an underestimate of income during the application process. Nevertheless, this possible explanation is only speculative.

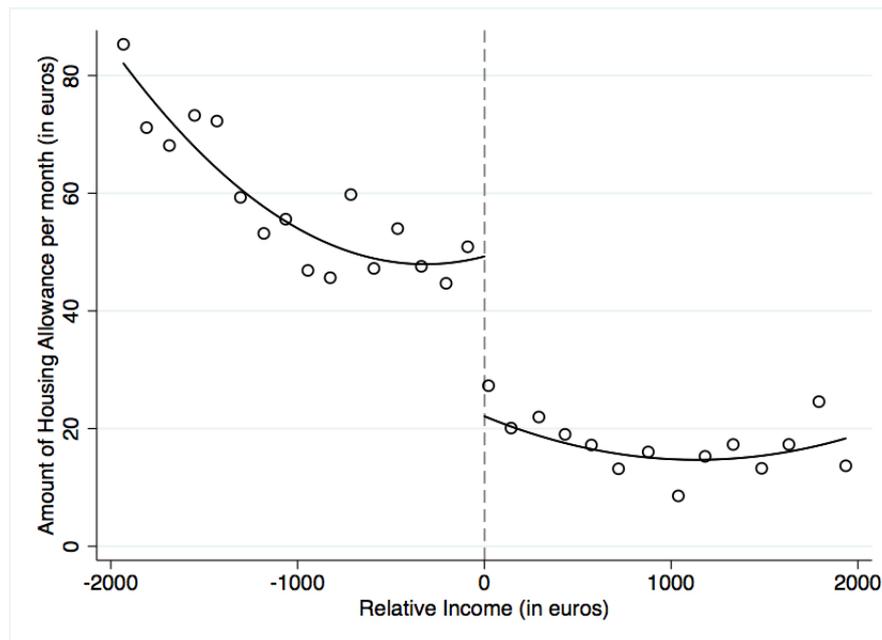
### 5.1.3 Continuous Treatment Variable

In addition to using a binary treatment variable for housing allowance, this study also considers the amount of housing allowance received per month,  $H_{iht}$ , as a continuous treatment variable. In this case, the amount of housing allowance per month is instrumented and estimated just as the binary treatment variable,  $A_{iht}$  (Lee & Lemieux, 2010). This continuous treatment variable could be informative to how much an increase in the amount of housing allowance affects different outcomes. Figure 5 illustrates that there is indeed a discontinuity in the amount of housing allowance at the income limit, however, this discontinuity does not appear to be as large as the discontinuity of the binary treatment variable. This is partially explained by the way the amount of allowance reduces with income. Furthermore, this discontinuity differs between household categories, as seen in Figures D.5-D.8.

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<sup>20</sup>The estimation equations for these analyses are identical to Equations 4-6, albeit the vector of binary controls for household category,  $C'_{ht}$ , is removed.

Figure 5: Discontinuity in amount of housing allowance (per month) at income limit



Data Source: BZK/CBS (2016, 2019). Figure 5 uses a subsample of 4,080 observations with a relative income (difference between household income and the income limit of the individual's household category) between -2000 and 2000, which are contained in 30 equally-sized averaged bins. The quadratic fitted lines are estimated separately: (i) for the observations below the cut-off and (ii) for the observations above the cut-off.

## 5.2 Internal Validity

As mentioned, in order for the RD design to be valid receiving housing allowance must be as good as random around the income limit and individuals cannot have precise control over their income. Thus, an examination of the continuity of background characteristics and McCrary's sorting test are presented in this section to establish whether a RD design is suitable for this study in this respect. The RD design is found to be indeed valid for this study since background characteristics tend to be balanced around the cut off and sorting is not detected at the income limits for all but one household category.

### 5.2.1 Continuity of Background Characteristics

To check whether receiving housing allowance is as good as random near the income limit, one can analyze the continuity of background characteristics near the income limit.

Since background characteristics should not be affected by receiving housing allowance, there should not be discontinuities of these variables at the income limit.

In order to perform this analysis, it is necessary to first focus on a sample near the income limit, i.e. choose a bandwidth. The bandwidth is the range of relative income near the income limit, which will be examined for the LATE analysis. For this analysis and the main estimation results, I employ different optimal bandwidths for each subsample.<sup>21</sup>

To test the continuity of the observable characteristics, t-tests are performed to inspect whether there is a statistically significant difference between the average above the income limit and the average below the income limit.<sup>22</sup> Table D.1 provides the results of the continuity checks of background characteristics for all household categories and each household category separately. Overall, most of the background characteristics are continuous along the income limit. However there are a few significant differences. It is important to note that some of these background characteristics could potentially be affected by housing allowance. For instance, a household's choice to live in a certain region, in social housing, and/or in an urban area could potentially be affected by housing allowance. If housing allowance itself is affecting these choices, then differences in these factors across the income limit do not raise concern for selection bias. However, differences in ethnicity, education, and children across the income limit is concerning since these factors are not a consequence of eligibility, therefore housing allowance is possibly endogenous to these factors. As a further check of the continuity of background characteristics, in the robustness check, all of the background characteristics will be controlled for to make sure any differences in the outcome variables are due to the housing allowance effect and not due to correlation between housing allowance and background characteristics. If the estimated effect of housing allowance significantly changes once these factors are controlled for, then it cannot be concluded that the households are sufficiently random around the income limit.

### **5.2.2 McCrary's Sorting Test**

A straightforward method to test the precision of households' control over their income is to examine whether the density of income is continuous along the income limit with the density test developed by McCrary (2008) (Lee & Lemieux, 2010). A discontinuity of the density at the income limit is indicative of sorting/bunching at the income limit (Lee & Lemieux, 2010). If there is evidence of sorting near the income limit, then the RD design is no longer appropriate because individuals are essentially choosing their treatment status. This is not

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<sup>21</sup>See Appendix E for further explanation of how optimal bandwidths are selected.

<sup>22</sup>An alternative strategy would be to plug in the background characteristics as the outcome variable in Equation 6.

only an important test for the RD design, but also to see if housing allowance is establishing a poverty trap such that households are intentionally keeping their income low.

Table 6 provides the discontinuity estimates of the McCrary test and Figures 6 and 7 as well as Figures D.9-D.12 provide the corresponding density plots.<sup>23</sup> The null hypothesis is that there is no discontinuity in the density at the income limit (McCrary, 2008). The results of the test indicate there is indeed sorting at the income limit. Meaning, there are more people just below the income limit than just above the income limit. Sorting makes the RD design an inappropriate identification strategy since housing allowance is no longer effectively random. However, after testing each household category separately, there is evidence for only one group sorting at the income limit: single, non-pension (EP) households. The discontinuity estimate for the EP subsample is more than twice as big as the discontinuity estimates for the other household categories. This might be a results of income flows being easier to manipulate for one person without a pension, compared to household with multiple income sources and/or fixed pensions. Thus, the EP households could have more precise control over their income, compared to other household categories, however, this reasoning is only speculative. After removing the EP households, the discontinuity estimate is no longer statistically different from 0 and there is no visible discontinuity, as seen in Figure 7. Thus, the aggregated sample used in the results does not include EP households and EP households will not be investigated separately due to sorting.

While the McCrary test indicates EP households are an inappropriate sample to use in this study, the results of the test are an important finding since this raises concerns that some EP households strategically maintain their income below the limit. Meaning, there is indication that the housing allowance policy possibly creates a poverty trap for EP households. To further investigate how EP households might manipulate their income, the analysis of the influence of housing allowance on labour market participation still includes EP households.

Lastly, it is important to note that the McCrary test determines whether a *lack* of sorting at the income limit can be ruled out, but passing the test does not inherently imply there is no sorting at all. Because income limits are decided beforehand and potentially known by the households, it is still possible that sorting does occur. Thus, alongside EP households, the other households' labour market participation will be investigated as well.

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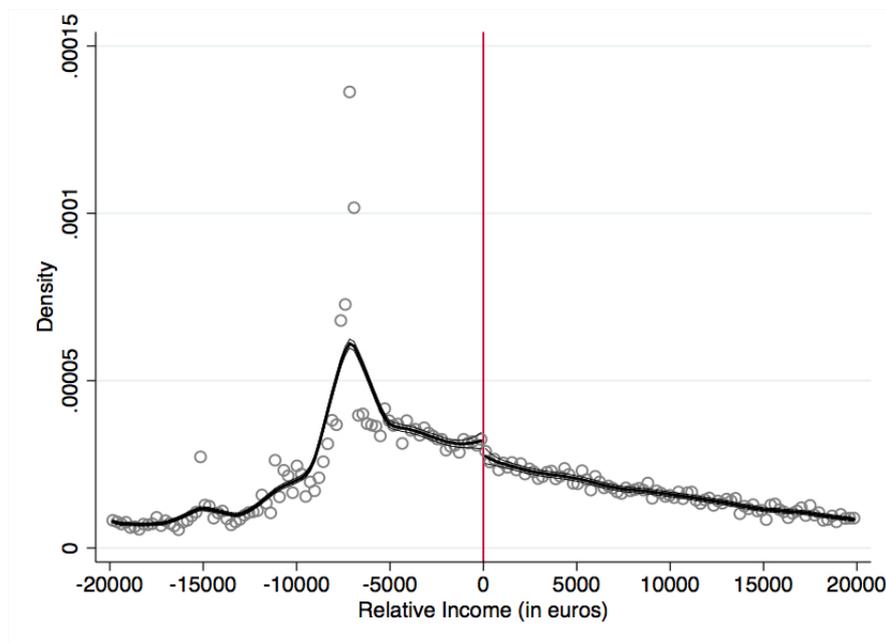
<sup>23</sup>Calculations are generated following the code by McCrary (2008), the DCdensity STATA package.

Table 6: McCrary sorting test, estimating log differences in density heights at the income limit, by household category

	Binwidth	Bandwidth	Discontinuity Estimate	Standard Error	T-value
All	234.80	2000	-0.14	0.06	-2.20*
EP	294.11	3000	-0.29	0.10	-2.96*
EP65+	215.25	1500	0.14	0.13	1.03
MP	646.94	4500	-0.13	0.11	-1.19
MP65+	400.86	1500	-0.04	0.17	-0.24
All, without EP	319.27	2000	-0.06	0.08	-0.71

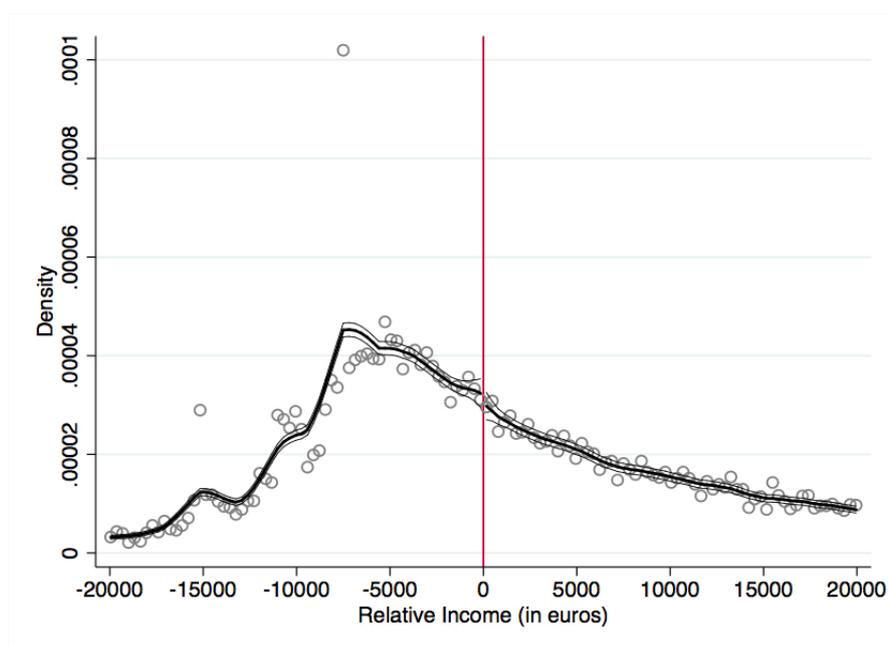
Data Source: BZK/CBS (2016, 2019). An absolute T-value above 1.96 means one can reject the null that there is not a discontinuity in the density, i.e. there is sorting, indicated by \*. Binwidths implemented are determined by calculations by McCrary (2008). EP = single, non-pension households, EP65+ = single, pension households, MP = multi-person, non-pension households, and MP65+ = multi-person, pension households.

Figure 6: Density plot of relative income, all household categories



Data Source: BZK/CBS (2016, 2019). Relative incomes between -€20,000 and €20,000 plotted.

Figure 7: Density plot of relative income, all household categories without EP households



Data Source: BZK/CBS (2016, 2019). Relative incomes between  $-\text{€}20,000$  and  $\text{€}20,000$  plotted. EP = single, non-pension households.

## 6 Results

This section presents the results of the regression analysis using the Fuzzy RD model explained in Section 5. Firstly, first stage estimates, using Equation 4, are presented with various polynomial orders. As mentioned in Section 5, similar to IV, in order for the Fuzzy RD to be viable, there has to be a meaningful first stage. Accordingly, reduced form and second stage estimates will only be estimated for models with a meaningful first stage. Secondly, reduced form estimates, using Equation 6, and second stage estimates, using Equation 5, are presented for each outcome variable. Lastly, the results are estimated with controls and with a smaller bandwidth as robustness checks.

### 6.1 First Stage and Polynomial Order

For a Fuzzy RD design, it is crucial for the first stage to be ‘strong’, as this corresponds to a discontinuity in the probability of receiving housing allowance (or amount of housing allowance received per month) at the income limit (Lee & Lemieux, 2010). As a rule of thumb, the F-statistic of the instrument,  $E_{ih}$ , in the first stage regression should be greater than 10, to make sure the instrument is not weak (Staiger & Stock, 1994).<sup>24</sup> Thus, only first stage models with an F-statistic greater than 10 are used in the reduced form and second stage estimations.

The visual inspection of the relationship between relative income and the housing allowance measures indicates nonlinearity. Thus, different functional forms of the relative income,  $f(R_{ih})$ , are tested in the first stage to decide, which form of the function fits the data the best (Lee & Lemieux, 2010). Here, the Akaike information criterion (AIC) approach is used, which considers the trade-off between bias and variance of using higher polynomial functions (R. Jacob et al., 2012). Simply, the model with the smallest AIC value fits the data the best, compared to the other models tested (R. Jacob et al., 2012).<sup>25</sup> One caveat of using this approach for an RD design is that the test does not take into account that having a small bandwidth and using a higher order polynomial for the relative income can lead to inaccurate estimations, since the data could be ‘overfitted’ (Lee & Lemieux, 2010). As suggested by Lee & Lemieux (2010), with consideration of the bandwidths used in this study, only lower order polynomials, i.e. linear and quadratic, are tested. The first stage models with the lowest AIC

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<sup>24</sup>The F-test, which derives the F-statistic, tests whether the coefficient for the instrument, income eligibility, in the first stage regression is statistically different from 0.

<sup>25</sup>Note, this procedure is only capable of comparing models and does not indicate how well the model fits the data, in general.

will be used in the corresponding second stage models.<sup>26</sup>

Table 6 provides the first stage results using Equation 4 for the aggregated subsample and the household categories individually. For the aggregated subsample, income eligibility is a viable instrument for the probability of receiving housing allowance and the preferred model is quadratic.

Corresponding with Figures D.1-D.4, there is indeed a significant relationship between income eligibility and the probability of receiving housing allowance for all of the household categories, though the strength of the instrument and the estimated discontinuity differ between the household categories. In sum, the effect of receiving housing allowance on household behavior will be estimated for the aggregated subsample, and all of the household subsamples, except for EP households due to sorting. A quadratic function of relative income will be used for the estimations for the aggregated sample as well as for the EP, single, pension (EP65+), and multi-person, non-pension (MP) subsamples, while the preferred function of relative income for the multi-person, pension (MP65+) subsample is linear.

The first stage results using the continuous treatment variable, the amount of housing allowance received per month, show that income eligibility is only a viable instrument for the aggregated sample and the EP and EP65+ households and the preferred function of relative income is quadratic. Thus, only the aggregated sample and the EP65+ subsample with a quadratic function of relative income are used to test the effect of the amount of housing allowance on household behavior. In addition, the effect of the amount of housing allowance on labour market participation will be estimated for EP households.

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<sup>26</sup>As noted in Section 5, the first and second stage in this study will have the same functional form. This could also be done by choosing the lowest AIC value in the second stage. However, because there are multiple outcome variables tested, for simplicity, the polynomial order is chosen based off of the first stage results.

Table 6: First stage estimates: the relationship between income eligibility and housing allowance measures

	ALL <sup>†</sup>		EP		EP65+		MP		MP65+	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dependent variable: receiving housing allowance										
eligibility	0.19*** (0.03)	0.22*** (0.03)	0.28*** (0.04)	0.30*** (0.04)	0.23*** (0.05)	0.24*** (0.05)	0.22*** (0.05)	0.22*** (0.05)	0.22*** (0.06)	0.22*** (0.06)
F-stat	<b>51.55</b>	<b>56.49</b>	<b>49.10</b>	<b>56.86</b>	<b>23.04</b>	<b>25.48</b>	<b>22.70</b>	<b>22.94</b>	<b>12.68</b>	<b>13.21</b>
AIC	3,044.24	<u>3,032.80</u>	1,874.88	<u>1,860.38</u>	1,039.40	<u>1,037.76</u>	1,688.02	<u>1,684.42</u>	<u>642.81</u>	644.22
Dependent variable: amount of housing allowance										
eligibility	17.75*** (4.65)	19.10*** (4.58)	20.43*** (6.77)	23.32*** (6.63)	22.33*** (6.86)	23.56*** (6.64)	14.23* (8.30)	14.30* (8.24)	14.87** (8.25)	15.00** (8.21)
F-stat	<b>14.54</b>	<b>17.42</b>	9.09	<b>12.37</b>	<b>10.60</b>	<b>12.59</b>	2.94	3.01	3.25	3.34
AIC	32,365.63	<u>32,338.66</u>	19,468.32	<u>19,446.30</u>	11,330.42	<u>11,322.41</u>	17,059.79	<u>17,053.62</u>	<u>7,144.08</u>	7145.85
Bandwidth ( $\pm$ )	2,000	2,000	3,000	3,000	1,500	1,500	4,500	4,500	1,500	1,500
Category controls	Yes	Yes	No	No	No	No	No	No	No	No
Polynomial order	Linear	Quadratic	Linear	Quadratic	Linear	Quadratic	Linear	Quadratic	Linear	Quadratic
<i>N</i>	2,901	2,901	1,720	1,720	1,038	1,038	1,467	1,467	662	662

Data Source: BZK/CBS (2016, 2019). Estimated using Equation 4. \*, \*\*, \*\*\* Statistically significant at the 10%, 5%, 1% level, respectively. Heteroskedasticity robust standard errors are reported in parentheses. F-statistics on the coefficient for the instrument, income eligibility, are in bold when greater than 10. Lowest AIC value of the sample group underlined. Bandwidths with respect to relative income. All estimated regressions include a constant, function of relative income, and a control for year. Polynomial order in reference to function of relative income. Six binary category controls for EP65+, MP, and MP65+ for each year, one omitted. Receiving housing allowance is 1 if household receives housing allowance, 0 if not. Amount of housing allowance is in euros per month. EP = single, non-pension households, EP65+ = single, pension households, MP = multi-person, non-pension households, and MP65+ = multi-person, pension households.

<sup>†</sup> 'ALL' does not include EP households.

## 6.2 The Effect of Housing Allowance on Household Behavior

As mentioned in Section 5, to find the LATE of housing allowance on household outcomes, the instrumented treatment variable, derived from the first stage,<sup>27</sup> is used in the second stage, Equation 5. Here, the second stage, i.e. local average treatment effect, results are presented. Additionally, the estimates for the reduced form, i.e. intent to treat effect, are provided and the relationship between relative income and the outcome variables is plotted.

### 6.2.1 Housing Consumption

As stated in Section 3, the income and substitution effects of housing allowance should translate to a higher rent and/or total housing costs and demand for higher quality housing, on average, for recipients of housing allowance, *ceteris paribus*. Furthermore, recipients of housing allowance might try to maximize welfare benefits, possibly in collusion with their landlord, which would be indicated by a higher average rent per square meter for housing allowance recipients, compared to those who do not receive allowance, *ceteris paribus*. Overall, the results indicate that only housing costs are affected by housing allowance.

Table 7 provides the results for the effect of housing allowance on rent and total housing costs, and Figures F.1 and F.2 illustrate the ITT effect for rent and total housing costs, respectively. Housing allowance is found to not have a statistically significant effect on rent but have a statistically significant negative effect on the total housing costs. One can see, in Figure F.2, that the negative effect is most noticeable for the aggregated and EP65+ subsamples. For the aggregated subsample, on average, *ceteris paribus*, those receiving housing allowance spend €148.22 less on housing costs per month (€1,779 per year), and an additional euro of housing allowance per month, decreases housing costs by €1.70. An effect greater than one euro seems conflicting, since the cost of housing should decrease only a euro for each additional euro of housing allowance. However, the estimated effect on housing costs exceeding one euro may be a byproduct of households with housing allowance tending to have lower rents as well, given the results for rent are negative for the aggregated and EP65+ subsamples. However, the estimates for rent are insignificant, so this speculation cannot be confirmed by these results. Nevertheless, because housing allowance is found to decrease housing costs, these findings suggest that housing allowance does make housing more affordable for at least the EP65+ subsample and possibly the MP subsample. However, the effect of housing allowance on total housing costs for the MP65+ subsample is insignificant and negligible, and it cannot

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<sup>27</sup>Note that the estimated first stages for each outcome variable differ slightly, due to some varying missing observations for each outcome variable. The individual first stage regressions are checked to make sure they remain strong and that the estimated eligibility coefficient does not greatly deviate from the original estimate

be concluded that housing allowance makes housing more affordable for MP65+ households. Overall, it does not appear that housing allowance leads to overconsumption of housing for these subsamples.

While housing allowance, in principle, should encourage recipients to consume better quality housing, housing allowance is found to neither affect the number of rooms nor the area of the current house for all subsamples, as shown in Table 8. Furthermore, Figures F.3 and F.4 illustrate the lack of discontinuity in number of rooms and area of house at the income limit. Thus, it cannot be concluded that housing allowance increases the demand for higher quality housing.

As mentioned, a positive effect of housing allowance on rent per square meter would provide indication of possible collusion with tenants and landlords, as some of the increased rental price due to allowance is captured by the landlord. Here, it is found that the effect of housing allowance on rent per square meter is insignificant for all subsamples, as shown by Table 9. Furthermore, there is not a clear discontinuity at the income limit as seen in Figure F.5. Thus, it cannot be concluded that there is collusion between tenants and landlords to maximize housing benefits.

In sum, the main results indicate that housing allowance makes housing more affordable for EP65+, and possibly MP, households, and there is no evidence for overconsumption of housing nor of collusion between tenants and landlords for these subsamples.

Table 7: The effect of housing allowance on rent and housing costs

	ALL <sup>†</sup>		EP65+		MP	MP65+
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable: rent						
<i>Reduced form</i>						
eligibility	-12.92 (10.81)	-12.92 (10.81)	-11.70 (18.34)	-11.70 (18.34)	-12.84 (16.41)	1.49 (20.19)
relative income	-0.00 (0.00)	-0.00 (0.00)	0.00 (0.01)	0.00 (0.01)	-0.00 (0.00)	0.01 (0.01)
relative income <sup>2</sup>	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	
constant	580.41*** (11.67)	580.41*** (11.67)	563.02*** (13.75)	563.02*** (13.75)	606.92*** (11.86)	542.33*** (12.55)
<i>Second stage</i>						
allowance	-58.91 (49.69)	-0.68 (0.60)	-48.78 (76.88)	-0.50 (0.80)	-59.07 (75.67)	6.88 (92.67)
relative income	-0.00 (0.01)	-0.01 (0.01)	-0.00 (0.02)	-0.01 (0.02)	-0.00 (0.01)	0.01 (0.02)
relative income <sup>2</sup>	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	
constant	583.84*** (15.27)	590.42*** (21.25)	519.01*** (15.76)	516.74*** (12.79)	623.65*** (31.41)	567.36*** (27.33)
<i>N</i>	2,901	2,901	1,038	1,038	1,467	662
Dependent variable: total housing costs						
<i>Reduced form</i>						
eligibility	-32.51*** (11.64)	-32.51*** (11.64)	-41.94** (19.14)	-41.94** (19.14)	-28.27 (18.65)	-6.45 (21.39)
relative income	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	0.01** (0.00)	0.02 (0.01)
relative income <sup>2</sup>	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	
constant	766.75*** (12.59)	766.75*** (12.59)	696.85*** (14.38)	696.85*** (14.38)	741.20*** (13.36)	720.75*** (13.32)
<i>Second stage</i>						
allowance	-148.22*** (49.98)	-1.70*** (0.60)	-174.83** (76.90)	-1.78** (0.82)	-130.10* (79.13)	-29.70 (95.93)
relative income	-0.00 (0.01)	-0.01 (0.01)	-0.01 (0.02)	-0.01 (0.02)	0.00 (0.01)	0.02 (0.02)
relative income <sup>2</sup>	-0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	
constant	760.86*** (15.35)	777.42*** 21.50	680.11*** (15.94)	671.99*** (13.03)	777.38*** (32.64)	725.28*** (28.24)
<i>N</i>	2,901	2,901	1,038	1,038	1,467	662
Treatment variable	Binary	Continuous	Binary	Continuous	Binary	Binary
Bandwidth (±)	2,000	2,000	1,500	1,500	4,500	1,500
Category controls	Yes	Yes	No	No	No	No
Polynomial order	Quadratic	Quadratic	Quadratic	Quadratic	Quadratic	Linear

Data Source: BZK/CBS (2016, 2019). Estimates of Equation 5 (second stage) and 6 (reduced form). \*, \*\*, \*\*\* Statistically significant at the 10%, 5%, 1% level, respectively. *eligibility* is whether the household is eligible for housing allowance based on income. *allowance* is either 'binary' (receiving housing allowance or not) or 'continuous' (the amount of housing allowance per month). Heteroskedasticity robust standard errors are reported in parentheses. Bandwidths with respect to relative income (household income - income limit). All columns control for year. Polynomial order in reference to function of relative income. Six binary category controls for EP65+, MP, and MP65+ for each year, one omitted. EP = single, non-pension households, EP65+ = single, pension households, MP = multi-person, non-pension households, and MP65+ = multi-person, pension households. *rent* (not including housing allowance) and *total housing costs* (including housing allowance) are in euros per month.

<sup>†</sup> 'ALL' does not include EP households.

Table 8: The effect of housing allowance on number of rooms and area of the current house

	ALL <sup>†</sup>		EP65+		MP	MP65+
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable: number of rooms						
<i>Reduced form</i>						
eligibility	-0.03 (0.07)	-0.03 (0.07)	0.05 (0.11)	0.05 (0.11)	-0.08 (0.11)	-0.08 (0.14)
relative income	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)
relative income <sup>2</sup>	-0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	
constant	3.88*** (0.07)	3.88*** (0.07)	3.26*** (0.07)	3.26*** (0.07)	3.92*** (0.08)	3.82*** (0.08)
<i>Second Stage</i>						
allowance	-0.16 (0.31)	-0.00 (0.00)	0.20 (0.46)	0.00 (0.00)	-0.35 (0.51)	-0.38 (0.63)
relative income	-0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)
relative income <sup>2</sup>	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	
constant	3.74*** (0.10)	3.76*** (0.13)	3.20*** (0.08)	3.21*** (0.07)	4.01*** (0.20)	3.82*** (0.20)
N	2,901	2,901	1,038	1,038	1,467	662
Dependent variable: area of house						
<i>Reduced Form</i>						
eligibility	-3.12 (2.98)	-3.12 (2.98)	2.11 (3.32)	2.11 (3.32)	-4.49 (5.18)	-12.23 (7.60)
relative income	-0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	-0.01** (0.00)
relative income <sup>2</sup>	-0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	
constant	97.30*** (4.48)	97.30*** (4.48)	85.17*** (2.49)	85.17*** (2.49)	96.65*** (3.74)	101.22*** (4.13)
<i>Second stage</i>						
allowance	-14.20 (13.65)	-0.16 (0.16)	8.79 (13.75)	0.09 (0.14)	-20.65 (23.98)	-56.32 (37.67)
relative income	-0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	-0.01** (0.01)
relative income <sup>2</sup>	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)	
constant	105.70*** (5.49)	107.28*** (6.85)	79.65*** (2.65)	80.06*** (2.14)	102.37*** (10.07)	116.56*** (12.79)
N	2,901	2,901	1,038	1,038	1,467	662
Treatment variable	Binary	Continuous	Binary	Continuous	Binary	Binary
Bandwidth (±)	2,000	2,000	1,500	1,500	4,500	1,500
Category controls	Yes	Yes	No	No	No	No
Polynomial order	Quadratic	Quadratic	Quadratic	Quadratic	Quadratic	Linear

Data Source: BZK/CBS (2016, 2019). Estimates of Equation 5 (second stage) and 6 (reduced form). \*, \*\*, \*\*\* Statistically significant at the 10%, 5%, 1% level, respectively. *eligibility* is whether the household is eligible for housing allowance based on income. *allowance* is either 'binary' (receiving housing allowance or not) or 'continuous' (the amount of housing allowance per month). Heteroskedasticity robust standard errors are reported in parentheses. Bandwidths with respect to relative income (household income - income limit). All columns control for year. Polynomial order in reference to function of relative income. Six binary category controls for EP65+, MP, and MP65+ for each year, one omitted. EP = single, non-pension households, EP65+ = single, pension households, MP = multi-person, non-pension households, and MP65+ = multi-person, pension households. *area of house* is in meters squared.

<sup>†</sup> 'ALL' does not include EP households.

Table 9: The effect of housing allowance on rent per square meter

	ALL <sup>†</sup>	All	EP65+	EP65+	MP	MP65+
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable: rent/m <sup>2</sup>						
<i>Reduced form</i>						
eligibility	0.06 (0.19)	0.06 (0.19)	-0.22 (0.30)	-0.22 (0.30)	-0.06 (0.28)	0.47 (0.48)
relative income	0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
relative income <sup>2</sup>	0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	
constant	6.70*** (0.19)	6.70*** (0.19)	7.12*** (0.22)	7.12*** (0.22)	7.10*** (0.52)	5.71*** (0.27)
<i>Second stage</i>						
allowance	0.29 (0.88)	0.00 (0.01)	-0.93 (1.25)	-0.01 (0.01)	-0.28 (1.27)	2.15 (2.31)
relative income	0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
relative income <sup>2</sup>	0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	
constant	6.26*** (0.25)	6.23*** (0.34)	6.85*** (0.24)	6.80*** (0.20)	7.18*** (0.52)	5.78*** (0.61)
<i>N</i>	2,901	2,901	1,038	1,038	1,467	662
Treatment variable	Binary	Continuous	Binary	Continuous	Binary	Binary
Bandwidth (±)	2,000	2,000	1,500	1,500	4,500	1,500
Category controls	Yes	Yes	No	No	No	No
Polynomial order	Quadratic	Quadratic	Quadratic	Quadratic	Quadratic	Linear

Data Source: BZK/CBS (2016, 2019). Estimates of Equation 5 (second stage) and 6 (reduced form). \*, \*\*, \*\*\* Statistically significant at the 10%, 5%, 1% level, respectively. *eligibility* is whether the household is eligible for housing allowance based on income. *allowance* is either 'binary' (receiving housing allowance or not) or 'continuous' (the amount of housing allowance per month). Heteroskedasticity robust standard errors are reported in parentheses. Bandwidths with respect to relative income (household income - income limit). All columns control for year. Polynomial order in reference to function of relative income. Six binary category controls for EP65+, MP, and MP65+ for each year, one omitted. EP = single, non-pension households, EP65+ = single, pension households, MP = multi-person, non-pension households, and MP65+ = multi-person, pension households. *rent* is total rent per month, before including housing allowance.

<sup>†</sup> 'ALL' does not include EP households.

### **6.2.2 Home Ownership**

The results in Table 10 consider the effect of housing allowance on preference for home ownership and Figure F.6 illustrates the corresponding intent-to-treat effect. A negative affect of housing allowance on preference for home ownership would indicate a rental trap created by the policy. Conversely, housing allowance has a statistically significant impact only on the EP65+ subsample, where receiving housing allowance increases the probability of preferring to own a home by 8% on average, *ceteris paribus*. However, this estimate is only significant at the 10% level. A possible explanation for the counter intuitive results is that housing allowance encourages home ownership by nudging recipients to use the allowance later to “gain upward mobility in the housing market” (Chen & Enström Öst, 2005). Though this answer is only speculative. In sum, there is no evidence of a rental trap for compliers in these subsamples.

Table 10: The effect of housing allowance on preference for home ownership

	ALL <sup>†</sup>		EP65+		MP	MP65+
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable: preference for home ownership						
<i>First stage</i>						
eligibility	0.23*** (0.03)	20.98*** (4.64)	0.25*** (0.05)	25.95*** (6.47)	0.23*** (0.05)	0.23*** (0.06)
F-stat	59.63	20.47	27.54	16.1	23.31	13.09
<i>Reduced form</i>						
eligibility	0.02 (0.02)	0.02 (0.02)	0.02* (0.01)	0.02* (0.01)	0.03 (0.04)	0.01 (0.01)
relative income	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
relative income <sup>2</sup>	-0.00* (0.00)	-0.00* (0.00)	-0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)	
constant	0.17*** (0.02)	0.17*** (0.02)	-0.00 (0.00)	-0.00 (0.00)	0.23*** (0.03)	-0.00 (0.01)
<i>Second stage</i>						
allowance	0.09 (0.07)	0.00 (0.00)	0.08* (0.04)	0.00 (0.00)	0.13 (0.19)	0.07 (0.07)
relative income	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
relative income <sup>2</sup>	-0.00** (0.00)	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)	
constant	-0.01 (0.02)	-0.02 (0.03)	-0.00 (0.01)	-0.00 (0.00)	0.19** (0.08)	-0.02 (0.02)
<i>N</i>	2,794	2,794	1,014	1,014	1,381	632
Treatment variable	Binary	Continuous	Binary	Continuous	Binary	Binary
Bandwidth ( $\pm$ )	2,000	2,000	1,500	1,500	4,500	1500
Category controls	Yes	Yes	No	No	No	No
Polynomial order	Quadratic	Quadratic	Quadratic	Quadratic	Quadratic	Linear

Data Source: BZK/CBS (2016, 2019). Estimates of Equation 5 (second stage) and 6 (reduced form). \*, \*\*, \*\*\* Statistically significant at the 10%, 5%, 1% level, respectively. *eligibility* is whether the household is eligible for housing allowance based on income. *allowance* is either 'binary' (receiving housing allowance or not) or 'continuous' (the amount of housing allowance per month). Heteroskedasticity robust standard errors are reported in parentheses. Bandwidths with respect to relative income (household income - income limit). All columns control for year. Polynomial order in reference to function of relative income. Six binary category controls for EP65+, MP, and MP65+ for each year, one omitted. EP = single, non-pension households, EP65+ = single, pension households, MP = multi-person, non-pension households, and MP65+ = multi-person, pension households. *preference for home ownership* is 1 if the respondent would like to live in a owner-occupied property, and 0 if the respondent would like to live in a rental property. First stage results provided for subsamples with different *N* than the main results in Table 6.

<sup>†</sup> 'ALL' does not include EP households.

### 6.2.3 Labour Market Participation

Next, there is an investigation of the effect of housing allowance on labour market participation.<sup>28</sup> Overall, the estimated negative effect of housing allowance on working hours for MP households prompts concern for a poverty trap for the MP subsample.

The results in Table 11 provide the estimates of the effect of housing allowance on the total working hours per week of the household members in 2015. Firstly, housing allowance is found to have a statistically insignificant effect on the aggregated sample and single-person households, which corresponds with the graphs in Figure F.7. It is important to note that while the effect on working hours for EP households is insignificant, it does not rule out that housing allowance is not affecting labour supply for this subsample since only EP households from the 2015 study are investigated. Strikingly, housing allowance, on average, is found to decrease hours worked by roughly 22 hours per week for MP households, *ceteris paribus*. This raises concerns that the policy is creating a poverty trap for MP households. Additionally, this brings into question the validity of the RD estimates for MP households. If certain MP households work less hours in order to be eligible for housing allowance, the assumption that MP households around the cut-off are assigned treatment randomly no longer holds. Note, however, in Figure F.7 the discontinuity of working hours at the income limit for MP households is not so clear. Nevertheless, this finding motivates further research into the influence of housing allowance on labour supply for family, working-age households.

Demonstrated in Table 12, housing allowance does not seem to affect whether the partner of the household breadwinner has a personal income, which is further confirmed by Figure F.8. Thus, it cannot be concluded that housing allowance has an effect on the employment of the partner of the household breadwinner.

In sum, it cannot be confirmed from this study that EP households sort into treatment for housing allowance by lowering their labour supply; however, housing allowance is found to negatively effect labour supply for MP households.

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<sup>28</sup>Note, there are a few limitations with uncovering the effect on labour market participation in this study since the working hours measurement only occurred in the WoOn 2015 study and the indicator of whether the partner of the household breadwinner receives a personal income only applies to the multi-person households.

Table 11: The effect of housing allowance on working hours per week of household members

	ALL <sup>†</sup>		EP		EP65+		MP	MP65+
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable: working hours/week								
<i>First stage</i>								
eligibility	0.27*** (0.04)	17.49*** (4.48)	0.40*** (0.05)	20.73*** (6.20)	0.23*** (0.06)	16.52** (6.56)	0.32*** (0.06)	0.22*** (0.07)
F-stat	54.47	15.22	69.77	11.2	13.12	6.34	31.54	9.11
<i>Reduced form</i>								
eligibility	-1.89 (1.43)	-1.89 (1.43)	-0.74 (2.21)	-0.74 (2.21)	1.43 (0.97)		-6.97** (3.30)	
relative income	-0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)		-0.00 (0.00)	
relative income <sup>2</sup>	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)		-0.00* (0.00)	
constant	34.86*** (1.52)	34.86*** (1.52)	23.00*** (1.47)	23.00*** (1.47)	0.25 (0.27)		38.45*** (2.13)	
<i>Second stage</i>								
allowance	-6.88 (5.24)	-0.11 (0.08)	-1.84 (5.51)	-0.04 (0.11)	6.29 (4.72)		-21.65** (10.83)	
relative income	-0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)		-0.00 (0.00)	
relative income <sup>2</sup>	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)		-0.00 (0.00)	
constant	1.39 (0.86)	1.44 (0.89)	23.09*** (1.68)	23.28*** (2.19)	0.13 (0.33)		41.28*** (3.39)	
<i>N</i>	1,413	1,413	869	869	485	485	755	324
Treatment variable	Binary	Continuous	Binary	Continuous	Binary	Continuous	Binary	Binary
Bandwidth (±)	2,000	2,000	3,000	3,000	1,500	1,500	4,500	1,500
Category controls	Yes	Yes	No	No	No	No	No	No
Polynomial order	Quadratic	Quadratic	Quadratic	Quadratic	Quadratic	Quadratic	Quadratic	Linear

Data Source: BZK/CBS (2016). Estimates of Equation 5 (second stage) and 6 (reduced form). \*, \*\*, \*\*\* Statistically significant at the 10%, 5%, 1% level, respectively. *eligibility* is whether the household is eligible for housing allowance based on income. *allowance* is either 'binary' (receiving housing allowance or not) or 'continuous' (the amount of housing allowance per month). Heteroskedasticity robust standard errors are reported in parentheses. Bandwidths with respect to relative income (household income - income limit). All columns control for year. Polynomial order in reference to function of relative income. Four binary category controls for EP, EP65+, MP, and MP65+, one omitted. EP = single, non-pension households, EP65+ = single, pension households, MP = multi-person, non-pension households, and MP65+ = multi-person, pension households. Self-reported working hours of respondent and partner, aggregated. First stage results provided for subsamples with different *N* than the main results in Table 6. The reduced form and second stage for the EP65+, with continuous treatment variable, and MP65+ subsamples not estimated due to weak instrumental variable <sup>†</sup> 'ALL' does not include EP households.

Table 12: The effect of housing allowance on the probability of the partner of the household breadwinner has a personal income

	MP	MP65+
	(1)	(2)
Dependent variable: working partner		
<i>First stage</i>		
eligibility	0.22*** (0.06)	0.22*** (0.06)
F-stat	15.28	12.86
<i>Reduced form</i>		
eligibility	-0.02 (0.05)	-0.00 (0.04)
relative income	0.00 (0.00)	0.00 (0.00)
relative income <sup>2</sup>	-0.00** (0.00)	
constant	0.79*** (0.03)	0.90*** (0.03)
<i>Second stage</i>		
allowance	-0.11 (0.24)	-0.02 (0.19)
relative income	0.00 (0.00)	0.00 (0.00)
relative income <sup>2</sup>	-0.00* (0.00)	
constant	0.82*** (0.09)	0.92*** (0.06)
<i>N</i>	1,025	654
Treatment variable	Binary	Binary
Bandwidth ( $\pm$ )	4,500	1,500
Category controls	No	No
Polynomial order	Quadratic	Linear

Data Source: BZK/CBS (2016, 2019). Estimates of Equation 5 (second stage) and 6 (reduced form). \*, \*\*, \*\*\* Statistically significant at the 10%, 5%, 1% level, respectively. *eligibility* is whether the household is eligible for housing allowance based on income. *allowance* is either 'binary' (receiving housing allowance or not) or 'continuous' (the amount of housing allowance per month). Heteroskedasticity robust standard errors are reported in parentheses. Bandwidths with respect to relative income (household income - income limit). All columns control for year. Polynomial order in reference to function of relative income. MP = multi-person, non-pension households and MP65+ = multi-person, pension households. First stage results provided for subsamples with different *N* than the main results in Table 6. *working partner* is 1 if partner of the household's main breadwinner's partner has an income, and 0 if not.

#### **6.2.4 Wealth**

Since receiving housing allowance also depends on the recipient having below a certain level of assets, housing allowance might also affect wealth. Table 13 and 14 provide the results of the estimated effect of housing allowance on total household assets and savings, respectively; and Figures F.9 and F.10 illustrate the relationships between relative income and total assets and savings, respectively. Housing allowance is found to have an insignificant effect on total assets for all subsamples except for MP households. However, as mentioned in Section 6.2.3, estimates concerning MP households should be interpreted with caution, since there may be possible income manipulation. For all subsamples, housing allowance has an insignificant effect on household savings. In sum, it cannot be concluded from these results that housing allowance has adverse effects on wealth.

Table 13: The effect of housing allowance on total household assets

	ALL <sup>†</sup>		EP65+		MP	MP65+
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable: total assets						
<i>First stage</i>						
eligibility					0.22***	
F-stat					(0.05)	
					23.06	
<i>Reduced form</i>						
eligibility	-2,754.76	-2,754.76	-25,302.30	-25,302.30	17,710.81*	1,709.29
	(9,542.63)	(9,542.63)	(21,092.99)	(21,092.99)	(9,482.94)	(12,866.63)
relative income	-0.58	-0.58	-8.44	-8.44	5.64	-7.11
	(3.35)	(3.35)	(8.69)	(8.69)	(3.50)	(8.03)
relative income <sup>2</sup>	-0.00	-0.00	-0.01	-0.01	0.00	
	(0.00)	(0.00)	(0.01)	(0.01)	(0.00)	
constant	8,864.29	8,864.29	54,911.07***	54,911.07***	-293.51	35,944.94***
	(6,722.29)	(6,722.29)	(21,272.98)	(21,272.98)	(9,648.95)	(6,594.10)
<i>Second stage</i>						
allowance	-12,558.31	-144.26	-105,469.50	-1,073.98	81,277.10*	7,868.45
	(43,303.18)	(497.38)	(88,493.06)	(921.90)	(47,626.01)	(59,529.69)
relative income	-1.46	-2.07	-17.50	-21.78	9.47*	-6.63
	(6.23)	(8.30)	(16.27)	(20.50)	(5.56)	(10.91)
relative income <sup>2</sup>	-0.00	-0.00	-0.00	0.00	0.00	
	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	
constant	55,810.93***	57,214.06***	56,025.99***	51,130.21***	-23,014.36	51,105.64***
	(13,817.33)	(18,038.70)	(18,325.79)	(14,471.21)	(21,896.18)	(18,783.70)
<i>N</i>	2,901	2,901	1,038	1,038	1,462	662
Treatment Variable	Binary	Continuous	Binary	Continuous	Binary	Binary
Bandwidth (±)	2,000	2,000	1,500	1,500	4,500	1,500
Category Controls	Yes	Yes	No	No	No	No
Polynomial Order	Quadratic	Quadratic	Quadratic	Quadratic	Quadratic	Linear

Data Source: BZK/CBS (2016, 2019). Estimates of Equation 5 (second stage) and 6 (reduced form). \*, \*\*, \*\*\* Statistically significant at the 10%, 5%, 1% level, respectively. *eligibility* is whether the household is eligible for housing allowance based on income. *allowance* is either 'binary' (receiving housing allowance or not) or 'continuous' (the amount of housing allowance per month). Heteroskedasticity robust standard errors are reported in parentheses. Bandwidths with respect to relative income (household income - income limit). All columns control for year. Polynomial order in reference to function of relative income. Six binary category controls for EP65+, MP, and MP65+ for each year, one omitted. EP = single, non-pension households, EP65+ = single, pension households, MP = multi-person, non-pension households, and MP65+ = multi-person, pension households. Total assets measured in euros. First stage results provided for subsamples with different *N* than the main results in Table 6.

<sup>†</sup> 'ALL' does not include EP households.

Table 14: The effect of housing allowance on total household savings

	ALL <sup>†</sup>		EP65+		MP	MP65+
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable: savings						
<i>First stage</i>						
eligibility	0.22*** (0.03)	18.77*** (4.58)			0.22*** (0.05)	
F-stat	55.28	16.81			22.74	
<i>Reduced form</i>						
eligibility	-1,260.93 (3,019.35)	-1,260.93 (3,019.35)	-8,594.50 (5,331.40)	-8,594.50 (5,331.40)	1,222.73 (2,716.93)	-1,058.08 (7,334.50)
relative income	0.73 (1.32)	0.73 (1.32)	-3.97 (2.73)	-3.97 (2.73)	0.75 (0.73)	-1.36 (4.15)
relative income <sup>2</sup>	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
constant	31,556.06*** (2,966.87)	31,556.06*** (2,966.87)	31,036.77*** (14,573.82)	31,036.77*** (14,573.82)	11,915.86*** (2,427.52)	31,616.72*** (4,442.44)
<i>Second stage</i>						
allowance	-5,808.67 (13,755.45)	-67.18 (158.94)	-35,825.13 (21,840.44)	-364.80 (231.36)	5,641.91 (12,778.23)	-4,870.71 (33,377.10)
relative income	0.31 (2.21)	0.02 (2.88)	-7.05 (4.41)	-8.51 (5.52)	1.02 (1.28)	-1.66 (5.95)
relative income <sup>2</sup>	-0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
constant	30,847.13*** (4,545.11)	31,515.31*** (5,988.82)	31,236.41*** (4,433.35)	29,573.45*** (3,610.84)	10,384.00* (5,727.94)	31,332.22*** (10,390.37)
<i>N</i>	2,896	2,896	1,038	1,038	1,457	662
Treatment Variable	Binary	Continuous	Binary	Continuous	Binary	Binary
Bandwidth (±)	2,000	2,000	1,500	1,500	4,500	1,500
Category Controls	Yes	Yes	No	No	No	No
Polynomial Order	Quadratic	Quadratic	Quadratic	Quadratic	Quadratic	Linear

Data Source: BZK/CBS (2016, 2019). Estimates of Equation 5 (second stage) and 6 (reduced form). \*, \*\*, \*\*\* Statistically significant at the 10%, 5%, 1% level, respectively. *eligibility* is whether the household is eligible for housing allowance based on income. *allowance* is either 'binary' (receiving housing allowance or not) or 'continuous' (the amount of housing allowance per month). Heteroskedasticity robust standard errors are reported in parentheses. Bandwidths with respect to relative income (household income - income limit). All columns control for year. Polynomial order in reference to function of relative income. Six binary category controls for EP65+, MP, and MP65+ for each year, one omitted. EP = single, non-pension households, EP65+ = single, pension households, MP = multi-person, non-pension households, and MP65+ = multi-person, pension households. Savings measured in euros. First stage results provided for subsamples with different *N* than the main results in Table 6.

<sup>†</sup> 'ALL' does not include EP households.

## 6.3 Robustness Checks

Two sensitivity analyses are performed in this study to ensure the results are not driven by selection bias. First, the main estimates are tested with all the background characteristics as controls to investigate potential biases. Second, the bandwidths are adjusted to reduce potential biases in the results.

### 6.3.1 Background Characteristic Controls

For the validity of the RD estimates, it is crucial that including background characteristics as controls does not greatly hinder the results. If the estimates change significantly, then there is concern of selection bias, as the RD design assumes the treatment is exogenous to all background characteristics, observable and unobservable. Table F.1 compares the second stage estimates for the model with and without controls.<sup>29</sup> Indeed, there are a few estimates that do change considerably. Notably, the sign for the estimated effect of housing allowance on savings for the MP65+ subsample changes and the effect of housing allowance on total assets for MP households becomes insignificant. These findings indicate that the results with the chosen optimal bandwidths are possibly bias due to housing allowance being endogenous to outside factors. Therefore, the results are re-estimated with smaller bandwidths, which will reduce the bias of the results.

### 6.3.2 Bandwidth Adjustments

To test the sensitivity of the results, one can adjust the bandwidth to be smaller or larger. Since the addition of background controls raises concerns of selection bias, only a smaller bandwidth is tested, as a larger bandwidth will have greater bias. Thus, the results are re-estimated with a bandwidth 25% smaller than the main estimation bandwidth.<sup>30</sup> While the new results will have a lower bias, the results will also be less precise since the estimation uses less observations (R. Jacob et al., 2012). Tables F.2-F.9 provide the estimates with the smaller bandwidths.

The new results show that: the effect of housing allowance on housing costs remains statistically significant at the 1% level; for EP65+ households, the effect of housing allowance on preference for home ownership is no longer significant; for MP households, the effect of housing allowance on total working hours not only remains significant at the 5% level but

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<sup>29</sup>Only binary treatment variable tested with controls.

<sup>30</sup>Bandwidths smaller than a 25% reduction generate a weak instrument. All new samples are re-examined using the McCrary test; sorting detected for only the EP household subsample.

also increases in magnitude, and the positive effect of housing allowance on total assets disappears when the bandwidth is reduced; for EP65+ households, a negative impact of housing allowance on savings is found, though it is only significant at the 10% level, suggesting a possible wealth gap for single, pension households; and other estimates remain insignificant. While significance of the new estimates remains the same when controls are added, the coefficients do differ with controls, which brings into question the validity of these results as well. To address this, one could further decrease the bandwidth, but this could also lead to biased results due to a weak instrument with a small sample size. While the validity of these results is uncertain, these findings identify important issues concerning housing allowance that warrant further study.

## 7 Concluding remarks

The intention of this paper is to investigate whether the Dutch housing allowance policy has unintended effects on the decision-making and behavior of households. By exploiting the income cut-offs for housing allowance eligibility, this paper attempts to use a fuzzy regression discontinuity design to elicit the causal effect. However, there is evidence for possible income manipulation at the income limit for single and multi-person working-age households. This invalidates the RD design for these two groups, but it also suggests that housing allowance incites working-age households to keep their income low. Additionally, the results suggest that housing allowance may discourage single, pension households from saving. The paper finds no effect of housing allowance on rent, housing quality, or preferences for home ownership.

While the RD design is an arguably robust identification strategy to elicit the treatment effect of policies, there are a couple important limitations to this study that should be addressed. Firstly, the findings from this study, if valid, only identify the effect of the policy locally, for households near the income limit that comply to the housing allowance assignment rule. Meaning, these results cannot be easily generalized to the rest of the population, and housing allowance could have a different effect on a sample further away from the income limit (R. Jacob et al., 2012). Therefore, further research using an alternative identification strategy is necessary to identify whether housing allowance has a general effect on the household outcomes considered here. Secondly, the sorting detected for single, working-age (EP) households, the negative association between housing allowance and labour supply for family, working-age (MP) households, and the inconsistencies revealed by including background characteristic controls all suggest that the estimates are possibly invalidated by selection bias. Thus, income manipulation cannot be ruled out particularly for EP and MP households, and

to be safe, for other household types as well. Therefore, the estimated impact of housing allowance on other factors in this paper, such as housing consumption and home ownership preferences, should be interpreted with caution, as sorting would make these estimates invalid.

Nevertheless, this paper brings to light important concerns about the Dutch housing allowance policy, which require further attention, namely the poverty trap and the wealth gap. Firstly, the manipulation of the running variable, in this case, is a significant finding in itself, as it suggests a poverty trap. Further research is necessary to understand how and to what extent income manipulation is prompted by the policy. There are a few suggestions of how the Netherlands could address the poverty trap, such as lowering the rate at which allowance declines with income (Haffner & Boelhouwer, 2006) or making welfare benefits income-independent by introducing a basic income (Priemus & Haffner, 2017). However, these options are not ideal solutions, as reducing the reduction rate of allowance would make the policy less targeted towards a certain income group (Haffner & Boelhouwer, 2006), and basic income does not target housing affordability. Secondly, this paper brings attention to a possible relationship between housing allowance and wealth. Though this study does not find strong evidence for housing allowance discouraging wealth accumulation, this is the first paper, to my knowledge, to investigate this potential wealth gap and further research is necessary to substantiate these findings.

Based on the findings of this paper, it is imperative for policy makers to consider how the housing allowance policy, and other welfare policies, affect household behavior. Though the Dutch housing allowance policy was designed with good intentions, this study finds potential weak points in the policy, which could inadvertently cause households to stay in poverty by constraining their income and wealth. Thus, further identification and investigation of these side effects of housing allowance can lead to a more efficient and effective policy.

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## A Housing Allowance Scheme

### A.1 2014 Housing Allowance Scheme

Table A.1: Household categories, in 2014

Type of Household	Description
Single-person household, non-AOW (EP)	Household consists of one person who was younger than the state pension age (65 years) on 1 January 2014.
Multi-person household, non-AOW (MP)	Household consists of more than one household member and more than half of the household income is earned by the household member(s) who are younger than the state pension age (65 years) on 1 January 2014.
Single-person household, AOW (EP65+)	Household consists of one person who was or older than the state pension age (65 years) on 1 January 2014.
Multi-person household, AOW (MP65+)	Household consists of multiple members, with more than half of the household income earned by a member who was or older than the state pension age (65 years) on 1 January 2014.

Adapted from “Informatieblad Huurtoeslag 2014” by Belastingdienst, 2014.

Table A.2: Income limits for housing allowance eligibility, by household category in 2014

Household Category	Income Threshold
Single-person household, under 65 years old (EP)	€21,600
Single-person household, over 65 years old (EP65+)	€21,600
Multi-person household, under 65 years old (MP)	€29,325
Multi-person household, over 65 years old (MP65+)	€29,400

Adapted from “Informatieblad Huurtoeslag 2014” by Belastingdienst, 2014.

Table A.3: Wealth limits for housing allowance eligibility in 2014

Applicant Situation	Maximum wealth as of 1 January 2014
Applicant is younger than the pension age (65 years)	€21,139 per household member
Applicant is younger than the pension age (65 years) and a single parent; From 1 July to 31 December 2005, applicant has receive housing allowance with more than €20,300 in assets; from 2006 to 2013, the applicant received housing allowance and in 2014 he/she is entitled to a single parent's tax credit	€42,278 per household member
Applicant is of or older than the pension age (65 years) and income is not more than €14,302	€49,123 per household member
Applicant is of or older than the pension age (65 years) and income is more than €14,302 but less than €19,895	€35.131 per household member
Applicant is of or older than the pension age (65 years) and income is more than €19,895	€21.139 per household member

Adapted from “Informatieblad Huurtoeslag 2014” by Belastingdienst, 2014.

## A.2 Calculating Housing Allowance

An applicant's housing allowance is determined based off of their income, their rent, and their household category. Given that the applicant fits all the requirements, their designated basic rent for year  $t$  is determined for recipient  $i$  by equation (1):

$$\text{basic rent}_{iht} = (a_{ht} \cdot \text{income}_{iht}^2) + (b_{ht} \cdot \text{income}_{iht}) + \tau_t \quad (\text{A.7})$$

where factors  $a$  and  $b$  are multipliers determined by household category  $h$  and  $\tau$  is a constant added, which does not depend on household category. Table A.4 and A.5 provides the 2017 and 2014 factors, respectively. The basic rent is used as a baseline, where rent below this level is not compensated for.

The 2017 (2014) limits are set as followed. The minimum basic rent level is €223.42 (€226.98) for non-pension households, €221.60 (€225.16) for single-person, pension households, and €219.79 (€223.35) for multi-person, pension households (Belastingdienst, 2016a, 2014). The quality discount limit is set to €414.02 (€389.05) (Belastingdienst, 2016a, 2014). The capping limit, for households with one or two people, is set to €592.55 (€556.82) (Belastingdienst, 2016a, 2014). For households with three or more people, the capping limit is set higher, at €635.05 (€596.75) (Belastingdienst, 2016a, 2014). The housing allowance limit is €710.68 (€699.48), for all household types, except for individuals under 23 years old and without children, which have a maximal limit €414.02 (€389.05) (Belastingdienst, 2016a, 2014).

Table A.4: Housing allowance calculating factors,  $t = 2017$

Factors	EP	EP65+	MP	MP65+
a	0.000000702729	0.000001025197	0.000000399071	0.000000605312
b	0.002157297539	-0.005519295292	0.002092801553	-0.004953910842
$\tau$	€16,94	€16,94	€16,94	€16,94

Adapted from “Berekening Huurtoeslag 2017” by Belastingdienst, 2016.

Table A.5: Housing allowance calculating factors,  $t = 2014$

Factors	EP	EP65+	MP	MP65+
a	0.000000744662	0.000001103613	0.000000419824	0.000000643838
b	0.002091986183	-0.006089092981	0.002140982472	-0.005285639367
$\tau$	€27.44	€27.44	€27.44	€27.44

Adapted from “Berekening Huurtoeslag 2014” by Belastingdienst, 2014.

## B Variable Formulation

### B.1 Variable Definitions and Sources

Table B.1: Outcome variable definitions and sources

Variable	Code	Definition	Source
<i>rent</i>	bhuurii_r	Rent per month of current home, minus housing allowance, revised	WoOn
<i>total housing costs</i>	totwlv_r	Total housing costs per month, revised	Derivation
<i>area of house</i>	gebruiksopp	Surface area of the current home. reference date: 1 January 2015 (2017)	BAG
<i>number of rooms</i>	Kamers	number of rooms in current home	WoOn
<i>preference for home ownership</i>	VerhWens, HuurKoop_n, HrkpVrk_n	Whether the respondent's household prefers to own a home within the next two years	WoOn
<i>total household working hours per week</i>	BetWrkOP, BetWrkPA	Aggregate number of hours worked per week by respondent and partner (2015 only)	WoOn
<i>working partner</i>	bronpar_r	Whether the partner of the household main breadwinner has a source of income in 2014 (2017), revised	IPS
<i>total assets</i>	vermhh_r	Assets filed in tax box 3 in 2014 (2017), revised	IPS
<i>savings</i>	bankteg	Total household bank and savings balances as of 1 January 2014 (2017, revised)	Wealth Statistics

Source: BZK/CBS (2016, 2019); Janssen & Lok (2016); Janssen (2019). "revised" = revised in 2019 with data from registrations (Janssen, 2019); WoOn = from survey; IPS = Income Production System (*Inkomensproductie systeem*), compilation of registrations from tax authorities by CBS (Janssen & Lok, 2016); BAG = Basic registration Addresses and Buildings (*Basisregistratie Adressen en Gebouwen*); Derivation = variable is derived from basic data from WoON, IPS as well as data provided by ABF Research (Janssen & Lok, 2016); Wealth statistics by CBS. Codes are from the 2015 survey. Different codes for the 2017 survey are the follow: for total assets, vermogh\_r; for savings, bankteg\_r.

Table B.2: Treatment variables definitions and sources

Variable	Code	Definition	Source
<i>housing allowance</i>	ih <sub>s</sub> _r	Housing allowance received in 2014 (2017) (yes/no), revised	WoOn
<i>amount of housing allowance</i>	ihsmndbd2_r	Aggregated household housing allowance amount per month in 2014 (2017), revised	WoOn
<i>income</i>	blibhht_iv_r	Taxable income of household in 2014 (2017), according to the rent allowance scheme, revised	IPS

Source: BZK/CBS (2016, 2019); Janssen & Lok (2016); Janssen (2019). “revised” = revised in 2019 with data from registrations (Janssen, 2019); WoOn = from survey; IPS = Income Production System (*Inkomensproductie systeem*), compilation of registrations from tax authorities by CBS (Janssen & Lok, 2016).

Table B.3: Background characteristic variable definitions and sources

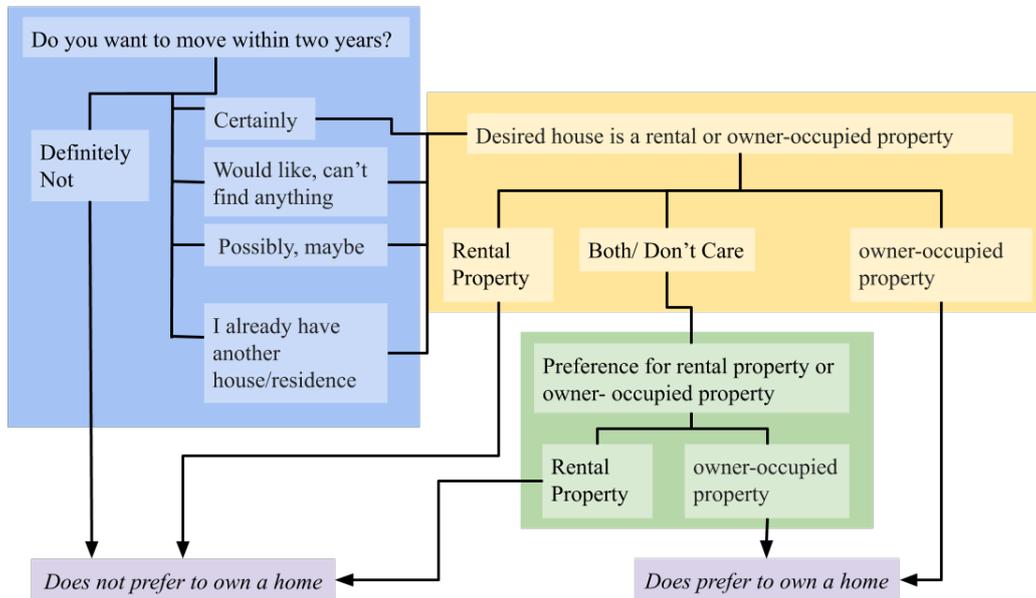
Variable	Code	Definition	Source
<i>region</i>	ldl	Region of the Netherlands (North, South, East, West)	MI
<i>social housing</i>	Eigendom	Whether the household currently lives in social housing or in owner-occupied/other type of rental unit	WoOn
<i>ethnicity</i>	etniop3	Ethnicity of respondent (Dutch, Western, Non-Western)	BRP
<i>immigrant</i>	gblop3 gblpa3	Respondent and/or partner are an immigrant (country of birth is not the Netherlands)	BRP
<i>age of the household head</i>	LftHH	Age, in years, of the household head	WoOn
<i>urbanity</i>	Stedgem	urbanity of municipality (5 classes)	MI
<i>higher education</i>	NivBehOP	Respondent’s level of completed training is HBO or university education	WoOn
<i>have children</i>	Aantkind	Total number of the respondent’s children residing in the current home	WoOn

Source: BZK/CBS (2016, 2019); Janssen & Lok (2016); Janssen (2019). WoOn = from survey; MI = based on municipality information; BRP = Basic Persons Registration (*Basisregistratie Personen*). Codes are from the 2015 survey. Different codes for the 2017 survey are the follow: for having children, aantkind4 (four classes), for age of the household head i\_lfthkw7\_r (7 classes).

## B.2 Preference for Ownership Formulation

The preference for ownership is based on a few questions from the study. Figure B.1. illustrates how the variable is constructed using the survey answers.

Figure B.1: Formulation of ownership preference variable

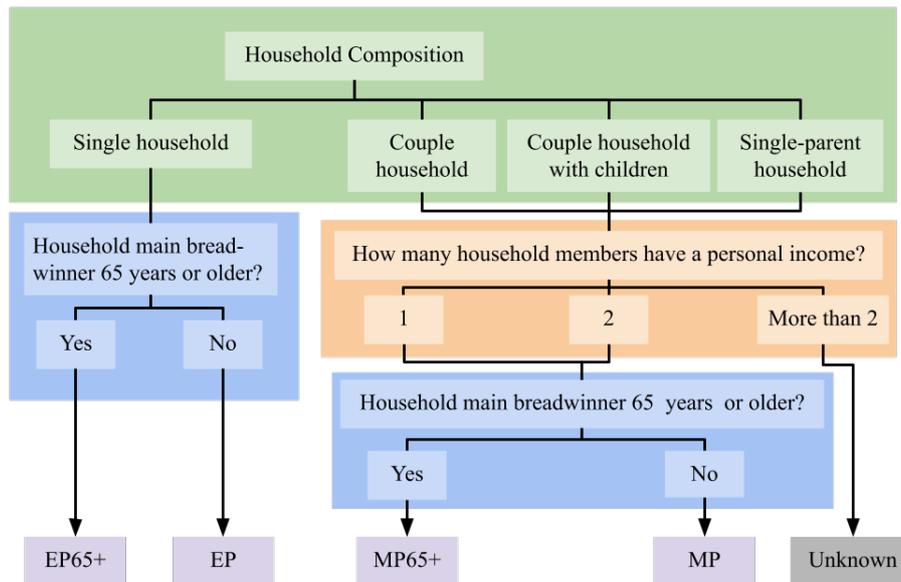


Coloured boxes represent one survey question. Blue is VerhWens; Yellow is HuurKoop\_n; Green is HrkpVrk\_n.

## B.3 Household Category

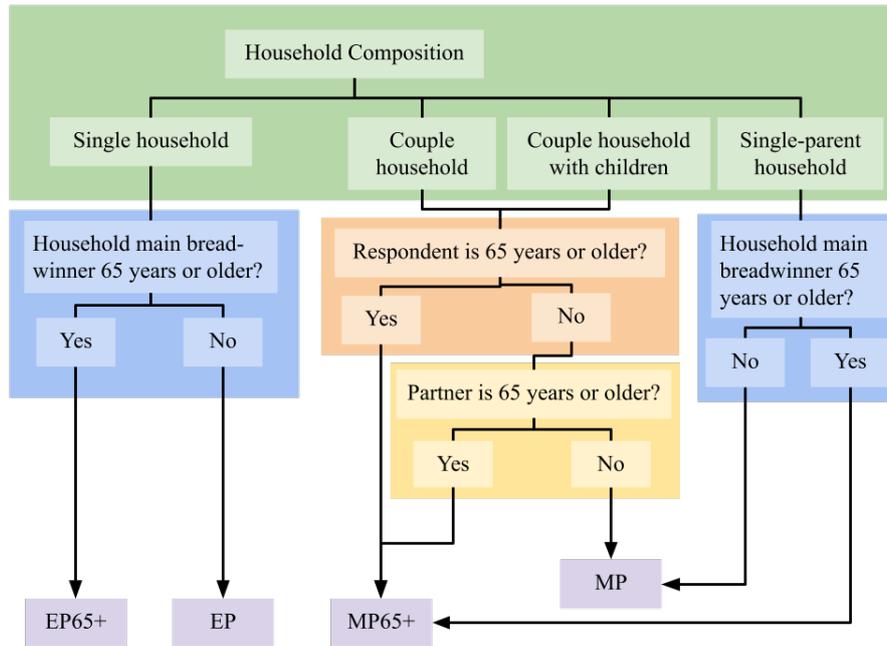
The household category is based off of a few variables. Figures B.2 and B.3 explain how households are classified into the categories for 2014 and 2017, respectively. Note, that it is assumed that those who are 65 in the 2015 (2018) survey turned 65 before 1 January 2014 (2017). For multiple person household in 2014, in order to distinguish between pension and non-pension households, one must know whether more than half of the income is from a pension age member. From the information given in the WoOn survey, one can derive this by the number of income sources in the household and the age of the household bread winner, i.e. the primary income earner of the family. If there is only one or two income earner(s), one can distinguish whether a household is pension or non-pension based on the age of the primary income earner. However, if there are more than 2 income earners in the household, one cannot distinguish if more than 50% of the earnings comes from a pension age household member.

Figure B.2: Formulation of household categories, 2014



Coloured boxes represent one survey question. Green is SamHH8 (household composition in 8 classes: single household, couple household, couple with others household, couple with children household, couple with children and others household, single-parent household, single-parent with others household, non-family household. Only family households used in this study.); Orange is ahlmi (number of members of the household with a personal income); Blue is i\_lfthkw (age of the main household breadwinner, source: income statistics 2014). Unknown observations are removed from study. EP = single, non-pension households, EP65+ = single, pension households, MP = multi-person, non-pension households, and MP65+ = multi-person, pension households.

Figure B.3: Formulation of household categories, 2017



Coloured boxes represent one survey question. Green is samhh8 (household composition in 8 classes: single household, couple household, couple with others household, couple with children household, couple with children and others household, single-parent household, single-parent with others household, non-family household. Only family households used in this study.); Orange is leeftijd (age of respondent in 7 classes); Yellow is lftpa7 (age of the partner in 7 classes); Blue is i\_lfthkw\_r (age of the main household breadwinner, source: income statistics 2017). EP = single, non-pension households, EP65+ = single, pension households, MP = multi-person, non-pension households, and MP65+ = multi-person, pension households.

## C IV estimator proof

Prove that  $\beta = \frac{\theta}{\lambda}$ :

1. The reduced form estimate is  $\theta = \beta\lambda$ :

Plug the first stage into the second stage (given  $f_r(R_{iht}) = f(R_{iht}) = g(R_{iht})$ ), :

$$Y_{iht} = \alpha_2 + \beta[\alpha_1 + \lambda E_{iht} + f(R_{iht}) + \rho_1 X'_{iht} + \tau_1 C'_{ht} + \gamma_1 T_t + \mu_{1ih}] + f_r(R_{iht}) + \rho_2 X'_{iht} + \tau_2 C'_{ht} + \gamma_2 T_t + \mu_{2ih}$$

rewrite it as:

$$Y_{iht} = (\alpha_2 + \beta\alpha_1) + \beta\lambda E_{iht} + f(R_{iht}) + (\rho_1 + \rho_2)X'_{iht} + (\tau_1 + \tau_2)C'_{ht} + (\gamma_1 + \gamma_2)T_t + (\mu_{1ih} + \mu_{2ih})$$

Replace  $(\alpha_2 + \beta\alpha_1) = \alpha_0$ ,  $(\rho_1 + \rho_2) = \rho_0$ ,  $(\tau_1 + \tau_2) = \tau_0$ ,  $(\gamma_1 + \gamma_2) = \gamma_0$  and  $(\mu_{1ih} + \mu_{2ih}) = \mu_{0ih}$ :

$$Y_{iht} = \alpha_0 + \beta\lambda E_{iht} + f(R_{iht}) + \rho_0 X'_{iht} + \tau_0 C'_{ht} + \gamma_0 T_t + \mu_{0ih}$$

Remember, the reduced form is:

$$Y_{iht} = \alpha_0 + \theta E_{iht} + g(R_{iht}) + \rho_0 X'_{iht} + \tau_0 C'_{ht} + \gamma_0 T_t + \mu_{0ih}$$

Thus,  $\theta = \beta\lambda$ .

2. The reduced form estimate divided by the first stage estimate is the second stage estimate,

$\beta = \frac{\theta}{\lambda}$ :

The reduced form estimate is:

$$E[Y_{iht} | E_{iht} = 1, R_{iht} = r, X' = x', C' = c', T = t] - E[Y_{iht} | E_{iht} = 0, R_{iht} = r, X' = x', C' = c', T = t]$$

$$\begin{aligned} &= (\alpha_0 + \beta\lambda + r + \rho_0 x' + \tau_0 c' + \gamma_0 t + \mu_{0ih}) - (\alpha_0 + r + \rho_0 x' + \tau_0 c' + \gamma_0 t + \mu_{0ih}) \\ &= \beta\lambda \end{aligned}$$

The first stage estimate is:

$$E[A_{iht} | E_{iht} = 1, R_{iht} = r, X' = x', C' = c'] - E[A_{iht} | E_{iht} = 0, R_{iht} = r, X' = x', C' = c']$$

$$= (\alpha_1 + \lambda + r + \rho_1 x' + \tau_1 c' + \gamma_1 t + \mu_{1ih}) - (\alpha_1 + r + \rho_1 x' + \tau_1 c' + \gamma_1 t + \mu_{1ih})$$

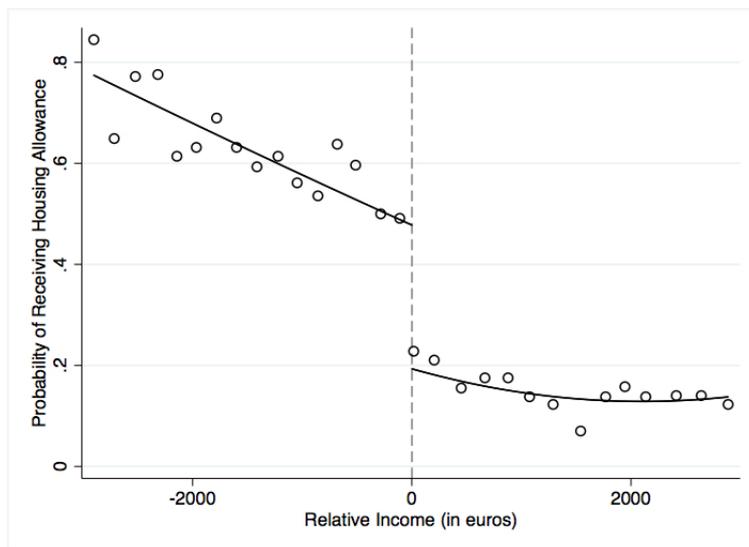
$$= \lambda$$

Thus, the reduced form estimate divided by the first stage estimate is the second stage estimate:

$$\frac{E[Y_{iht}|E_{iht} = 1] - E[Y_{iht}|E_{iht} = 0]}{E[A_{iht}|E_{iht} = 1] - E[A_{iht}|E_{iht} = 0]} = \frac{\beta\lambda}{\lambda} = \beta$$

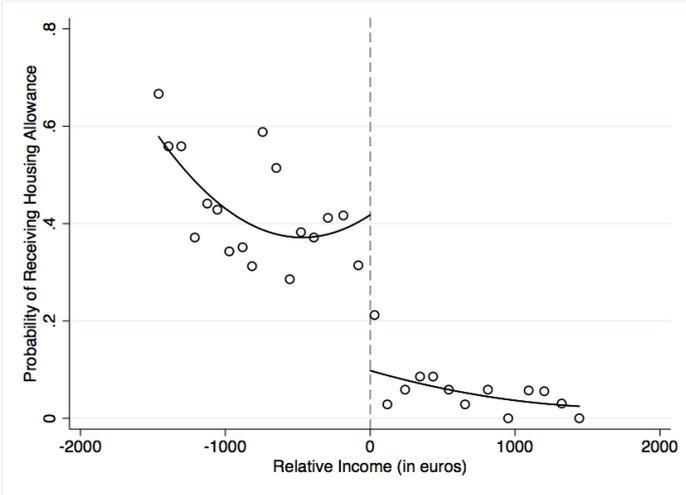
## D Figures and Tables from Methodology

Figure D.1: Discontinuity in receiving housing allowance at income limit for single, non-pension (EP) households



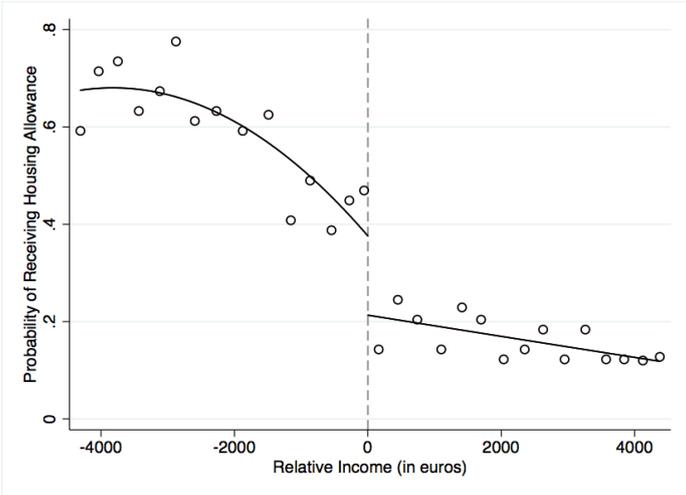
Data Source: BZK/CBS (2016, 2019).  $n = 1,720$ . Only observations with a relative income (difference between household income and the income limit of the individual's household category) between -3000 and 3000 are used and each graph includes 30 equally-sized bins. The quadratic fitted lines are estimated separately: (i) for the observations below the cut-off and (ii) for the observations above the cut-off.

Figure D.2: Discontinuity in receiving housing allowance at income limit for single, pension (EP65+) households



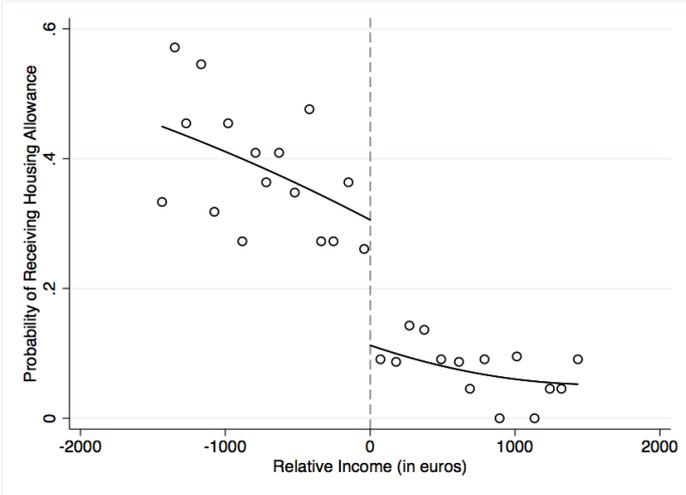
Data Source: BZK/CBS (2016, 2019).  $n = 1,038$ . Only observations with a relative income (difference between household income and the income limit of the individual's household category) between -1500 and 1500 are used and each graph includes 30 equally-sized bins. The quadratic fitted lines are estimated separately: (i) for the observations below the cut-off and (ii) for the observations above the cut-off.

Figure D.3: Discontinuity in receiving housing allowance at income limit for multi-person, non-pension (MP) households



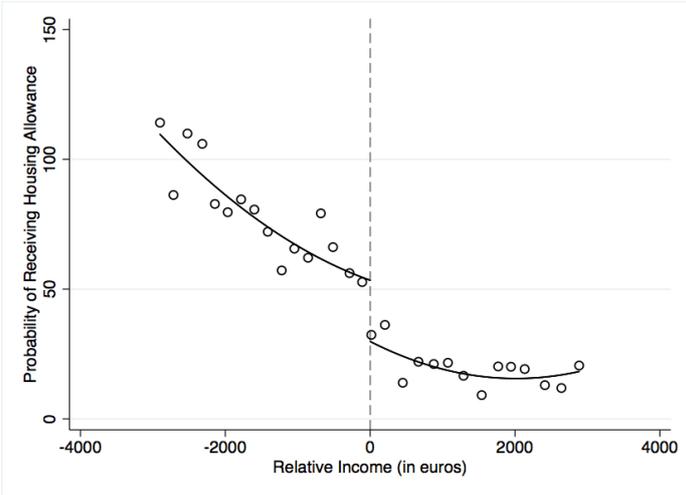
Data Source: BZK/CBS (2016, 2019).  $n = 1,467$ . Only observations with a relative income (difference between household income and the income limit of the individual's household category) between -4500 and 4500 are used and each graph includes 30 equally-sized bins. The quadratic fitted lines are estimated separately: (i) for the observations below the cut-off and (ii) for the observations above the cut-off.

Figure D.4: Discontinuity in receiving housing allowance at income limit for multi-person, non-pension (MP65+) households



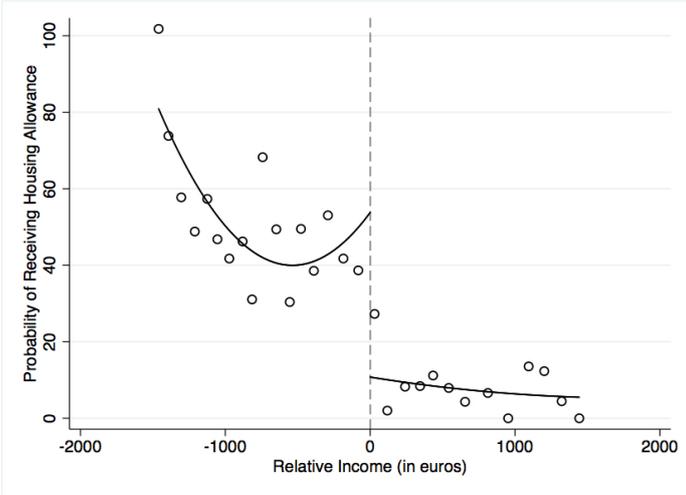
Data Source: BZK/CBS (2016, 2019).  $n = 662$ . Only observations with a relative income (difference between household income and the income limit of the individual’s household category) between -1500 and 1500 are used and each graph includes 30 equally-sized bins. The quadratic fitted lines are estimated separately: (i) for the observations below the cut-off and (ii) for the observations above the cut-off.

Figure D.5: Discontinuity in amount of housing allowance per month at income limit for single, non-pension (EP) households



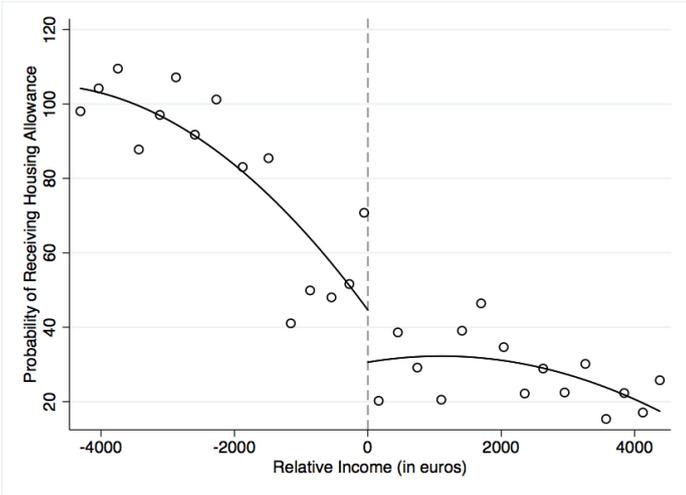
Data Source: BZK/CBS (2016, 2019).  $n = 1,720$ . Only observations with a relative income (difference between household income and the income limit of the individual’s household category) between -3000 and 3000 are used and each graph includes 30 equally-sized bins. The quadratic fitted lines are estimated separately: (i) for the observations below the cut-off and (ii) for the observations above the cut-off.

Figure D.6: Discontinuity in amount of housing allowance per month at income limit for single, pension (EP65+) households



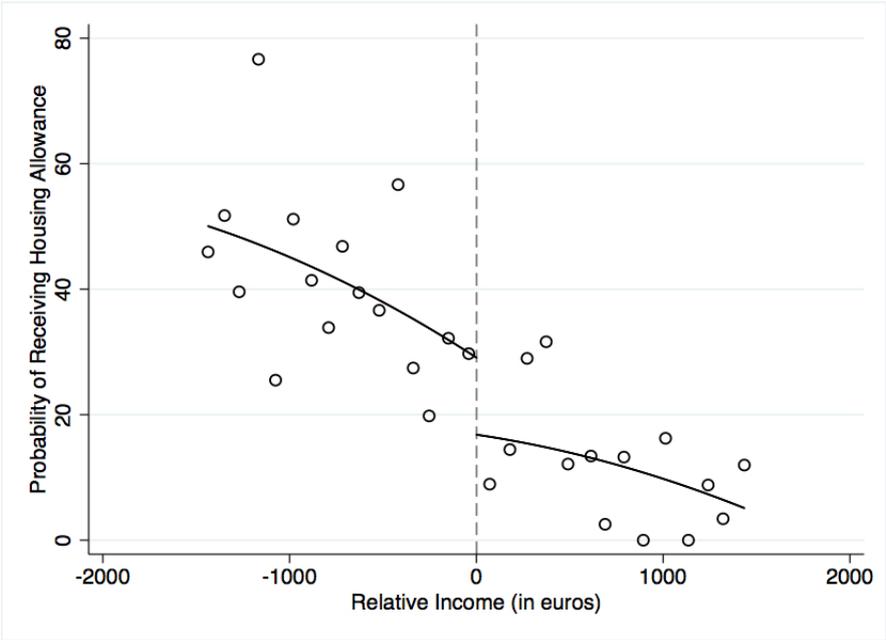
Data Source: BZK/CBS (2016, 2019).  $n = 1,038$ . Only observations with a relative income (difference between household income and the income limit of the individual’s household category) between -1500 and 1500 are used and each graph includes 30 equally-sized bins. The quadratic fitted lines are estimated separately: (i) for the observations below the cut-off and (ii) for the observations above the cut-off.

Figure D.7: Discontinuity in amount of housing allowance per month at income limit for multi-person, non-pension (MP) households



Data Source: BZK/CBS (2016, 2019).  $n = 1,467$ . Only observations with a relative income (difference between household income and the income limit of the individual’s household category) between -4500 and 4500 are used and each graph includes 30 equally-sized bins. The quadratic fitted lines are estimated separately: (i) for the observations below the cut-off and (ii) for the observations above the cut-off.

Figure D.8: Discontinuity in amount of housing allowance per month at income limit for multi-person, non-pension (MP65+) households



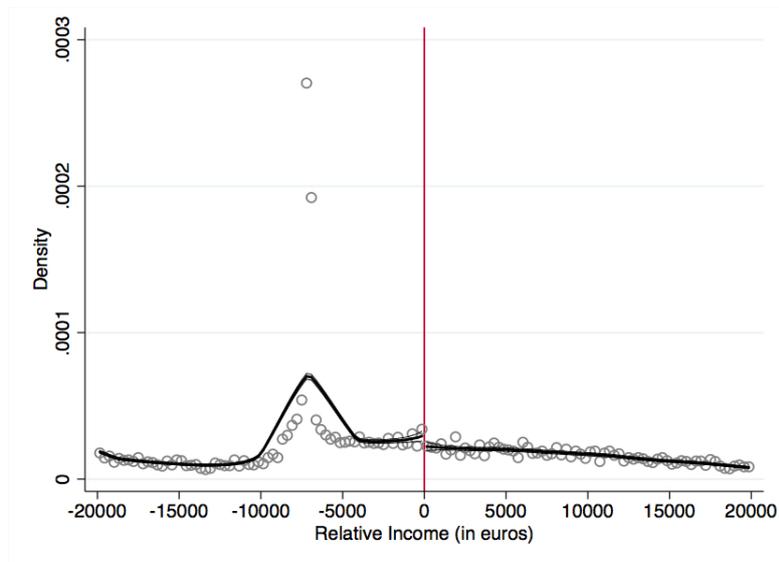
Data Source: BZK/CBS (2016, 2019).  $n = 662$ . Only observations with a relative income (difference between household income and the income limit of the individual's household category) between -1500 and 1500 are used and each graph includes 30 equally-sized bins. The quadratic fitted lines are estimated separately: (i) for the observations below the cut-off and (ii) for the observations above the cut-off.

Table D.1: Continuity of background characteristics

	All			EP			EP65+			MP			MP65+		
	Eligible	Not Eligible	p	Eligible	Not Eligible	p	Eligible	Not Eligible	p	Eligible	Not Eligible	p	Eligible	Not Eligible	p
Region (%)															
<i>North</i>	7.03	5.71	*	6.41	6.66		8.10	5.88		8.10	6.68		6.96	4.67	
<i>East</i>	21.44	20.94		22.14	22.28		17.46	17.02		24.29	23.85		18.66	18.38	
<i>West</i>	51.27	52.98		52.52	51.45		54.60	57.56		47.50	49.15		50.01	56.39	
<i>South</i>	20.25	20.37		18.93	19.61		19.84	19.54		20.31	20.11		24.23	20.56	
Social Housing (%)	81.06	81.07		75.73	75.54		85.56	87.82		77.33	77.06		88.02	84.42	
Ethnicity (%)															
<i>Native Dutch</i>	82.03	83.59		77.28	82.08	**	87.46	87.18		68.29	71.30		87.74	92.83	**
<i>Western</i>	10.93	9.98		11.75	10.05		9.84	10.92		12.42	11.01		10.31	5.61	**
<i>Non-Western</i>	7.03	6.43		10.97	7.87	**	2.70	1.89		19.30	17.69		1.95	1.56	
Immigrant (%)	12.58	11.73		15.15	11.50	**	8.41	7.14		27.53	25.95		8.64	6.23	
Age, household head (%)															
<i>17-34 years old</i>	15.13	16.41		33.50	36.80		0.00	0.00		31.98	32.63		0.00	0.00	
<i>35-64 years old</i>	30.08	31.48		66.50	63.20		0.00	0.00		68.02	67.37		2.23	2.49	
<i>65+ years old</i>	52.11	54.79		0.00	0.00		100.00	100.00		0.00	0.00		97.77	97.51	
Urbanity of Municipality (%)															
<i>Strong to very strong</i>	57.97	57.82		62.72	60.29		56.67	56.72		57.76	58.85		52.65	52.96	
<i>Moderate</i>	17.50	16.82		16.12	17.31		17.46	17.86		18.89	16.25		20.06	21.18	
<i>Little to none</i>	24.53	25.36		21.17	22.40		25.87	25.42		23.35	24.90		27.30	25.86	
Higher education, respondent (%)	12.50	11.06		19.81	22.52		6.98	4.62	*	20.11	20.84		4.73	3.12	
Have Children (%)	8.69	10.24	*	0.00	0.00		0.00	0.00		61.27	54.52	***	2.79	1.87	
Bandwidth ( $\pm$ )	2,000	2,000		3,000	3,000		1,500	1,500		4,500	4,500		1,500	1,500	

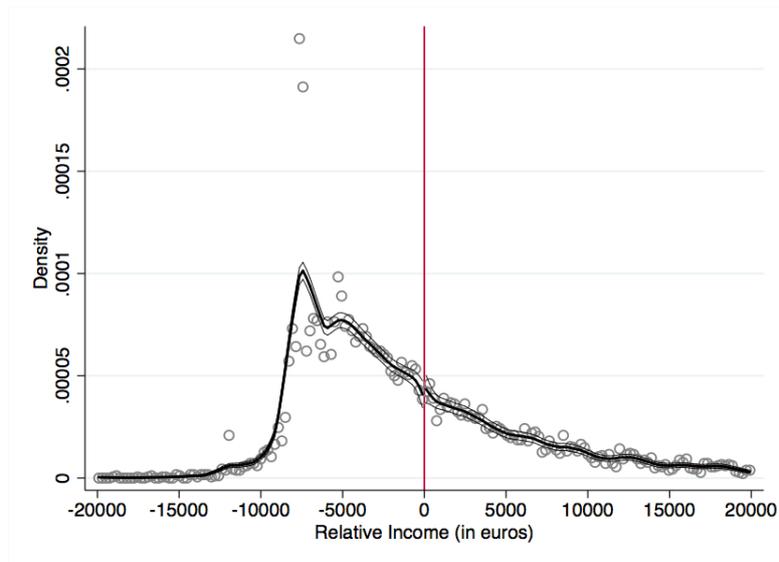
Data Source: BZK/CBS (2016). EP = single, non-pension households, EP65+ = single, pension households, MP = multi-person, non-pension households, and MP65+ = multi-person, pension households. Bandwidth is with respect to the relative income (household income - income limit). p represents the statistical significance of the difference between the means of the eligible and non-eligible group. \*, \*\*, \*\*\* Statistically significant at the 10%, 5%, 1% level, respectively. Considered immigrant is respondent and/or partner is an immigrant. Urbanity: strong to very strong = >1500 addresses/km; moderate = 1000-1500 addresses/km; little to none = <1000 addresses/km. Higher education is considered a bachelor's/master's at a HBO or a university.

Figure D.9: Density plot of relative income, single, non-pension (EP) households



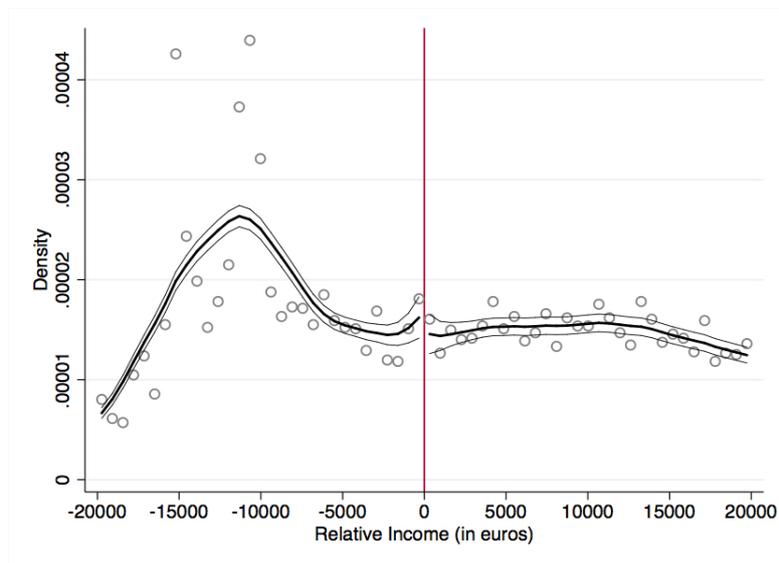
Data Source: BZK/CBS (2016, 2019). Relative incomes between  $-\text{€}20,000$  and  $\text{€}20,000$  plotted.

Figure D.10: Density plot of relative income, single, pension (EP65+) households



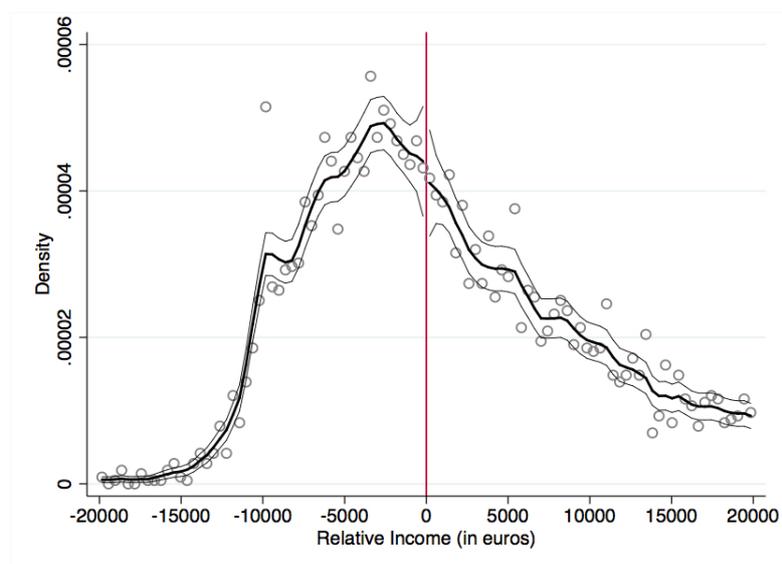
Data Source: BZK/CBS (2016, 2019). Relative incomes between -€20,000 and €20,000 plotted.

Figure D.11: Density plot of relative income, multi-person, non-pension (MP) households



Data Source: BZK/CBS (2016, 2019). Relative incomes between -€20,000 and €20,000 plotted.

Figure D.12: Density plot of relative income, multi-person, pension (MP65+) households



Data Source: BZK/CBS (2016, 2019). Relative incomes between  $-\text{€}20,000$  and  $\text{€}20,000$  plotted.

## E Bandwidth Selection Estimates

Choosing the right bandwidth is important, as one must find a balance between variance and bias. A bandwidth that is too wide can lead to more variance but also more bias. Likewise, a narrow bandwidth will have less variance, but also less bias. Taking the advice of Imbens & Lemieux (2008) and Lee & Lemieux (2010), I use the same bandwidth for the first and second stage regressions, as using different bandwidths makes usual 2SLS standard errors invalid. As suggested by (Imbens & Lemieux, 2008), I discard 50% of the observations on either side of the income limit before assessing the optimal bandwidth. Lee & Lemieux (2010) propose that the bandwidth can either be chosen by visually analyzing the running variable or by minimizing the cross validation criterion. In this study, I use a minimizing mean squared error (MSE) -optimal bandwidth selector developed in Calonico, Cattaneo, Farrell, & Titiunik (2018); Calonico, Cattaneo, & Farrell (2018); Calonico et al. (2014).<sup>31</sup> Table E.1 provides the optimal bandwidth results using different outcome variables, as Imbens & Lemieux (2008) suggest using the outcome variable to choose the bandwidth. Each outcome variable has a different optimal bandwidth, but for simplicity, the rounded median bandwidths are used in the main results.<sup>32</sup>

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<sup>31</sup>`rdbwselect` STATA package. This estimator allows for Fuzzy RD specification.

<sup>32</sup>The same bandwidths estimated for the binary treatment variable are used for the continuous treatment variable.

Table E.1: Optimal bandwidth estimates, all household categories

Variables	Optimal Bandwidths					
	All	EP	EP65+	MP	MP65+	All (without EP)
<b>Housing Consumption</b>						
<i>rent</i>	2443	3697	2150	4652	2383	1925
<i>housing costs</i>	1874	3429	1929	5036	2051	2387
<i>area of house</i>	2010	4008	1709	5663	1557	2950
<i>number of rooms</i>	1703	3588	2044	5231	1917	2330
<i>rent/m<sup>2</sup></i>	1936	2412	1751	5949	1768	1928
<b>Tenure Choice</b>						
<i>preference to own</i>	1508	2232	1114	4947	1398	1627
<b>Labour Market Participation</b>						
<i>working partner</i> <sup>†</sup>				4700	2416	
<i>working hours/week</i> <sup>††</sup>	2444	3769	1400	3819	1687	1633
<b>Wealth</b>						
<i>total assets</i>	3130	2634	1946	3628	1323	4058
<i>total savings</i>	3166	2497	1788	4682	1661	2743
<b>Median</b> <sup>‡</sup>	2000	3000	1500	4500	1500	2000

Data Source: BZK/CBS (2016, 2019). EP = single, non-pension households, EP65+ = single, pension households, MP = multi-person, non-pension households, and MP65+ = multi-person, pension households. Each optimal bandwidth calculated by first discarding 50% of the observations on both sides of the cut off of the respective sample (Imbens & Lemieux, 2008), then estimating the bandwidth using a minimizing squared error-optimal bandwidth selector (Calonico, Cattaneo, Farrell, & Titiunik, 2018). Bandwidths estimated with respect to the binary treatment variable. *rent* does not include housing allowance; *housing costs* does include housing allowance.

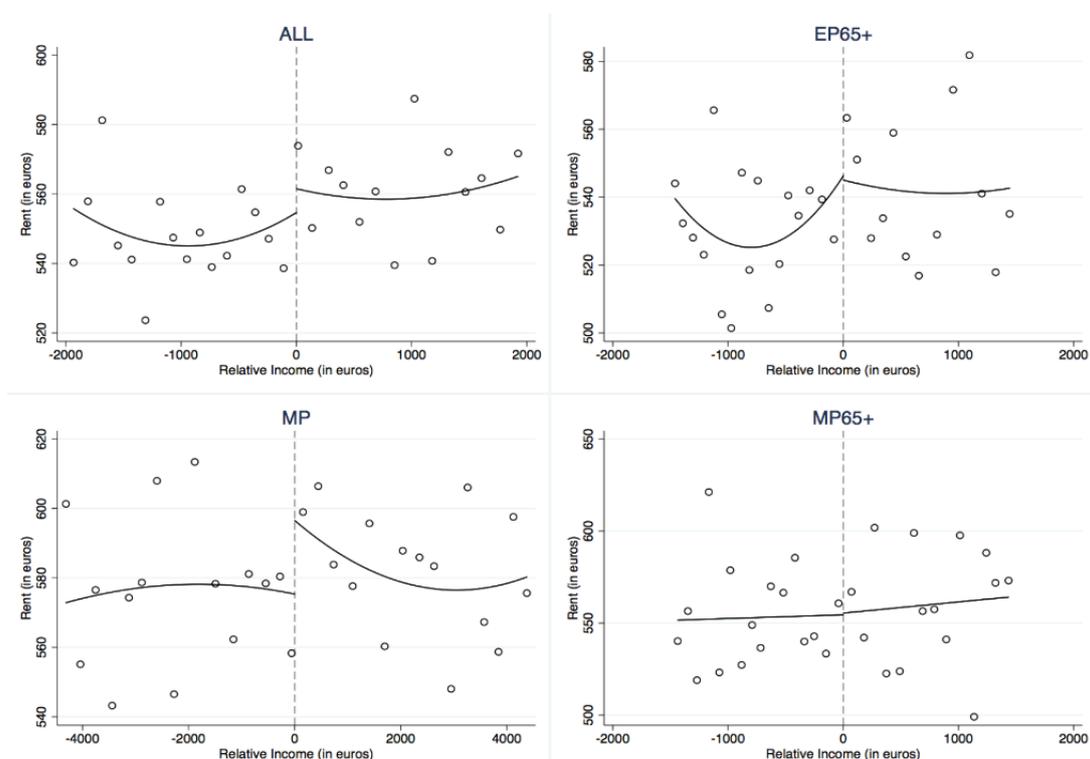
<sup>†</sup>partner of main household breadwinner; only for multi-person households.

<sup>††</sup>total working hours per week, of all household members. Only available for WoOn 2015.

<sup>‡</sup>rounded down to the nearest 500.

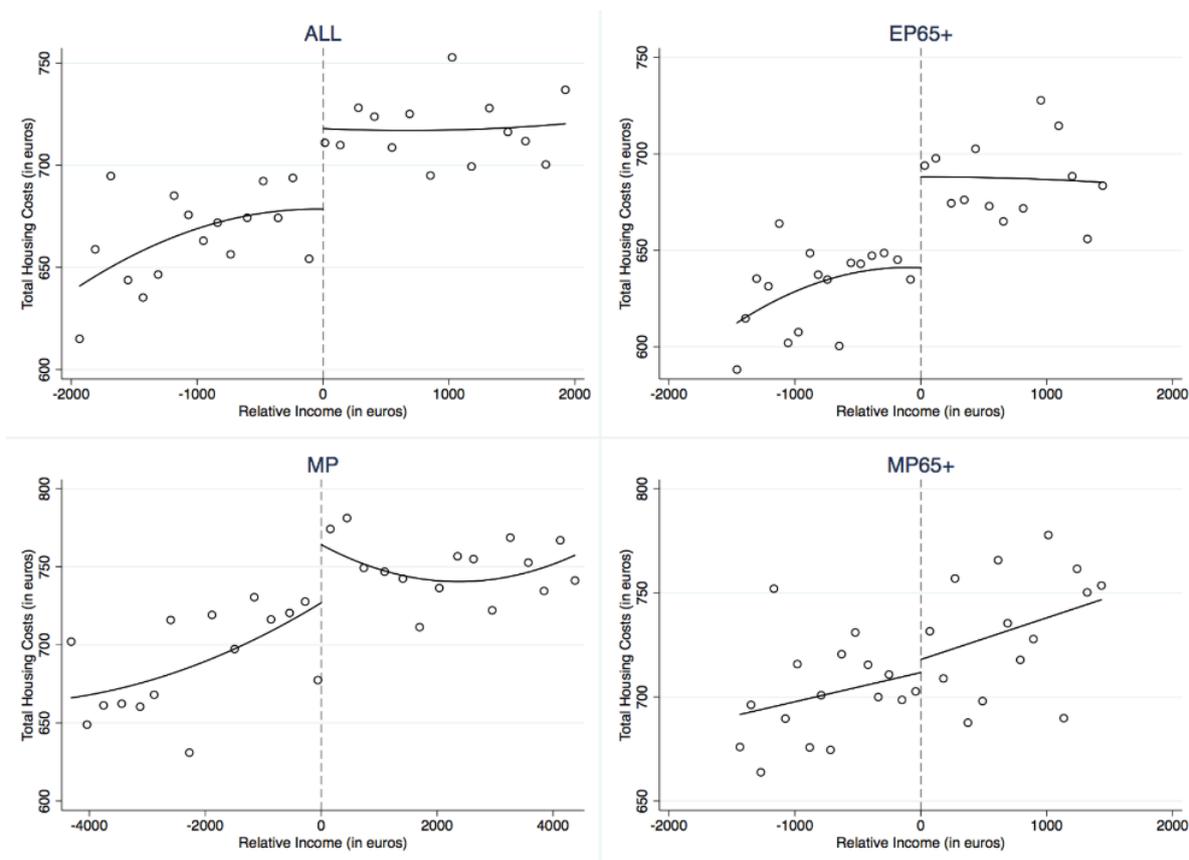
## F Tables and Figures from Results

Figure F.1: Intent-to-treat: the relationship between relative income and rent



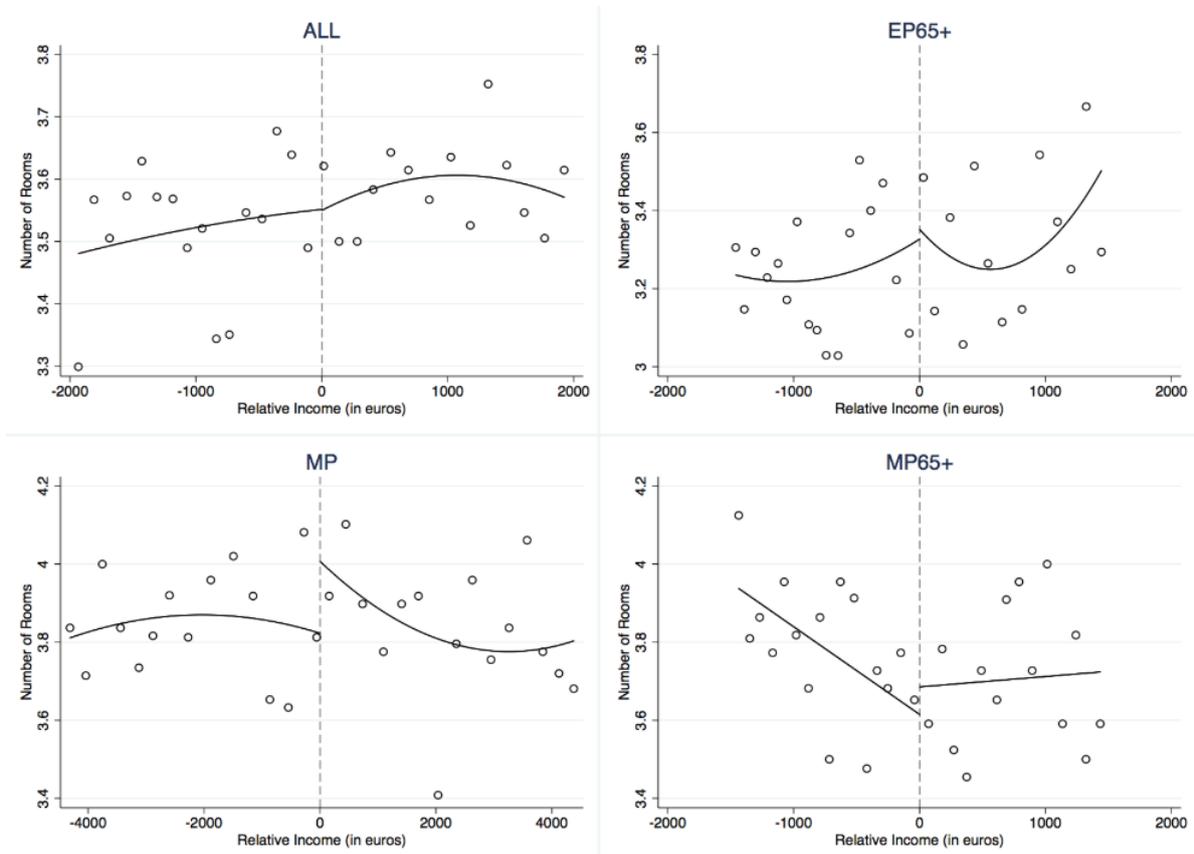
Data Source: BZK/CBS (2016, 2019). For ALL,  $n = 2,901$ ; only observations with a relative income (difference between household income and the income limit of the individual's household category) between -2000 and 2000. For EP65+,  $n = 1,038$ ; only observations with a relative income between -1500 and 1500 are used. For MP,  $n = 1,467$ ; only observations with a relative income between -4500 and 4500 are used. For MP65+,  $n = 662$ ; only observations with a relative income between -1500 and 1500 are used. Each scatter plot includes 30 equally-sized averaged bins. The lines are the quadratic (linear for MP65+) fitted lines of the estimated relationship between relative income and rent. The fitted lines are estimated separately: (i) for the observations below the cut-off and (ii) for the observations above the cut-off. EP = single, non-pension households, EP65+ = single, pension households, MP = multi-person, non-pension households, and MP65+ = multi-person, pension households. ALL does not include EP households. Rent is measured in euros per month.

Figure F.2: Intent-to-treat: the relationship between relative income and total housing costs



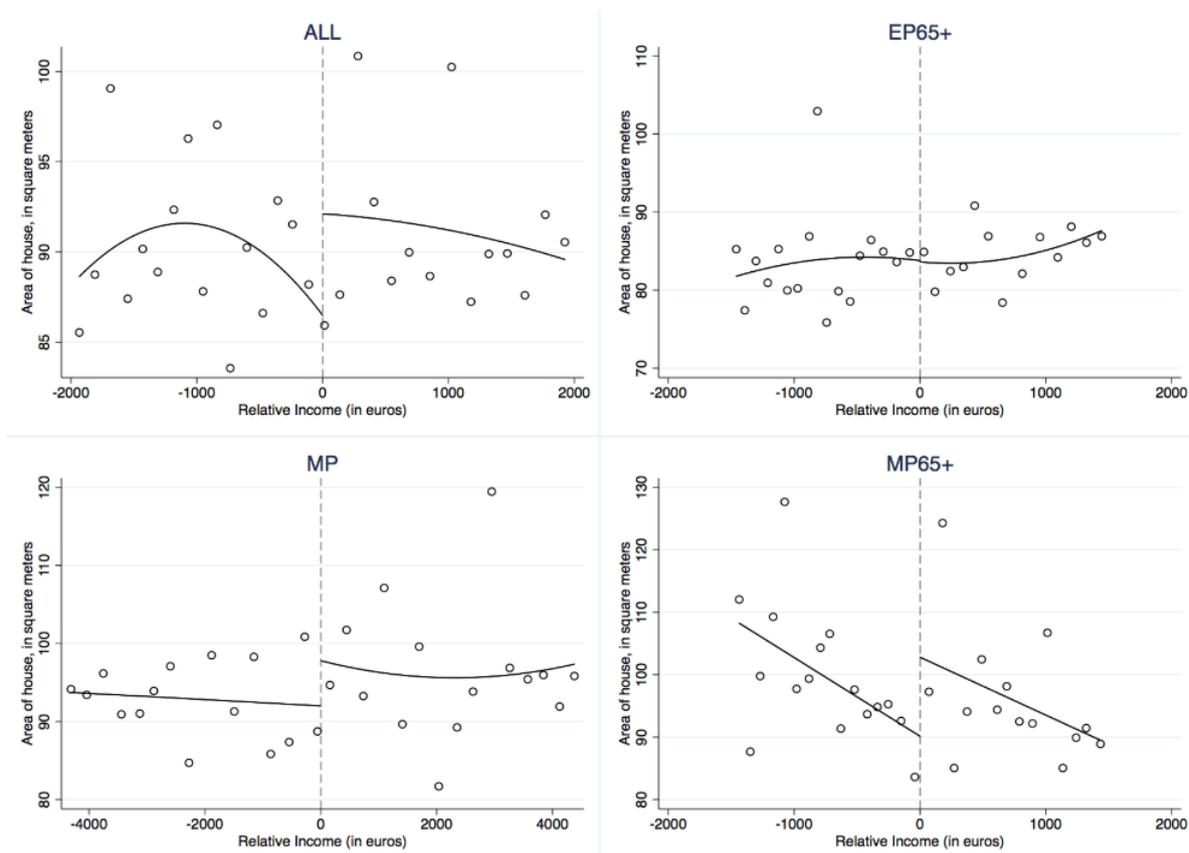
Data Source: BZK/CBS (2016, 2019). For ALL,  $n = 2,901$ ; only observations with a relative income (difference between household income and the income limit of the individual's household category) between -2000 and 2000. For EP65+,  $n = 1,038$ ; only observations with a relative income between -1500 and 1500 are used. For MP,  $n = 1,467$ ; only observations with a relative income between -4500 and 4500 are used. For MP65+,  $n = 662$ ; only observations with a relative income between -1500 and 1500 are used. Each scatter plot includes 30 equally-sized averaged bins. The lines are the quadratic (linear for MP65+) fitted lines of the estimated relationship between relative income and housing costs. The fitted lines are estimated separately: (i) for the observations below the cut-off and (ii) for the observations above the cut-off. EP = single, non-pension households, EP65+ = single, pension households, MP = multi-person, non-pension households, and MP65+ = multi-person, pension households. ALL does not include EP households. Housing costs are measured in euros per month.

Figure F.3: Intent-to-treat: the relationship between relative income and number of rooms



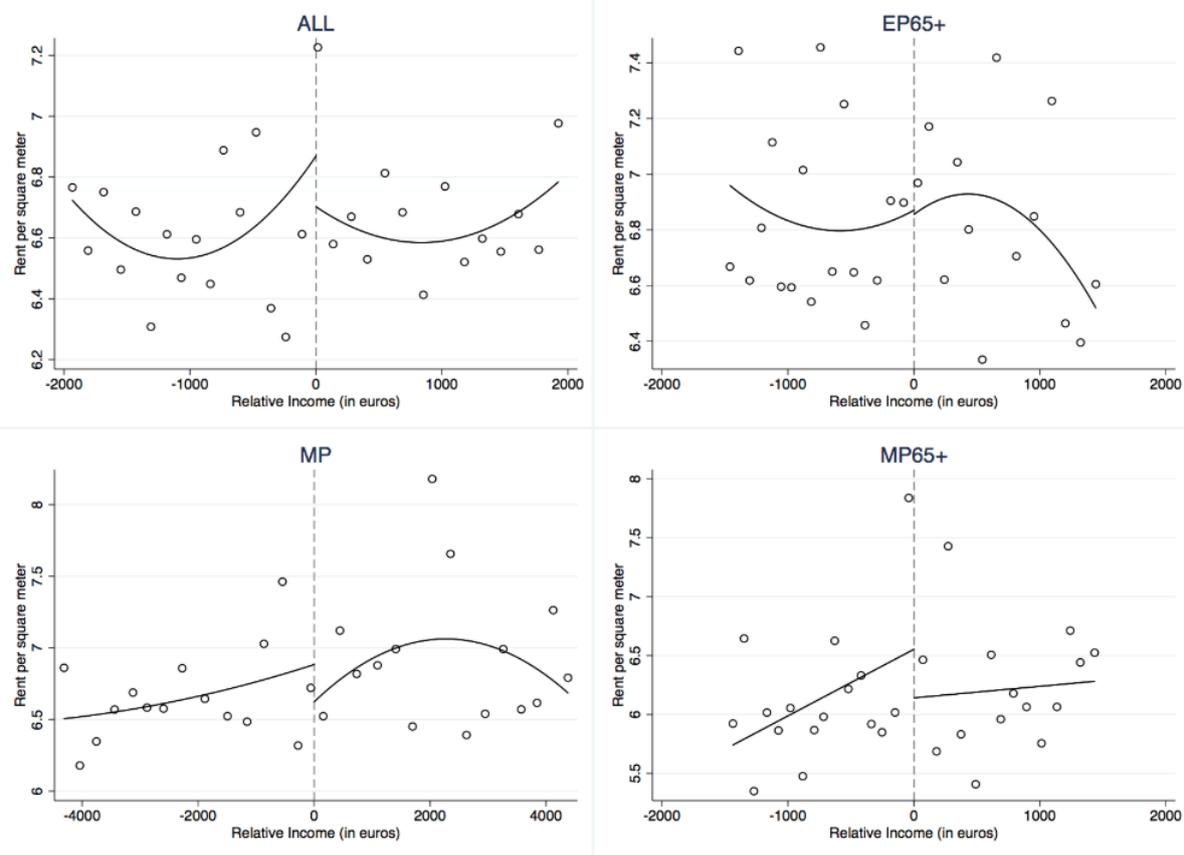
Data Source: BZK/CBS (2016, 2019). For ALL,  $n = 2,901$ ; only observations with a relative income (difference between household income and the income limit of the individual's household category) between -2000 and 2000. For EP65+,  $n = 1,038$ ; only observations with a relative income between -1500 and 1500 are used. For MP,  $n = 1,467$ ; only observations with a relative income between -4500 and 4500 are used. For MP65+,  $n = 662$ ; only observations with a relative income between -1500 and 1500 are used. Each scatter plot includes 30 equally-sized averaged bins. The lines are the quadratic (linear for MP65+) fitted lines of the estimated relationship between relative income and number of rooms. The fitted lines are estimated separately: (i) for the observations below the cut-off and (ii) for the observations above the cut-off. EP = single, non-pension households, EP65+ = single, pension households, MP = multi-person, non-pension households, and MP65+ = multi-person, pension households. ALL does not include EP households.

Figure F.4: Intent-to-treat: the relationship between relative income and area of current house



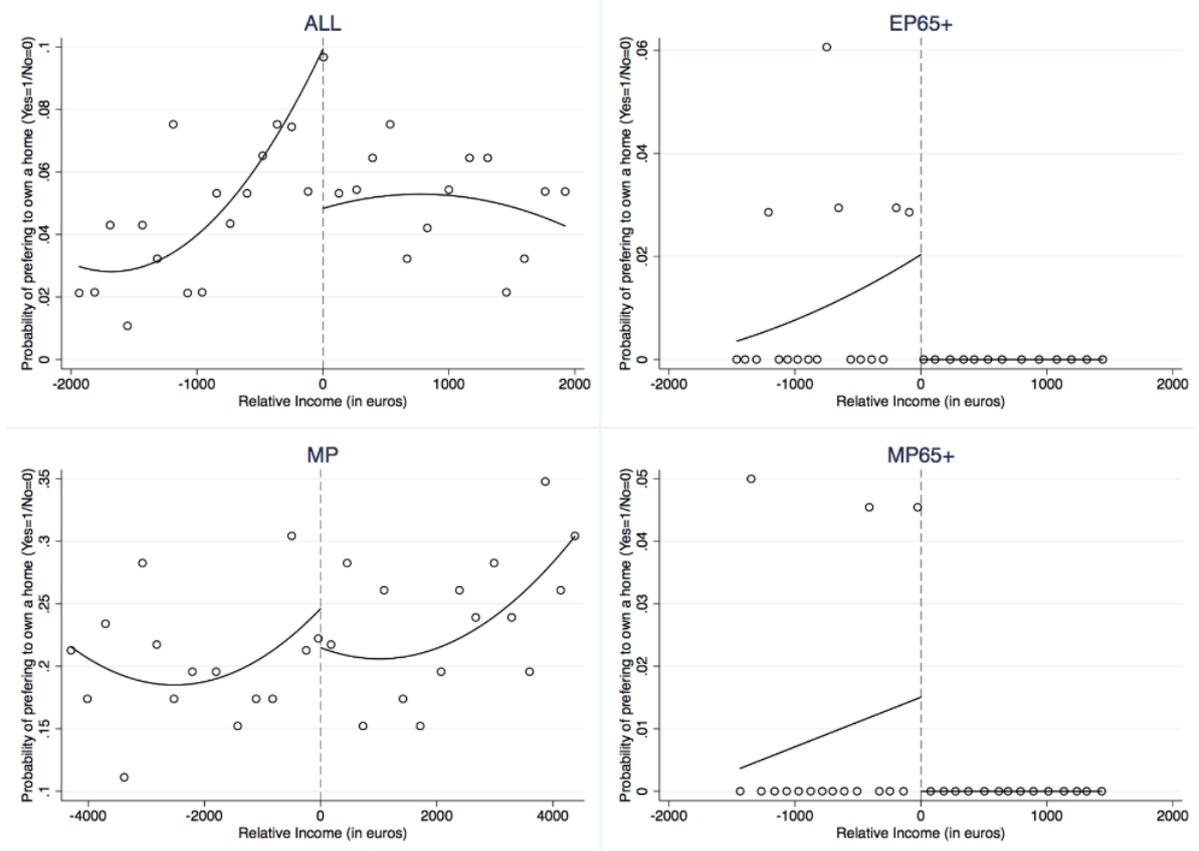
Data Source: BZK/CBS (2016, 2019). For ALL,  $n = 2,901$ ; only observations with a relative income (difference between household income and the income limit of the individual's household category) between -2000 and 2000. For EP65+,  $n = 1,038$ ; only observations with a relative income between -1500 and 1500 are used. For MP,  $n = 1,467$ ; only observations with a relative income between -4500 and 4500 are used. For MP65+,  $n = 662$ ; only observations with a relative income between -1500 and 1500 are used. Each scatter plot includes 30 equally-sized averaged bins. The lines are the quadratic (linear for MP65+) fitted lines of the estimated relationship between relative income and area of current house. The fitted lines are estimated separately: (i) for the observations below the cut-off and (ii) for the observations above the cut-off. EP = single, non-pension households, EP65+ = single, pension households, MP = multi-person, non-pension households, and MP65+ = multi-person, pension households. ALL does not include EP households.

Figure F.5: Intent-to-treat: the relationship between relative income and rent per square meter



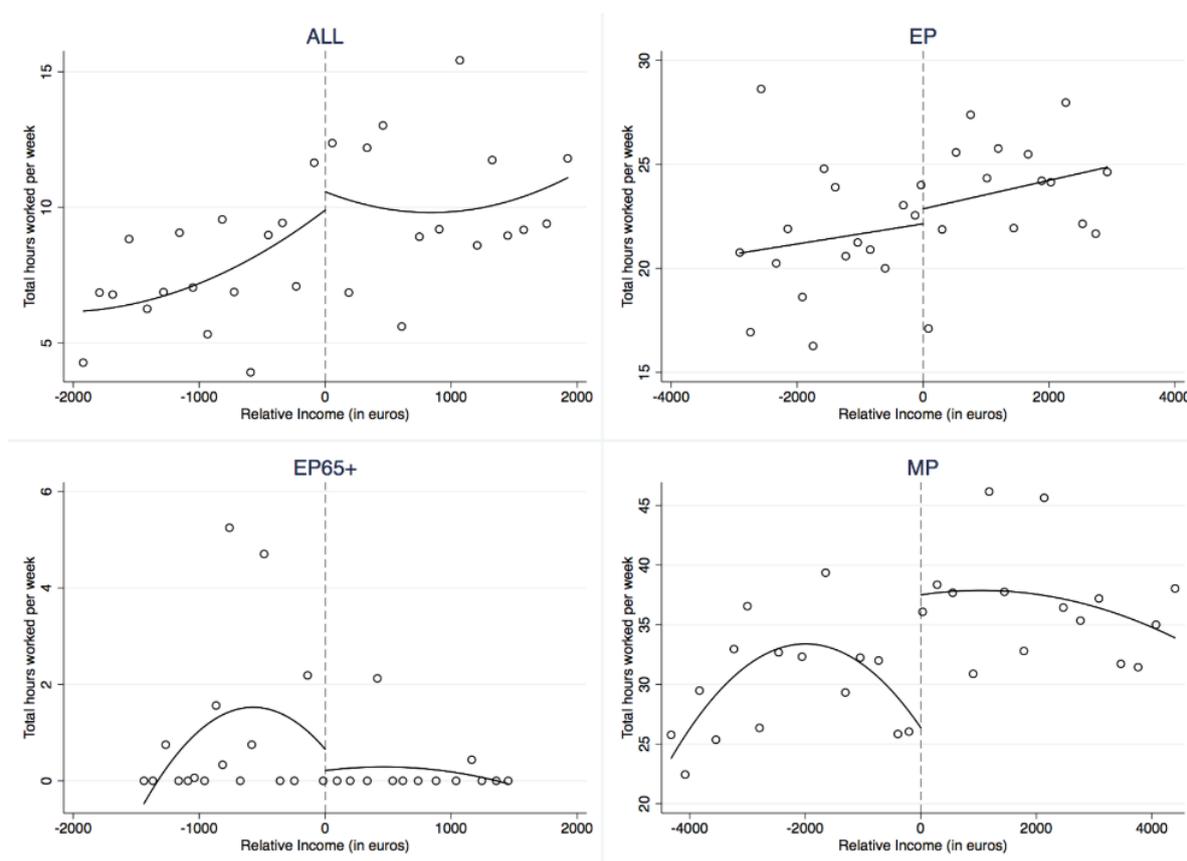
Data Source: BZK/CBS (2016, 2019). For ALL,  $n = 2,901$ ; only observations with a relative income (difference between household income and the income limit of the individual’s household category) between -2000 and 2000. For EP65+,  $n = 1,038$ ; only observations with a relative income between -1500 and 1500 are used. For MP,  $n = 1,467$ ; only observations with a relative income between -4500 and 4500 are used. For MP65+,  $n = 662$ ; only observations with a relative income between -1500 and 1500 are used. Each scatter plot includes 30 equally-sized averaged bins. The lines are the quadratic (linear for MP65+) fitted lines of the estimated relationship between relative income and rent per square meter. The fitted lines are estimated separately: (i) for the observations below the cut-off and (ii) for the observations above the cut-off. EP = single, non-pension households, EP65+ = single, pension households, MP = multi-person, non-pension households, and MP65+ = multi-person, pension households. ALL does not include EP households. Rent is measured in euros per month.

Figure F.6: Intent-to-treat: the relationship between relative income and preference for home ownership



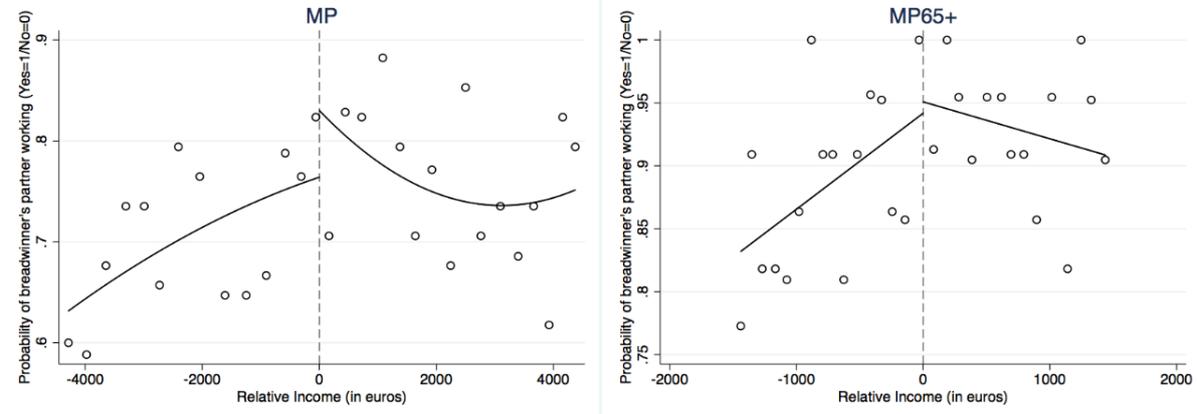
Data Source: BZK/CBS (2016, 2019). For ALL,  $n = 2,794$ ; only observations with a relative income (difference between household income and the income limit of the individual's household category) between -2000 and 2000. For EP65+,  $n = 1,014$ ; only observations with a relative income between -1500 and 1500 are used. For MP,  $n = 1,381$ ; only observations with a relative income between -4500 and 4500 are used. For MP65+,  $n = 632$ ; only observations with a relative income between -1500 and 1500 are used. Each scatter plot includes 30 equally-sized averaged bins. The lines are the quadratic (linear for MP65+) fitted lines of the estimated relationship between relative income and preference for home ownership. The fitted lines are estimated separately: (i) for the observations below the cut-off and (ii) for the observations above the cut-off. EP = single, non-pension households, EP65+ = single, pension households, MP = multi-person, non-pension households, and MP65+ = multi-person, pension households. ALL does not include EP households.

Figure F.7: Intent-to-treat: the relationship between relative income and household's total working hours per week



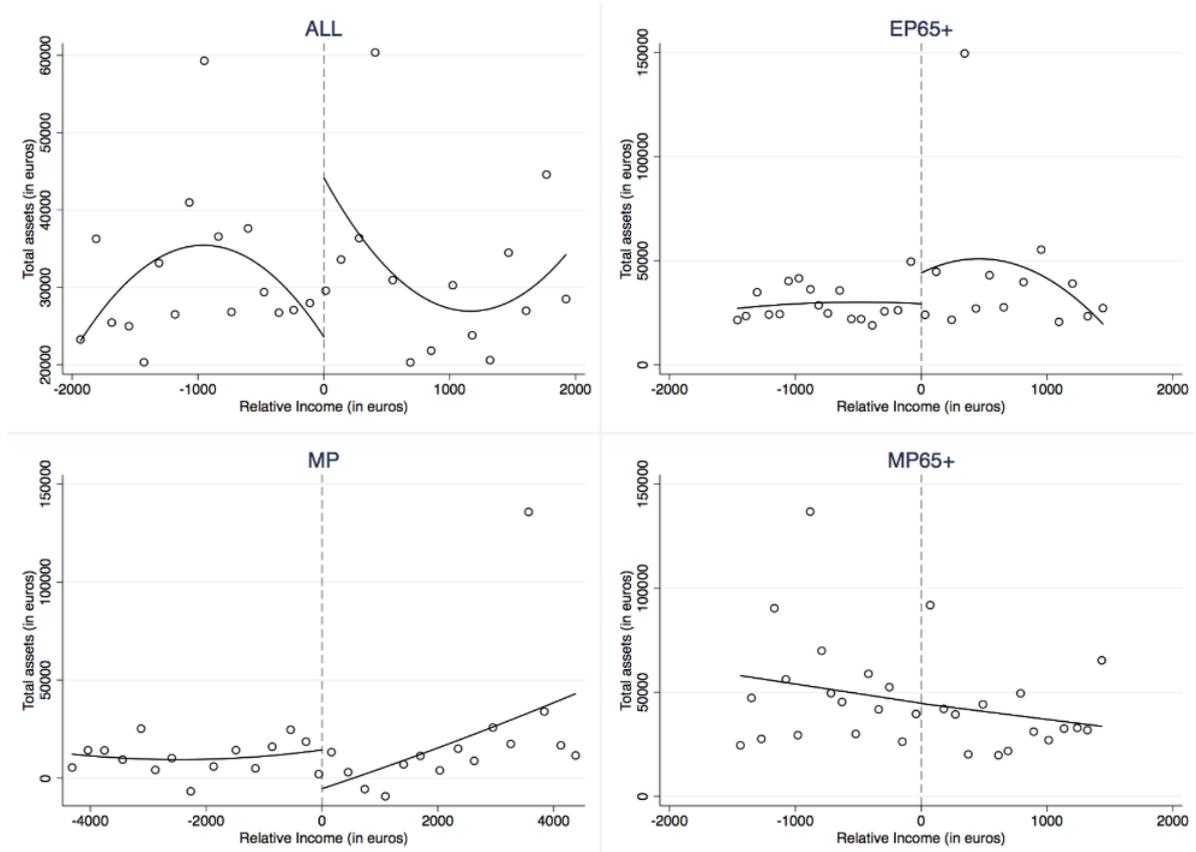
Data Source: BZK/CBS (2016). For ALL,  $n = 1,413$ ; only observations with a relative income (difference between household income and the income limit of the individual's household category) between -2000 and 2000. For EP,  $n = 869$ ; only observations with a relative income between -3000 and 3000 are used. For EP65+,  $n = 485$ ; only observations with a relative income between -1500 and 1500 are used. For MP,  $n = 755$ ; only observations with a relative income between -4500 and 4500 are used. Each scatter plot includes 30 equally-sized averaged bins. The lines are the quadratic fitted lines of the estimated relationship between relative income and total working hours per week. The fitted lines are estimated separately: (i) for the observations below the cut-off and (ii) for the observations above the cut-off. EP = single, non-pension households, EP65+ = single, pension households, and MP = multi-person, non-pension households. ALL does not include EP households. Self-reported working hours per week of respondent and partner

Figure F.8: Intent-to-treat: the relationship between relative income and probability of breadwinner's partner having a personal income



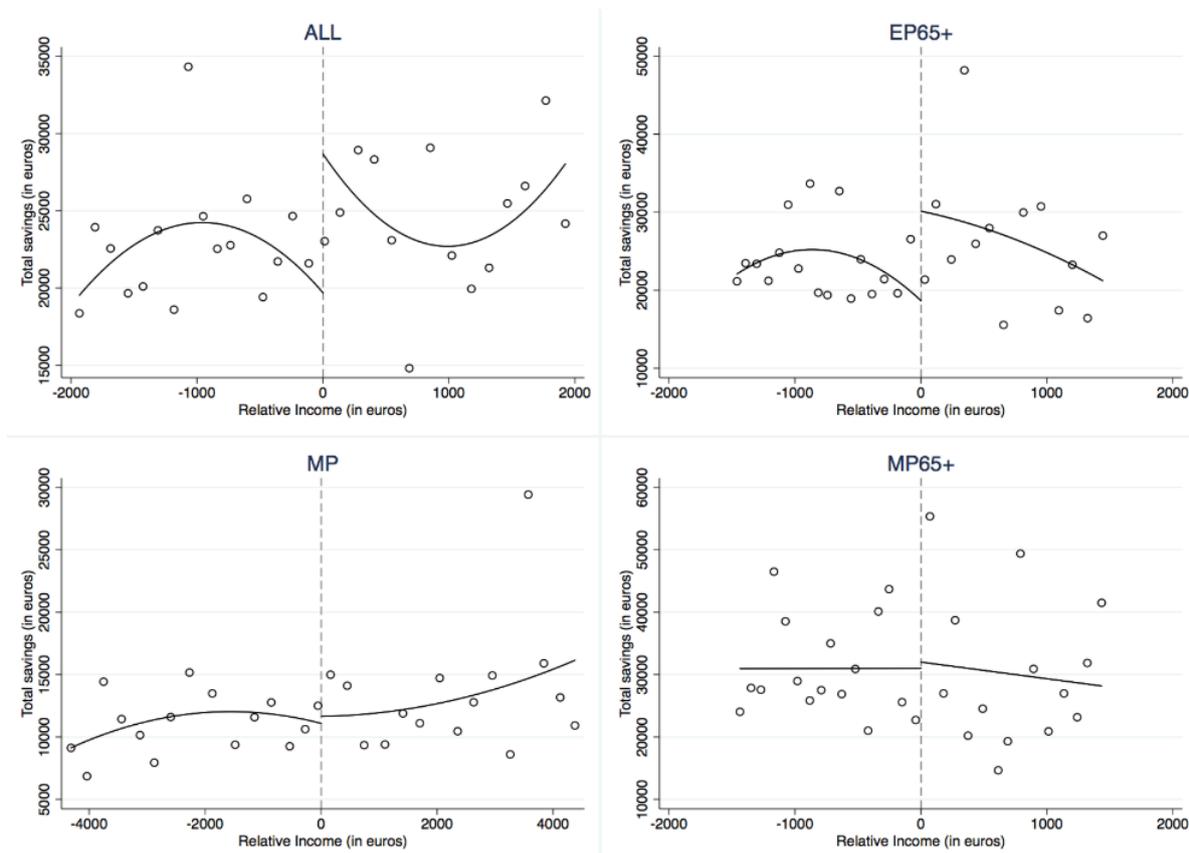
Data Source: BZK/CBS (2016, 2019). For MP,  $n = 1,025$ ; only observations with a relative income between -4500 and 4500 are used. For MP65+,  $n = 654$ ; only observations with a relative income between -1500 and 1500 are used. Each scatter plot includes 30 equally-sized averaged bins. The lines are the quadratic (linear for MP65+) fitted lines of the estimated relationship between relative income and probability of breadwinner's partner working. The fitted lines are estimated separately: (i) for the observations below the cut-off and (ii) for the observations above the cut-off. MP = multi-person, non-pension households, and MP65+ = multi-person, pension households.

Figure F.9: Intent-to-treat: the relationship between relative income and total assets



Data Source: BZK/CBS (2016, 2019). For ALL,  $n = 2,901$ ; only observations with a relative income (difference between household income and the income limit of the individual's household category) between -2000 and 2000. For EP65+,  $n = 1,038$ ; only observations with a relative income between -1500 and 1500 are used. For MP,  $n = 1,462$ ; only observations with a relative income between -4500 and 4500 are used. For MP65+,  $n = 662$ ; only observations with a relative income between -1500 and 1500 are used. Each scatter plot includes 30 equally-sized averaged bins. The lines are the quadratic (linear for MP65+) fitted lines of the estimated relationship between relative income and total assets. The fitted lines are estimated separately: (i) for the observations below the cut-off and (ii) for the observations above the cut-off. EP = single, non-pension households, EP65+ = single, pension households, MP = multi-person, non-pension households, and MP65+ = multi-person, pension households. ALL does not include EP households. Total assets measured in euros.

Figure F.10: Intent-to-treat: the relationship between relative income and total savings



Data Source: BZK/CBS (2016, 2019). For ALL,  $n = 2,896$ ; only observations with a relative income (difference between household income and the income limit of the individual's household category) between -2000 and 2000. For EP65+,  $n = 1,038$ ; only observations with a relative income between -1500 and 1500 are used. For MP,  $n = 1,457$ ; only observations with a relative income between -4500 and 4500 are used. For MP65+,  $n = 662$ ; only observations with a relative income between -1500 and 1500 are used. Each scatter plot includes 30 equally-sized averaged bins. The lines are the quadratic (linear for MP65+) fitted lines of the estimated relationship between relative income and total savings. The fitted lines are estimated separately: (i) for the observations below the cut-off and (ii) for the observations above the cut-off. EP = single, non-pension households, EP65+ = single, pension households, MP = multi-person, non-pension households, and MP65+ = multi-person, pension households. ALL does not include EP households. Savings measured in euros.

Table F.1: Second stage estimates with and without controls

	ALL <sup>†</sup>		EP65+		MP		MP65+	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable: rent allowance	-58.91 (49.69)	-54.17 (46.63)	-48.78 (76.88)	-44.02 (74.09)	-59.07 (75.67)	-55.16 (67.59)	6.88 (92.67)	6.06 (92.34)
Dependent variable: total housing costs allowance	-148.22*** (49.98)	-139.44*** (46.61)	-174.83** (76.90)	-166.53** (73.61)	-130.10* (79.13)	-130.89* (70.57)	-29.70 (95.93)	-14.40 (95.63)
Dependent variable: number of rooms allowance	-0.16 (0.31)	-0.19 (0.29)	0.20 (0.46)	0.19 (0.46)	-0.35 (0.51)	-0.44 (0.45)	-0.38 (0.63)	-0.33 (0.63)
Dependent variable: area of house allowance	-14.20 (13.65)	-19.37 (13.10)	8.79 (13.75)	3.76 (13.43)	-20.65 (23.98)	-27.96 (23.40)	-56.32 (37.67)	-57.18 (35.53)
Dependent variable: rent/m <sup>2</sup> allowance	0.29 (0.88)	0.50 (0.83)	-0.93 (1.25)	-0.58 (1.21)	-0.28 (1.27)	-0.01 (1.06)	2.15 (2.31)	2.30 (2.46)
Dependent variable: preference for home ownership allowance	0.09 (0.07)	0.11 (0.07)	0.08* (0.04)	0.08* (0.05)	0.13 (0.19)	0.14 (0.17)	0.07 (0.07)	0.06 (0.06)
Dependent variable: working hours/week allowance	-6.88 (5.24)	-5.75 (4.76)	6.29 (4.72)	5.44 (4.14)	-21.65** (10.83)	-16.35* (9.68)		
Dependent variable: working partner allowance					-0.11 (0.24)	-0.11 (0.22)	-0.02 (0.19)	-0.05 (0.19)
Dependent variable: total assets allowance	-12,558.31 (43,303.18)	-12,396.98 (42,432.50)	-105,469.50 (88,493.06)	-106,077.10 (87,217.63)	81,277.10* (47,626.01)	71,575.07 (43,599.49)	7,868.45 (59,529.69)	27,571.90 (62,631.57)
Dependent variable: savings allowance	-5,808.67 (13,755.45)	-5,916.51 (13,446.54)	-35,825.13 (21,840.44)	-35,332.31 (21,536.97)	5,641.91 (12,778.23)	1,157.60 (11,893.2)	-4,870.71 (33,377.10)	4,456.71 (33,986.77)
Bandwidth (±)	2,000	2,000	1,500	1,500	4,500	4,500	1,500	1,500
Category Controls	Yes	Yes	No	No	No	No	No	No
Full set of controls	No	Yes	No	Yes	No	Yes	No	Yes
Polynomial Order	Quadratic	Quadratic	Quadratic	Quadratic	Quadratic	Quadratic	Linear	Linear

Table notes on following page.

<sup>†</sup> 'ALL' does not include EP households.

Notes for Table F.1: Data Source: BZK/CBS (2016, 2019). Estimates of Equation 5. \*, \*\*, \*\*\* Statistically significant at the 10%, 5%, 1% level, respectively. *eligibility* is whether the household is eligible for housing allowance based on income. *allowance* is 'binary' (receiving housing allowance or not). Heteroskedasticity robust standard errors are reported in parentheses. Bandwidths with respect to relative income (household income - income limit). All columns control for year. Polynomial order in reference to function of relative income. Six binary category controls for EP65+, MP, and MP65+ for each year, one omitted. EP = single, non-pension households, EP65+ = single, pension households, MP = multi-person, non-pension households, and MP65+ = multi-person, pension households. Rent (not including housing allowance) and total housing costs (including housing allowance) measured in euros per month. area of house measured in meters squared. Preference for home ownership is 1 if respondent prefers to own a home, if not, 0. Working hours are self-reported working hours per week of respondent and partner. Working partner is 1 if the partner of the household main breadwinner has an income, if not, 0. Total assets and savings are measured in euros. Full set of controls include controls for region, social housing, ethnicity, immigrant status, age, urbanity of the municipality, higher education, and children. For *rent*, *housing costs*, *number of rooms*, *area of house*, and *rent/m<sup>2</sup>*:  $n = 2,901$  for all,  $n = 1,038$  for EP65+,  $n = 1,467$  for MP, and  $n = 662$  for MP65+. For *rent*,  $n = 2,901$  for all,  $n = 1,038$  for EP65+,  $n = 1,467$  for MP, and  $n = 662$  for MP65+. For *preference for home ownership*,  $n = 2,794$  for all,  $n = 1,014$  for EP65+,  $n = 1,381$  for MP, and  $n = 632$  for MP65+. For *working hours/week*,  $n = 1,413$  for all,  $n = 485$  for EP65+, and  $n = 755$  for MP. For *working partner*,  $n = 1,025$  for MP, and  $n = 654$  for MP65+. For *total assets*,  $n = 2,901$  for all,  $n = 1,038$  for EP65+,  $n = 1,462$  for MP, and  $n = 662$  for MP65+. For *savings*,  $n = 2,896$  for all,  $n = 1,038$  for EP65+,  $n = 1,457$  for MP, and  $n = 662$  for MP65+.

Table F.2: First stage estimates: the relationship between income eligibility and housing allowance measures, with smaller bandwidth

	ALL <sup>†</sup>		EP		EP65+		MP		MP65+	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dependent variable: receiving housing allowance										
eligibility	0.22*** (0.03)	0.22*** (0.03)	0.30*** (0.05)	0.30*** (0.05)	0.26*** (0.06)	0.26*** (0.06)	0.18*** (0.05)	0.19*** (0.05)	0.24*** (0.07)	0.23*** (0.07)
F-stat	<b>41.34</b>	<b>44.21</b>	<b>39.76</b>	<b>43.26</b>	<b>20.43</b>	<b>21.5</b>	<b>11.51</b>	<b>12.81</b>	<b>11.13</b>	<b>11.42</b>
AIC	2,333.30	<u>2,329.16</u>	<u>1,487.90</u>	1,488.06	<u>763.20</u>	765.13	1,297.71	<u>1,289.83</u>	<u>482.45</u>	484.34
Dependent variable: amount of housing allowance										
eligibility	20.68*** (5.42)	21.32*** (5.34)	23.82*** (7.81)	25.20*** (7.73)	27.68*** (7.87)	27.76*** (7.66)	10.33 (9.52)	11.74 (9.40)	17.06* (9.18)	16.87* (9.17)
F-stat	<b>14.57</b>	<b>15.93</b>	9.3	<b>10.63</b>	<b>12.35</b>	<b>13.14</b>	1.18	1.56	3.45	3.39
AIC	24,420.34	<u>24,413.84</u>	14,934.90	<u>14,933.21</u>	<u>8,252.52</u>	8,254.50	12,691.04	<u>12,683.32</u>	<u>5,314.65</u>	5,316.48
Bandwidth (±)	1500	1500	2250	2250	1125	1125	3375	3375	1125	1125
Category Controls	Yes	Yes	No	No	No	No	No	No	No	No
Polynomial Order	Linear	Quadratic	Linear	Quadratic	Linear	Quadratic	Linear	Quadratic	Linear	Quadratic
N	2206	2206	1321	1321	766	766	1088	1088	494	494

Data Source: BZK/CBS (2016, 2019). Estimated using Equation 4. \*, \*\*, \*\*\* Statistically significant at the 10%, 5%, 1% level, respectively.

Heteroskedasticity robust standard errors are reported in parentheses. F-statistics on the coefficient for the instrument, income eligibility, are in bold when greater than 10. Lowest AIC value of the sample group underlined. Bandwidths with respect to relative income. All estimated regressions include a constant, function of relative income, and a control for year. Polynomial order in reference to function of relative income. Six binary category controls for EP65+, MP, and MP65+ for each year, one omitted. Receiving housing allowance is 1 if household receives housing allowance, 0 if not. Amount of housing allowance is in euros per month. EP = single, non-pension households, EP65+ = single, pension households, MP = multi-person, non-pension households, and MP65+ = multi-person, pension households.

<sup>†</sup> 'ALL' does not include EP households.

Table F.3: The effect of housing allowance on rent and housing costs, full model with smaller bandwidths

	ALL <sup>†</sup>		EP65+		MP	MP65+
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable: rent						
<i>Reduced form</i>						
eligibility	-8.55 (12.53)	-8.55 (12.53)	-1.19 (22.25)	-1.19 (22.25)	-14.43 (18.95)	-2.97 (22.76)
relative income	0.00 (0.01)	0.00 (0.01)	0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	0.00 (0.02)
relative income <sup>2</sup>	-0.00 (0.00)	-0.00 (0.00)			-0.00 (0.00)	
constant	577.81*** (13.27)	577.81*** (13.27)	511.73*** (15.66)	511.73*** (15.66)	604.63*** (14.26)	574.54*** (15.08)
<i>Second stage</i>						
allowance	-38.05 (55.77)	-0.40 (0.60)	-4.56 (85.06)	-0.04 (0.80)	-77.80 (102.85)	-12.64 (96.44)
relative income	0.00 (0.01)	-0.00 (0.01)	0.01 (0.02)	0.01 (0.02)	-0.01 (0.01)	0.00 (0.02)
relative income <sup>2</sup>	0.00 (0.00)	0.00 (0.00)			0.00 (0.00)	
constant	572.47*** (27.49)	580.12*** (17.15)	583.70*** (22.35)	517.37*** (12.83)	626.25*** (41.02)	572.47*** (27.49)
N	2,206	2,206	766	766	1,088	494
Dependent variable: total housing costs						
<i>Reduced Form</i>						
eligibility	-33.58** (13.49)	-33.58** (13.49)	-33.80 (23.15)	-33.80 (23.15)	-26.57 (21.46)	-13.56 (23.98)
relative income	0.01 (0.01)	0.01 (0.01)	0.02 (0.02)	0.02 (0.02)	0.01 (0.01)	0.01 (0.02)
relative income <sup>2</sup>	-0.00 (0.00)	-0.00 (0.00)			-0.00* (0.00)	
constant	761.79*** (17.29)	767.25*** (14.40)	667.21*** (16.25)	667.21*** (16.25)	740.68*** (15.99)	725.94*** (16.13)
<i>Second stage</i>						
allowance	-149.36*** (56.40)	-1.58*** (0.61)	-129.53 (84.66)	-1.22 (0.80)	-143.32 (106.45)	-57.68 (97.55)
relative income	-0.00 (0.01)	-0.01 (0.01)	0.01 (0.02)	0.01 (0.02)	-0.00 (0.01)	0.01 (0.02)
relative income <sup>2</sup>	-0.00 (0.00)	0.00 (0.00)			-0.00 (0.00)	
constant	761.79*** (17.29)	775.83*** (22.85)	674.62*** (15.03)	670.90*** (12.95)	780.51*** (41.32)	733.70*** (27.69)
N	2,206	2,206	766	766	1,088	494
Treatment variable	Binary	Continuous	Binary	Continuous	Binary	Binary
Bandwidth (±)	1,500	1,500	1,125	1,125	3,375	1,125
Category controls	Yes	Yes	No	No	No	No
Polynomial order	Quadratic	Quadratic	Linear	Linear	Quadratic	Linear

Data Source: BZK/CBS (2016, 2019). Estimates of Equation 5 (second stage) and 6 (reduced form). \*, \*\*, \*\*\* Statistically significant at the 10%, 5%, 1% level, respectively. *eligibility* is whether the household is eligible for housing allowance based on income. *allowance* is either 'binary' (receiving housing allowance or not) or 'continuous' (the amount of housing allowance per month). Heteroskedasticity robust standard errors are reported in parentheses. Bandwidths with respect to relative income (household income - income limit). All columns control for year. Polynomial order in reference to function of relative income. Six binary category controls for EP65+, MP, and MP65+ for each year, one omitted. EP = single, non-pension households, EP65+ = single, pension households, MP = multi-person, non-pension households, and MP65+ = multi-person, pension households. Rent (not including housing allowance and total housing costs (including housing allowance) are in euros per month.

<sup>†</sup> 'ALL' does not include EP households.

Table F.4: The effect of housing allowance on number of rooms and area of the current house, full model with smaller bandwidths

	ALL <sup>†</sup>		EP65+		MP	MP65+
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable: number of rooms						
<i>Reduced form</i>						
eligibility	-0.06 (0.08)	-0.06 (0.08)	0.03 (0.13)	0.03 (0.13)	-0.10 (0.12)	0.05 (0.15)
relative income	-0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)
relative income <sup>2</sup>	0.00 (0.00)	0.00 (0.00)			-0.00 (0.00)	
constant	3.89*** (0.08)	3.89*** (0.08)	3.24*** (0.08)	3.24*** (0.08)	3.94*** (0.09)	3.61*** (0.11)
<i>Second stage</i>						
allowance	-0.25 (0.35)	-0.00 (0.00)	0.12 (0.49)	0.00 (0.00)	-0.54 (0.67)	0.23 (0.65)
relative income	-0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)
relative income <sup>2</sup>	0.00 (0.00)	0.00 (0.00)			-0.00 (0.00)	
constant	3.76*** (0.11)	3.78*** (0.14)	3.21*** (0.08)	3.22*** (0.07)	4.09*** (0.26)	3.66*** (0.19)
N	2206	2206	766	766	1,088	494
Dependent variable: area of house						
<i>Reduced Form</i>						
eligibility	-4.58 (3.25)	-4.58 (3.25)	-0.07 (3.75)	-0.07 (3.75)	-1.99 (6.61)	-15.93 (10.17)
relative income	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)	-0.01 (0.01)
relative income <sup>2</sup>	-0.00 (0.00)	-0.00 (0.00)			0.00 (0.00)	
constant	106.16*** (6.21)	99.17*** (5.03)	80.19*** (2.33)	80.19*** (2.33)	93.86*** (5.09)	106.55*** (8.47)
<i>Second Stage</i>						
allowance	-20.38 (14.70)	-0.21 (0.16)	-0.27 (14.33)	-0.00 (0.13)	-10.71 (35.56)	-67.76 (46.97)
relative income	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)	-0.02 (0.01)
relative income <sup>2</sup>	0.00 (0.00)	0.00 (0.00)			0.00 (0.00)	
constant	106.16*** (6.21)	108.08*** (7.56)	80.42*** (2.43)	80.41*** (2.08)	96.84*** (14.55)	120.12*** (16.26)
N	2,206	2,206	766	766	1,088	494
Treatment variable	Binary	Continuous	Binary	Continuous	Binary	Binary
Bandwidth (±)	1,500	1,500	1,125	1,125	3,375	1,125
Category controls	Yes	Yes	No	No	No	No
Polynomial order	Quadratic	Quadratic	Linear	Linear	Quadratic	Linear

Data Source: BZK/CBS (2016, 2019). Estimates of Equation 5 (second stage) and 6 (reduced form). \*, \*\*, \*\*\* Statistically significant at the 10%, 5%, 1% level, respectively. *eligibility* is whether the household is eligible for housing allowance based on income. *allowance* is either 'binary' (receiving housing allowance or not) or 'continuous' (the amount of housing allowance per month). Heteroskedasticity robust standard errors are reported in parentheses. Bandwidths with respect to relative income (household income - income limit). All columns control for year. Polynomial order in reference to function of relative income. Six binary category controls for EP65+, MP, and MP65+ for each year, one omitted. EP = single, non-pension households, EP65+ = single, pension households, MP = multi-person, non-pension households, and MP65+ = multi-person, pension households. Area is in meters squared.

<sup>†</sup> 'ALL' does not include EP households.

Table F.5: The effect of housing allowance on rent per square meter, full model with smaller bandwidths

	ALL <sup>†</sup>		EP65+		MP	MP65+
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable: rent/m <sup>2</sup>						
<i>Reduced form</i>						
eligibility	0.12 (0.22)	0.12 (0.22)	-0.04 (0.35)	-0.04 (0.35)	0.00 (0.31)	0.42 (0.62)
relative income	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
relative income <sup>2</sup>	-0.00 (0.00)	-0.00 (0.00)			-0.00 (0.00)	
constant	6.58*** (0.21)	6.58*** (0.21)	6.27*** (0.23)	6.27*** (0.23)	7.06*** (0.22)	6.39*** (0.27)
<i>Second stage</i>						
allowance	0.52 (0.99)	0.01 (0.01)	-0.15 (1.34)	-0.00 (0.01)	0.01 (1.69)	1.78 (2.69)
relative income	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
relative income <sup>2</sup>	-0.00 (0.00)	-0.00 (0.00)			-0.00 (0.00)	
constant	6.27*** (0.27)	6.22*** (0.35)	6.79*** (0.23)	6.79*** (0.20)	7.05*** (0.65)	5.90*** (0.66)
<i>N</i>	2,206	2,206	766	766	1,088	494
Treatment variable	Binary	Continuous	Binary	Continuous	Binary	Binary
Bandwidth (±)	1,500	1,500	1,125	1,125	3,375	1,125
Category controls	Yes	Yes	No	No	No	No
Polynomial order	Quadratic	Quadratic	Linear	Linear	Quadratic	Linear

Data Source: BZK/CBS (2016, 2019). Estimates of Equation 5 (second stage) and 6 (reduced form). \*, \*\*, \*\*\* Statistically significant at the 10%, 5%, 1% level, respectively. *eligibility* is whether the household is eligible for housing allowance based on income. *allowance* is either 'binary' (receiving housing allowance or not) or 'continuous' (the amount of housing allowance per month). Heteroskedasticity robust standard errors are reported in parentheses. Bandwidths with respect to relative income (household income - income limit). All columns control for year. Polynomial order in reference to function of relative income. Six binary category controls for EP65+, MP, and MP65+ for each year, one omitted. EP = single, non-pension households, EP65+ = single, pension households, MP = multi-person, non-pension households, and MP65+ = multi-person, pension households. Area is in meters squared. Rent is total rent per month, before including housing allowance.

<sup>†</sup> 'ALL' does not include EP households.

Table F.6: The effect of housing allowance on preference for home ownership, with smaller bandwidths

	ALL <sup>†</sup>		EP65+		MP	MP65+
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable: preference for home ownership						
<i>First stage</i>						
eligibility	0.23*** (0.03)	22.28*** (5.40)	0.28*** (0.06)	30.98*** (7.62)	0.19*** (0.05)	0.25*** (0.07)
F-stat	45.39	17.04	22.61	16.51	12.22	11.41
<i>Reduced form</i>						
eligibility	0.02 (0.02)	0.02 (0.02)	0.02 (0.01)	0.02 (0.01)	0.04 (0.05)	0.02 (0.02)
relative income	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
relative income <sup>2</sup>	-0.00 (0.00)	-0.00 (0.00)			0.00 (0.00)	
<i>Second stage</i>						
allowance	0.09 (0.08)	0.00 (0.00)	0.07 (0.05)	0.00 (0.00)	0.19 (0.27)	0.10 (0.08)
relative income	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
relative income <sup>2</sup>	-0.00 (0.00)	-0.00 (0.00)			0.00 (0.00)	
<i>N</i>	2,129	2,129	751	751	1,024	473
Treatment variable	Binary	Continuous	Binary	Continuous	Binary	Binary
Bandwidth ( $\pm$ )	1,500	1,500	1,125	1,125	3,375	1,125
Category controls	Yes	Yes	No	No	No	No
Polynomial order	Quadratic	Quadratic	Linear	Linear	Quadratic	Linear

Data Source: BZK/CBS (2016, 2019). Estimates of Equation 5 (second stage) and 6 (reduced form). \*, \*\*, \*\*\* Statistically significant at the 10%, 5%, 1% level, respectively. *eligibility* is whether the household is eligible for housing allowance based on income. *allowance* is either 'binary' (receiving housing allowance or not) or 'continuous' (the amount of housing allowance per month). Heteroskedasticity robust standard errors are reported in parentheses. Bandwidths with respect to relative income (household income - income limit). All columns control for year. Polynomial order in reference to function of relative income. Six binary category controls for EP65+, MP, and MP65+ for each year, one omitted. EP = single, non-pension households, EP65+ = single, pension households, MP = multi-person, non-pension households, and MP65+ = multi-person, pension households. Preference for home ownership is 1 if the respondent would like to live in a owner-occupied property, and 0 if the respondent would like to live in a rental property. First stage results provided for subsamples with different *N* than the main results in Table F.11.

<sup>†</sup> 'ALL' does not include EP households.

Table F.15: The effect of housing allowance on working hours per week of household members, with first stage and relative income estimates

	ALL <sup>†</sup>		EP		EP65+		MP	MP65+
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable: working hours/week								
<i>First stage</i>								
eligibility	0.27*** (0.04)	18.75*** (5.17)	0.40*** (0.06)	22.53*** (6.95)	0.29*** (0.08)	22.02*** (7.61)	0.30*** (0.07)	0.22*** (0.08)
F-stat	38.82	13.14	49.63	10.5	14.29	8.37	20.54	7.01
<i>Reduced form</i>								
eligibility	-1.65 (1.67)	-1.65 (1.67)	0.67 (2.53)	0.68 (2.54)	1.19 (1.09)		-9.12** (3.80)	
relative income	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)		-0.00 (0.00)	
relative income <sup>2</sup>	0.00 (0.00)	0.00 (0.00)		0.00 (0.00)			0.00 (0.00)	
constant	1.14 (0.94)	1.14 (0.94)	22.26*** (1.48)	22.21*** (1.70)	0.45 (0.32)		38.82*** (2.49)	
<i>Second stage</i>								
allowance	-6.08 (6.16)	-0.09 (0.09)	1.68 (6.32)	0.03 (0.11)	4.13 (4.00)		-30.65** (14.21)	
relative income	-0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)		-0.00 (0.00)	
relative income <sup>2</sup>	0.00 (0.00)	0.00 (0.00)		-0.00 (0.00)			0.00 (0.00)	
constant	1.13 (0.93)	1.20 (0.98)	22.15*** (1.88)	21.97*** (2.50)	0.06 (0.47)		42.05*** (3.86)	
<i>N</i>	1,081	1,081	651	651	353	353	559	246
Treatment Variable	Binary	Continuous	Binary	Continuous	Binary	Continuous	Binary	Binary
Bandwidth (± euros)	1,500	1,500	2250	2250	1,125	1,125	3,375	1,125
Category Controls	Yes	Yes	No	No	No	No	No	No
Polynomial Order	Quadratic	Quadratic	Linear	Quadratic	Linear	Linear	Quadratic	Linear

Data Source: BZK/CBS (2016). Estimates of Equation 5 (second stage) and 6 (reduced form). \*, \*\*, \*\*\* Statistically significant at the 10%, 5%, 1% level, respectively. *eligibility* is whether the household is eligible for housing allowance based on income. *allowance* is either 'binary' (receiving housing allowance or not) or 'continuous' (the amount of housing allowance per month). Heteroskedasticity robust standard errors are reported in parentheses. Bandwidths with respect to relative income. All columns control for year. Polynomial order in reference to function of relative income. Four binary category controls for EP, EP65+, MP, and MP65+, one omitted. EP = single, non-pension households, EP65+ = single, pension households, MP = multi-person, non-pension households, and MP65+ = multi-person, pension households. Self-reported working hours of respondent and partner, aggregated. First stage results provided for subsamples with different *N* than the main results in Table F.11. The reduced form and second stage for the EP65+, with continuous treatment variable, and MP65+ subsamples not estimated due to weak instrumental variable.

<sup>†</sup> 'ALL' does not include EP households.

Table F.7: The effect of housing allowance on the probability of the partner of the household breadwinner having a personal income, with smaller bandwidths

	MP	MP65+
	(1)	(2)
Dependent variable: working partner		
<i>First stage</i>		
eligibility	0.20*** (0.06)	0.24*** (0.07)
F-stat	10.18	11.43
<i>Reduced form</i>		
eligibility	-0.05 (0.06)	-0.04 (0.05)
relative income	-0.00 (0.00)	-0.00 (0.00)
relative income <sup>2</sup>	-0.00 (0.00)	
constant	0.81*** (0.04)	0.97*** (0.03)
<i>Second stage</i>		
allowance	-0.26 (0.30)	-0.17 (0.20)
relative income	-0.00 (0.00)	-0.00 (0.00)
relative income <sup>2</sup>	-0.00 (0.00)	
constant	0.88*** (0.11)	0.97*** (0.06)
<i>N</i>	757	487
Treatment variable	Binary	Binary
Bandwidth ( $\pm$ )	3,375	1,125
Category controls	No	No
Polynomial order	Quadratic	Linear

Data Source: BZK/CBS (2016, 2019). Estimates of Equation 5 (second stage) and 6 (reduced form). \*, \*\*, \*\*\* Statistically significant at the 10%, 5%, 1% level, respectively. *eligibility* is whether the household is eligible for housing allowance based on income. *allowance* is either 'binary' (receiving housing allowance or not) or 'continuous' (the amount of housing allowance per month). Heteroskedasticity robust standard errors are reported in parentheses. Bandwidths with respect to relative income (household income - income limit). All columns control for year. Polynomial order in reference to function of relative income. MP = multi-person, non-pension households and MP65+ = multi-person, pension households. First stage results provided for subsamples with different *N* than the main results in Table F.11.

Table F.8: The effect of housing allowance on total household assets, full model with smaller bandwidths

	ALL <sup>†</sup>		EP65+		MP	MP65+
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable: total assets						
<i>First stage</i>						
eligibility					0.18*** (0.05)	
F-stat					12.62	
<i>Reduced form</i>						
eligibility	-9216.73 (10,438.59)	-9216.73 (10,438.59)	-26,167.21 (22,967.53)	-26,167.21 (22,967.53)	14,086.12* (7912.78)	-22,791.47 (16,560.45)
relative income	-6.72 (4.63)	-6.72 (4.63)	-8.95 (11.59)	-8.95 (11.59)	3.42 (2.44)	-34.03* (19.85)
relative income <sup>2</sup>	-0.00 (0.00)	-0.00 (0.00)			0.00 (0.00)	
constant	13,115.95* (7,625.08)	13,115.95* (7,625.08)	52,750.94*** (16,298.62)	52,750.94*** (16,298.62)	7,140.94 (5,651.92)	60,465.74*** (12,904.57)
<i>Second stage</i>						
allowance	-40,991.50 (46,143.75)	-432.29 (491.84)	-100,286.90 (88,491.58)	-945.44 (848.71)	76,517.80 (49,694.48)	-96,924.94 (70,804.38)
relative income	-9.50 (7.50)	-10.48 (8.69)	-15.87 (17.50)		8.09 (5.40)	-37.35* (21.80)
relative income <sup>2</sup>	-0.00 (0.00)	-0.00 (0.00)			-0.00 (0.00)	
constant	67,860.92*** (16,209.17)	71,715.10*** (20,129.26)	54,849.49*** (14,415.62)	51,968.64*** (12,140.71)	-14,277.04 (18,771.77)	80,0886.28*** (27,293.55)
<i>N</i>	2,206	2,206	766	766	1,084	494
Treatment variable	Binary	Continuous	Binary	Continuous	Binary	Binary
Bandwidth ( $\pm$ )	1,500	1,500	1,125	1,125	3,375	1,125
Category controls	Yes	Yes	No	No	No	No
Polynomial order	Quadratic	Quadratic	Linear	Linear	Quadratic	Linear

Data Source: BZK/CBS (2016, 2019). Estimates of Equation 5 (second stage) and 6 (reduced form). \*, \*\*, \*\*\* Statistically significant at the 10%, 5%, 1% level, respectively. *eligibility* is whether the household is eligible for housing allowance based on income. *allowance* is either 'binary' (receiving housing allowance or not) or 'continuous' (the amount of housing allowance per month). Heteroskedasticity robust standard errors are reported in parentheses. Bandwidths with respect to relative income (household income - income limit). All columns control for year. Polynomial order in reference to function of relative income. Six binary category controls for EP65+, MP, and MP65+ for each year, one omitted. EP = single, non-pension households, EP65+ = single, pension households, MP = multi-person, non-pension households, and MP65+ = multi-person, pension households. Total assets measured in euros. First stage results provided for subsamples with different *N* than the main results in Table F.11.

<sup>†</sup> 'ALL' does not include EP households.

Table F.9: The effect of housing allowance on total household savings, full model with smaller bandwidths

	ALL <sup>†</sup>		EP65+		MP	MP65+
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable: savings						
<i>First stage</i>						
eligibility	0.22*** (0.03)	21.15*** (5.35)			0.18*** (0.05)	
F-stat	43.53	15.65			12.36	
<i>Reduced form</i>						
eligibility	-4,322.30 (3,389.17)	-4,322.30 (3,389.17)	-11,440.78* (6196.40)	-11,440.78* (6196.40)	-95.53 (2,823.17)	-6,404.86 (8,774.09)
relative income	-2.15 (1.86)	-2.15 (1.86)	-7.11 (4.52)	-7.11 (4.52)	0.16 (0.70)	-6.97 (6.86)
relative income <sup>2</sup>	-0.00 (0.00)	-0.00 (0.00)			-0.00 (0.00)	
constant	34,169.03*** (3,498.52)	34,169.03*** (3,498.52)	31,534.26*** (4,211.95)	31,534.26*** (4,211.95)	13,674.18*** (2,250.40)	33,369.13*** (6,287.50)
<i>Second stage</i>						
allowance	-19,365.37 (14,839.47)	-204.34 (160.01)	-43,847.29* (23,600.46)	-413.37* (233.90)	-523.41 (15,403.88)	-27,237.85 (36,199.51)
relative income	-3.47 (2.73)	-3.94 (3.14)	-10.13* (5.89)	-11.02* (6.71)	0.12 (1.59)	-7.90 (6.78)
relative income <sup>2</sup>	-0.00 (0.00)	-0.00 (0.00)			-0.00 (0.00)	
constant	35,983.75*** (5060.68)	37,807.67*** (6,421.13)	33,677.31*** (4,106.95)	32,417.75*** (3,626.79)	13,820.82** (6,264.77)	37,485.98*** (10,980.65)
N	2,204	2,204	766	766	1,080	494
Treatment variable	Binary	Continuous	Binary	Continuous	Binary	Binary
Bandwidth (±)	1,500	1,500	1,125	1,125	3,375	1,125
Category controls	Yes	Yes	No	No	No	No
Polynomial order	Quadratic	Quadratic	Linear	Linear	Quadratic	Linear

Data Source: BZK/CBS (2016, 2019). Estimates of Equation 5 (second stage) and 6 (reduced form). \*, \*\*, \*\*\* Statistically significant at the 10%, 5%, 1% level, respectively. *eligibility* is whether the household is eligible for housing allowance based on income. *allowance* is either 'binary' (receiving housing allowance or not) or 'continuous' (the amount of housing allowance per month). Heteroskedasticity robust standard errors are reported in parentheses. Bandwidths with respect to relative income (household income - income limit). All columns control for year. Polynomial order in reference to function of relative income. Six binary category controls for EP65+, MP, and MP65+ for each year, one omitted. EP = single, non-pension households, EP65+ = single, pension households, MP = multi-person, non-pension households, and MP65+ = multi-person, pension households. Savings measured in euros. First stage results provided for subsamples with different *N* than the main results in Table F.11.

<sup>†</sup> 'ALL' does not include EP households.