

Moving “Away” from Opportunities?: Homeownership and Employment

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Abstract

Homeownership is promoted by the majority of OECD member countries. Nevertheless, the impact that owning a house can have on employment levels is not fully understood. In this paper, we estimate the causal effect of homeownership on employment using a regression discontinuity design that exploits an arbitrary threshold arising from a voucher-based homeownership program in Chile. We establish that homeownership decreases employment by between 3.85 and 5.33 percentage points. These results contrast with previous non-experimental literature, which has often found a positive effect of homeownership on labor market outcomes. Our findings are primarily the result of individuals not entering the labor market, rather than workers being motivated to leave their job. We also find that families receiving a house through this program are neither more nor less likely to move to another labor market, contrary to what was proposed by previous theoretical papers. A likely mechanism driving the effect is that families moving into their own house under this program tend to see an increase in their monthly unearned income and in their housework obligations, which raises the minimum wage for which they are willing to work.

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1 Introduction

Homeownership is deeply entrenched within society across the Western world. In the United States, President Bush once stated that “owning a home lies at the heart of the American dream”; on the far corner of the American continent, in Chile, President Bachelet expressed that “... people have organized and realized the dream of homeownership”; and across the ocean, in the United Kingdom, David Cameron claimed: “For years politicians have been talking about building what they call affordable homes... What people want are homes they can actually own”. Consequently, governments have attempted to make this aspiration materialize with extensive homeownership programs. The *Homeownership Voucher* in the United States,¹ *Affordable Homes* and *Right to Buy* in the United Kingdom,^{2,3} the *Home Buyers’ Plan* in Canada,⁴ and the *Subsidio Habitacional* in Chile are a few examples of a long list of national government programs that attempt to make houses affordable for families.⁵

Despite the strong public commitment to promoting homeownership, the wider impact that owning a house can have on employment is still in debate. Economists have proposed various theories to predict the direction of this relationship. McCormick (1983) suggests that homeownership has an effect of wealth. He pointed out that families transiting from renting to outright homeownership experience an increase in their assets and in their unearned income. Following a standard labor supply model, this should increase their reservation wage and decrease their employment levels (Cahuc and Zylberberg, 2004). The dominant branch of literature, initially proposed by Oswald (1996), argues that the higher spatial mobility of renters across different labor markets results in them being more likely to be employed than homeowners. Contrary to Oswald’s idea, others have claimed that the lower spatial mobility could increase their employment levels when compared with renters, as their

¹ http://portal.hud.gov/hudportal/HUD?src=/program_offices/public_indian_housing/programs/hcv/homeownership

² <https://www.gov.uk/topic/housing/funding-programmes>

³ <https://www.gov.uk/right-to-buy-buying-your-council-home/overview>

⁴ http://www.cmhc-schl.gc.ca/en/co/buho/buho_008.cfm

⁵ http://www.minvu.cl/opensite_20150713124520.aspx

search effort within a particular labor market is increased (Munch et al., 2006; Coulson and Fisher, 2002).

To the best of our knowledge, there has been no study in which homeownership is randomly or quasi-randomly assigned, making it difficult to empirically assess its effect on employment. In general, empirical studies have used panel data and have found a positive or zero effect of homeownership on labor market outcomes (Battu et al., 2008; Van Leuvensteijn and Koning, 2004; Goss and Phillips, 1997; Munch et al., 2008; Valletta, 2013). Flatau et al. (2003) is to our knowledge the only study to find a negative correlation between homeownership and labor market outcomes. However, the main concern with all previous studies is the endogeneity of homeownership and the potential omitted variables given the non-experimental methodology used.

In this paper, we exploit a Chilean homeownership program in which families are quasi-randomly assigned a house. In this program families apply to receive a voucher to assist them in buying a house.⁶ To select the voucher recipients, the Chilean government ranks applicant families and assigns as many vouchers as the budget permits. This method creates an arbitrary cut-off point.⁷ Among households just above the cut-off point, 60% redeem their voucher and buy a home. Following this, we use a fuzzy regression discontinuity design to study the effect of homeownership on employment for people of legal working age.⁸

Our results suggest that, four years after applying for the voucher, homeowners' employment rates decrease by between 3.84 and 5.33 percentage points (p.p.). In a further analysis we document that this effect is stronger among people who were not working at the moment of application. This implies that the effect arises mainly from people being disincentivized from entering the labor market, rather than being pushed out of it. Moreover, we observe that applicants in an early stage of their working life are more strongly affected.

Contradicting some of the theoretical literature, we provide evidence suggesting that spatial mobility is not the main driver of these results. In fact, we observe that homeowners are

⁶ This is the same program used in Navarrete (2016) to explore the effect of homeownership on student learning.

⁷ Voucher recipients are not permitted to obtain a mortgage to complement their voucher

⁸ Legal working age is fifteen years. The legal retirement age is sixty for women and sixty-five for men.

neither more nor less likely to move to a different labor market.⁹ This also suggests that the program analyzed here neither increases nor decreases the likelihood of a change in neighborhood, contrasting with the experimental section of the Moving To Opportunity program in the USA, which requires households to move to a different neighborhood (Sanbonmatsu et al., 2014).

We also find that the decrease in employment rates is more pronounced amongst parents with children below school age when applying for the voucher. This is likely to happen because, prior to accessing their own home, many voucher applicants live with a hosting family - often meaning living with their parents or other close relatives.¹⁰ When these applicants move into their own house, they may face a decrease in the support provided for home-related tasks (e.g. child care), which in turn increases their reservation wage and lowers their levels of employment.

Looking at the other potential change in housing status under this program, the remaining voucher applicants were renting at the time of application. Since voucher recipients are not permitted to obtain a mortgage to complement their voucher, families that transition from renting to living in their own house mechanically cease making monthly payments to landlords. These former renters see an outright increase in their monthly-uneared income, which should increase their reservation wage and decrease employment.

This paper contributes to the existing literature in three ways. First, this is the first paper to provide quasi-experimental causal evidence on the effect of homeownership on employment. Contrary to previous papers that rely on other empirical methods, we find a negative effect of homeownership on employment. Second, our results suggest that homeownership may prevent individuals from entering the labor market, rather than pushing them out of it. Third, we provide evidence suggesting that the reduced spatial mobility of homeowners is unlikely to be the main driving factor behind this negative effect, running counter to the

⁹ The Moving to Opportunity program offered voucher to families to help them with paying rental costs. Families in the non-experimental arm of this program, in which they were free to choose the location of their new house, showed similar mobility patterns as here (Sanbonmatsu et al., 2014).

¹⁰ 80% of hosting families are close family members, and 20% of all Chilean families live with a hosting family. This figure is also applicable to other countries: the proportion of young adults - between 18 and 29 years old - living with their parents is 31.08% in the UK and 31.54% in the USA.

prevailing ideas in current literature.

The paper is organized as follows. In the next section we will present information about the voucher-based housing program and the labor market context. Section 3 then provides an overview of the data used in this paper. Section 4 presents the empirical strategy of the paper. In Section 5, we discuss the regression discontinuity validity in further depth. Section 6 presents the results, Section 7 the potential mechanisms, and Section 8 concludes.

2 The Homeownership Program and Formal Workers

2.1 The Homeownership Program

Chile has a long tradition of offering subsidized housing to disadvantaged families. Historical accounts show that Chilean housing policy, first established in 1906, has allowed housing standards to improve and has delivered a higher number of units over the years.¹¹ Current homeownership policy targets the poorest 40% of the population, and recently the main focus of housing policy has been to provide disadvantaged families with a voucher to help them purchase their own house.

In the particular program analyzed in this paper, called *Adquisición de Vivienda Construída* (AVC), families must submit a new application for a housing voucher each time the governments launches a new round of offers, and the number of applicants far exceeds the number of vouchers offered.

In the AVC, families apply through a regional office of the Ministry of Housing and Urbanism (MINVU), selecting a particular region in which they would like to purchase a house.¹² To prevent a strategic approach to this process, families are only permitted to apply within one single region and are automatically excluded from the process if they apply in multiple regions. Once the application period has expired, the selection process is made according to regional rankings and budgetary restrictions. The MINVU first assigns a score to each application based on two factors - the family composition and their vulnerability

¹¹For a complete review of Chilean housing policy, see Rubio (2006); Rodrigo (1999).

¹²Chile is divided into 15 regions, which are the country's highest level of administrative division.

level (Chilean National Congress, 2006, 2011) - and then ranks applications at a regional level according to their score.¹³ With these regional rankings, the MINVU then assigns as many vouchers as its regional budget will allow. This two-stage process - regional ranking followed by the assigning of vouchers according to budgetary restrictions - generates regional cut-offs that we have been able to exploit to build my regression discontinuity design.

Vouchers from the AVC program vary in value between 12,000 and 25,000 USD, depending on the municipality in which the voucher is to be used. To prevent housing money from being used for unrelated expenses, the vouchers are issued in the form of certificates. The voucher's corresponding monetary value is only transferred to the seller of the house after the property contract has been signed.

The AVC housing vouchers are subject to a number of regulations. Recipient families are given a maximum timeframe of two years in which they can use their voucher; after this period, it expires permanently. Second, families cannot buy a house owned by a relative - this is checked against the government's own official family records. Third, families are not allowed to complement their MINVU voucher with financial credits when purchasing a house. This prevents a situation in which a financial institution is able to take over a subsidized property following defaults on payments by voucher recipients. Finally, families are permitted neither to sell, nor to rent out the house during the first five years of ownership, and must live in the house over this initial period. The Ministry of Housing pays visits to voucher-bought houses and checks whether the recipient family is indeed living in the house. If families do not to comply with this, they either automatically lose their purchased house or are forced to repay the voucher's monetary value to the MINVU.

In this study, we use data from the 2010 and 2011 AVC offer rounds. Offers from earlier years were not included as MINVU funds were not exhausted and so no cut-off point was generated. In 2012 and 2013 there were no offers as AVC resources were focused on housing reconstruction following the 2010 earthquake. Although the program was reintroduced from 2014 onwards, the short timespan between the offers and the follow-up data results renders

¹³The vulnerability index measures the socioeconomic characteristics of a family using factors such as family income and expenditure on serious diseases. This method is used to measure poverty levels by government in Chile.

these rounds of offers unsuitable for analysis.

2.2 Workers

In this paper we define a worker as an employee who is of legal working age and has access to unemployment insurance.

The Chilean Labor Code sets a minimum working age of fifteen years (Chilean National Congress, 2002). To legally claim pension benefits, the minimum age of retirement is sixty for women and sixty-five for men (Chilean National Congress, 2009).¹⁴

As a means of ensuring unemployment benefits, the Unemployment Insurance System (UIS) was first established in 2002. All workers that hold a contract with an employer are subscribed to this system.¹⁵ It mandates that, every month, employers report all of their formally contracted employees to the government, along with the worker's salary. We use this information to explore labor market outcomes.

3 Data

To perform this analysis, we have assembled two different datasets. For each application submitted to the AVC, the first dataset identifies: the head of family and his/her family members included in the application; the families that received a voucher; and the families amongst these recipients that went on to redeem their voucher. The second dataset identifies the employment status and corresponding wage of each family member in the sample.

3.1 Heads of Families and Family Member Datasets

To identify the heads of families, and their corresponding family members, the MINVU has provided us with four different datasets. The first dataset contains the 125,217 heads of families who applied for a voucher in 2010 and 2011. The variables within this dataset are the application score, the family ID, the head of family ID, their town of residence when

¹⁴The Chilean population tends to retire shortly after reaching this retirement age, with the average Chilean woman starting to receive a pension at age sixty-one, and the average man at sixty-five.

¹⁵The unemployment insurance system excludes civil servants and members of military forces.

applying, their region of application and offer round, and whether the family received the voucher or not.

The second dataset contains information regarding the family members included in the application of each head of family. The variables in this dataset are the family ID, the ID of each member of the family, the application score, and the region and offer round of the application. We link both datasets using the family ID. The linked dataset contains 362,696 individuals when counting heads of families and all family members (henceforth referred to as *applicants*).¹⁶

A third dataset provides information as to which family actually redeemed their housing voucher. This tells us whether or not the voucher was paid out and if so, the amount paid. This *voucher payment* dataset is merged with the previous information sources using the family ID.

In a fourth dataset, the MINVU provided us with each applicant's date of birth, gender, and town of residence four years after applying. We successfully link all applicants with their corresponding date of birth and residence, and all but 4,915 with their gender. Since the legal working age limit is dependent on gender (see Section 2.2), applicants whose genders could not be identified were removed from the sample, along with all applicants outside the legal working age, leaving us with 230,166 applicants.

After combining all sources, we examine each regional voucher assignment process to determine whether some regions did not have any applicants who did *not* receive a voucher. Out of 43 regional assignment processes,¹⁷ we found 3 in which all families were offered a voucher. We further analyzed each applicant's region of application, and identified 161 applicants for whom this variable was missing.¹⁸ We removed from the sample these regional assignment processes that had no non-recipients and all applicants for whom the region of application was missing. After this process, we were left with 228,995 applicants of legal

¹⁶We use the family ID to cluster standard errors by family, as most of the outcomes are likely to be correlated at the family level.

¹⁷There were 2 national offer rounds in 2010 and 1 in 2011. These occurred in all 15 regions, except for the Santiago Metropolitan Region, which participated in neither of the 2010 offer rounds. This accounts for the total of 43 regional assignment processes.

¹⁸This is most likely to have occurred due to a clerical or typing error at the database level.

working 4 years after applying.

Finally, we centered the cut-off scores from every round of offers and region to zero.¹⁹ We then calculated the centered scores of each application by subtracting the corresponding cut-off from each particular application score. The new score variable ranges from -998 to 998 in degrees of 0.1.

3.2 Unemployment Insurance Dataset

To allow us to explore labor market outcomes, the Ministry of Labor provided us with the wage and date of payment for every applicant with unemployment insurance between January 2010 and December 2015.

As the most recent employment data to which we have access is from December 2015, we can measure labor market outcomes for four years beyond the point at which families applied for a voucher. This means that we use 2014 employment data for offer rounds in 2010 and 2015 employment data for offers in 2011.

Using this dataset, we construct the following variables:

- *Employed*: equal to 1 if the applicant is in the *Unemployment Insurance* dataset in a given month and equal to 0 otherwise.
- *Wage*: equal to the observed wage in the *Unemployment Insurance* dataset (in US dollars) for a given month and equal to 0 if the applicant has no observed wage for that month.

Finally, we computed applicants' working status and the corresponding wage 2 months before applying as baseline measures. We combine this with the previous dataset using the applicant's IDs.

Table 1: Descriptive Statistics

	Sample	Non-Recipients	Recipients	p-value of equality of means test col. 2 & 3	Voucher users	Voucher non-users	p-value of equality of means test col. 5 & 6
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Age	32.344 (11.915)	32.559 (11.959)	30.012 (11.165)	0.000	29.994 (11.312)	30.022 (11.076)	0.865
Female	0.654 (0.476)	0.652 (0.476)	0.668 (0.471)	0.000	0.656 (0.475)	0.675 (0.4680)	0.008
Disabled Family Member	0.035 (0.185)	0.035 (0.183)	0.042 (0.200)	0.000	0.045 (0.206)	0.040 (0.195)	0.109
Elderly Family Member	0.035 (0.183)	0.035 (0.185)	0.026 (0.160)	0.000	0.033 (0.178)	0.023 (0.149)	0.000
Vulnerability	9.663 (5.574)	9.921 (5.530)	6.862 (5.272)	0.000	7.326 (5.184)	6.581 (5.304)	0.000
2010 Offer Round	0.303 (0.460)	0.305 (0.460)	0.284 (0.451)	0.000	0.260 (0.439)	0.298 (0.457)	0.000
Metropolitan Area	0.446 (0.497)	0.447 (0.497)	0.425 (0.494)	0.000	0.393 (0.488)	0.445 (0.497)	0.000
Voucher Value (US\$)					16125 (3393)		
Observations	228995	209658	19337		7277	12060	

Notes: Data are for applicants of legal working age, four years after the rounds of offers. The unit of observation is one applicant of legal working age. Legal working age starts at 15 years. Legal retirement age is 60 for women and 65 for men. *Age* is measured in years. *Female* is the share of applicants of legal working age that are females. *Disabled Family Member* is the share of applicants in families with a handicapped family member. *Elderly Family Member* is the share of applicants in families with an elderly family member. *Vulnerability* is the average percentile of family vulnerability with respect to the Chilean population. *Metropolitan Area* is the share of applicants that apply in the Santiago Metropolitan Region. *2010 Offer Round* is the share of applicants in the sample that applied for an offer in 2010. *Voucher Value* is the average value of the executed voucher in US dollars. Columns 1, 2, 3, 5, and 6 respectively show descriptive statistics for the whole sample, for applicants who did not receive a voucher, for applicants who received a voucher, for applicants who received a voucher and redeemed it, and for applicants who received a voucher but did not redeem it. Columns 4 and 7 respectively show the p-value for the t-test of equality of means between columns 2 and 3, and between columns 5 and 6.

3.3 Descriptive Statistics

Table 1 provides the descriptive statistics for applicants of legal working age and shows that the average age across the sample is 32 years. Applicants who received a voucher are around two years younger than those who did not. One possible explanation for this is the potential correlation between families with young children and the average age of parents: families with young children receive a higher score in the vulnerability index, thus implying that younger parents will be more likely to receive the voucher. This table also shows that the share of females in the sample remains stable at around 66% across the five groups. This implies that females tend to apply for the voucher in higher numbers, however gender does not seem to be correlated with receiving a voucher.

The fifth variable of Table 1 shows the average percentile of vulnerability, with respect to the Chilean population, of the applicant’s family. This is the measure used by the Chilean government to assess a family’s level of poverty. The vulnerability measure is built using not

¹⁹ As the cut-off is not pre-determined and depends on the number of vouchers given, we use the procedure described by Fort et al. (2016) to compute the distance of each applicant from the cut-off. Here, the authors suggest implementing a donut strategy, dropping the applicants who are at the cut-off, to avoid potential biases.

only each family’s income, but also other variables such as the family’s health expenditure on serious diseases (e.g. cancer) and assets held by the family. From now onwards we use the words vulnerability and poverty interchangeably.

Families with applicants of legal working age are on average in the most vulnerable 9% of families in the population. Moreover, those that go on to receive a voucher are in the 6% most vulnerable of families. The families in my sample are thus among the poorest of the Chilean population.

The average voucher value in the sample is 16,125 USD. Combining the fact that the average voucher recipient is at the 6th percentile of the vulnerability level in the Chilean population with the distribution of wages in Chile (CASEN, 2013), we compute that this value is equivalent to 12 years of wages for the average voucher recipient.

4 First Stage and Empirical Strategy

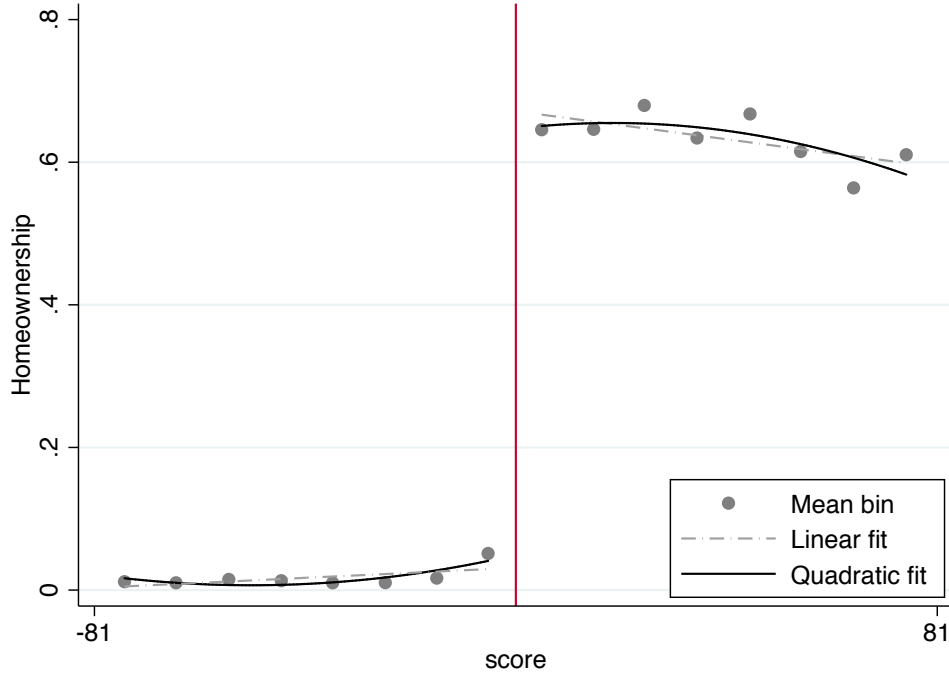
4.1 Take-up

We begin by showing that voucher-recipient families containing a family member of legal working age are more likely to go on to use their voucher to buy a house. To do this, we estimate the following equation:

$$\begin{aligned} \text{Homeownership}_{i,r,c,t} = & \alpha + \gamma_r + \eta_c + f_k(\text{Score}_{i,r,c}) + \beta D_{i,r,c} + D_{i,r,c} * f_k(\text{Score}_{i,r,c}) \\ & + \varphi X_{i,r,c} + e_{i,r,c,t} \quad \dots k = 1, 2 \end{aligned} \quad (1)$$

$\text{Homeownership}_{i,r,c}$ is a dummy indicator, equal to 1 if the applicant i , in region of application r , offer round c , and at time t bought a house using their voucher and 0 otherwise. α is the constant of the equation, γ_r is a fixed effect for region of application, η_c is a fixed effect for offer round. $\text{Score}_{i,r,c}$ is the application score for applicant i . The study examines the robustness of different functional forms of $\text{Score}_{i,r,c}$ using f_k , which is estimated separately on either side of the cut-off. Following Gelman and Imbens (2014), we estimate Equation

Figure 1: First Stage



Notes: Data are applicants of legal working age, four years after the offer rounds. The unit of observation is one applicant of legal working age. The legal working age starts at 15 years. Legal retirement age is 60 for women and 65 for men. Each dot is the share of applicants in a particular bin that purchased a house using the voucher. The bandwidth is estimated using the procedure proposed by Calonico et al. (2014).

1 with both polynomials of order 1, f_1 , and polynomials of order 2, f_2 .²⁰ $X_{i,r,c}$ is a vector of controls including the vulnerability level, gender, age, working status and wage before applying of applicant i , as well as dummies for whether their family has a disabled or an elderly member.

$D_{i,r,c}$ is a dummy for winning the voucher, which is defined as follows:

$$D_{i,r,c} = \begin{cases} 1 & \text{if } \text{Score}_{i,r,c} \geq 0 \\ 0 & \text{if } \text{Score}_{i,r,c} < 0 \end{cases}$$

The coefficient of interest is β , which estimates the differential likelihood of buying a house using the voucher at the cut-off score. We use the optimal bandwidth proposed by Calonico et al. (2014). Throughout the analysis, we cluster standard errors by family, as all

²⁰The literature has used different polynomials for long. Gelman and Imbens (2014) points that the polynomial order should not be higher than 2.

the different measurements are likely to be correlated at the family level.

Graph 1 shows that being above the cut-off increases the program take-up by around 60%. This point estimate does not vary much if we control for $\text{Score}_{i,r,c}$ with polynomials of order 1 or of order 2. In both cases, it is significant at the 1% level (Table A1 in the appendix).²¹

This graph also shows that some applicants below the cut-off point use the voucher. This is due to two factors: 1) applicants can appeal to reverse the Ministry of Housing's decision not to offer them a voucher, and 2) applicants who did not receive a voucher in an early round of offers may re-apply and receive a voucher in a later one.

Non-recipients could also potentially become homeowners by buying a house in the market without using a voucher. We find it unlikely that families close to the cut-off and who did not receive a voucher have sufficient money to buy a house on the market - particularly when the average value of the voucher is already 10 times the annual salary of a worker at that level of income distribution. Unfortunately, we do not have data to see whether non-recipients went on to purchase a house.

Graph 1 also shows that some voucher recipients did not redeem their voucher. Table 1 shows that more vulnerable families and families who applied in the Santiago Metropolitan Region are in fact less likely to redeem their voucher. This could reflect two points: first, that more vulnerable families face higher searching costs, perhaps due to their personal networks being more limited in their ability to help them with searching for a house; and second, that the housing market in the Santiago Metropolitan Region is tighter.

4.2 Fuzzy Regression Discontinuity

If all families that received a voucher were to use it to buy a house, we could estimate the following equation to measure the effect of homeownership on the outcome of interest:

²¹The first stage has an F-stat of 378.07, which is well above the rule of thumb of 10 for weak instruments provided by Angrist and Pischke (2008).

$$\begin{aligned} \text{Outcome}_{i,r,c,t} = & \omega + \psi_r + \tau_c + f_k(\text{Score}_{i,r,c}) + \beta_{ITT}D_{i,r,c} + D_{i,r,c} * f_k(\text{Score}_{i,r,c}) \\ & + \nu X_{i,r,c} + e_{i,r,c,t} \quad \dots k = 1, 2 \end{aligned} \quad (2)$$

where ψ_r is a fixed effect for region of application, τ_c is a fixed effect for offer round, and $X_{i,r,c}$, $\text{Score}_{i,r,c}$, and $D_{i,r,c}$ are as defined as in Equation 1.

Since not all families redeem their voucher, the parameter of interest in Equation 2 - β_{ITT} - will capture the effect of being offered a voucher, the so-called Intention to Treat effect. To estimate the effect of homeownership, we use the voucher assignment indicator as an instrument for homeownership and estimate a Two-Stage Least Square regression. The equation estimated is as follows:

$$\begin{aligned} \text{Outcome}_{i,r,c,t} = & \delta + \varepsilon_r + \zeta_c + f_k(\text{Score}_{i,r,c}) + \beta_{LATE}\text{Homeownership}_{i,r,c,t} \\ & + D_{i,r,c} * f_k(\text{Score}_{i,r,c}) + \rho X_{i,r,c} + e_{i,r,c,t} \quad \dots k = 1, 2 \end{aligned} \quad (3)$$

In this, we instrument $\text{Homeownership}_{i,r,c,t}$ using the first stage equation (Equation 1). In Equation 3, β_{LATE} captures the effect of using a voucher to buy a house on students around the cut-off, the so-called Local Average Treatment Effect (LATE). Our results and interpretations are based on β_{LATE} ; however, for completeness, we report β_{ITT} as well.

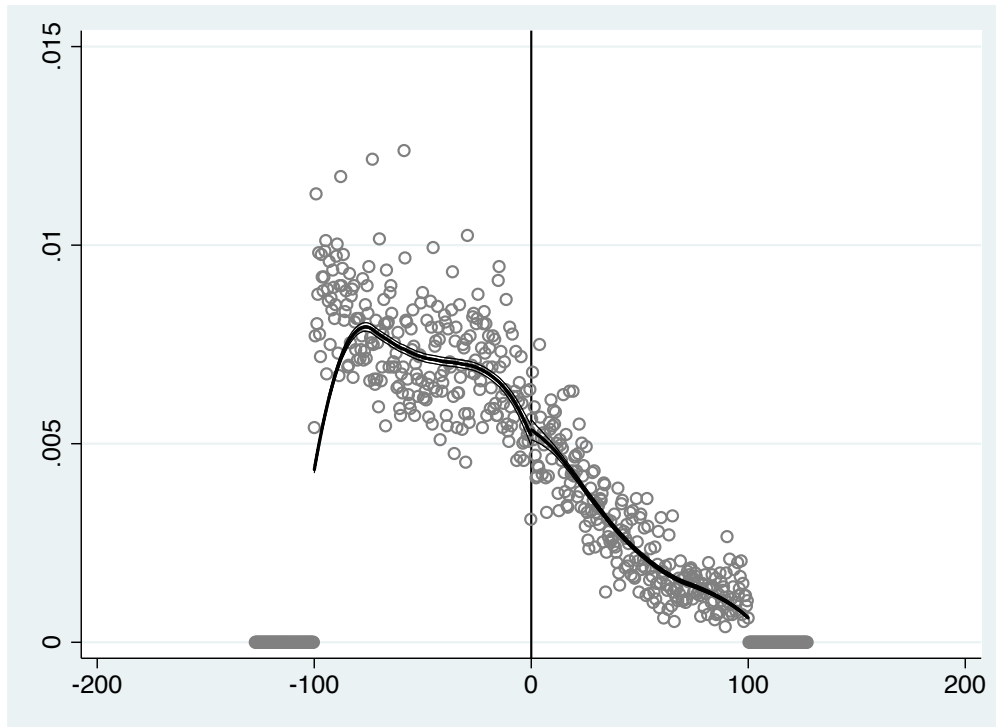
5 Regression Discontinuity Validity

5.1 McCrary Test

One of the key assumptions in the regression discontinuity design is that applicants cannot manipulate their application score, so they cannot actively choose to be above the cut-off (McCrary, 2008). Qualitatively, if applicants are able to manipulate the application score, I should see a discontinuity in the mass of applicants below and above the cut-off.

When performing the McCrary test to determine whether this discontinuity exists, I reject the manipulation of the cut-off with a t-stat of -0.2544 and a p-value of 0.7992. Figure

Figure 2: McCrary Test



Notes: Data are for applicants of legal working age, four years after the rounds of offers in 2010 and 2011. The unit of observation is one applicant of legal working age. The legal working age starts at 15 years. Legal retirement age is 60 for women and 65 for men. Each circle represents the share of applicants of legal working age in a particular bin.

2 also shows no discontinuity around the cut-off in the number of applicants. This suggests that applicants do not manipulate the application score to be above the cut-off. This is not surprising given that applicants (and authorities) do not know the cut-off ex-ante.

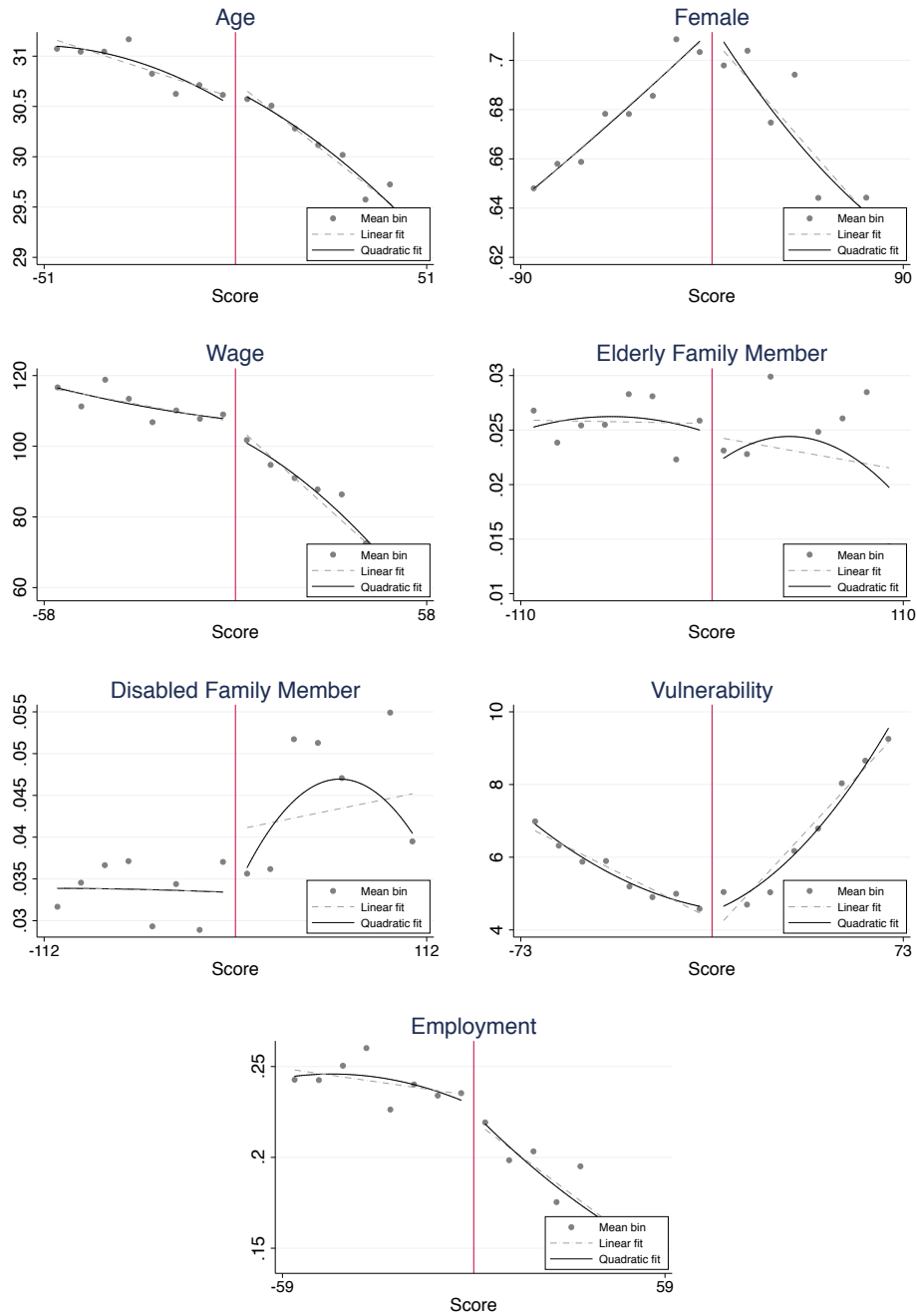
5.2 Balance Tests

Under the identifying assumption of the RD estimator - that treatment and control groups are locally comparable - predetermined covariates should be locally balanced around the threshold (Lee and Lemieux, 2010). To test this, we use the age and gender of each applicant, whether they were working before applying for the voucher and the corresponding wage, whether they have a disabled or elderly family member, and the family vulnerability level, as predetermined covariates. To perform this analysis, we use Equation 3, where the outcome variable is one of the covariates mentioned above.

Figure 3 do not show a discontinuity in the mean of any covariate around the threshold.

Table 2 shows the regression results for the balance test. Out of fourteen estimations, only one is significant at the 10 percent level. We do not believe that this represents a systematic difference between the treated and control groups around the cut-off - given the large number of estimations, it is common to have at least one estimation at this significance level. Moreover, the corresponding graph - the bottom panel in Figure 3 - do not show a major discontinuity between the control and treatment groups. This evidence suggests that the treatment is as good as locally randomly assigned around the cut-off.

Figure 3: Continuity of Covariates around the Threshold



Notes: Data are for applicants of legal working age, four years after the rounds of offers. The unit of observation is applicant of legal working age. The legal working age starts at 15 years. Legal retirement age is 60 for women and 65 for men. *Age* is the age in years of applicants. *Female* is a dummy variable equal to 1 if the applicant is female and 0 if not. *Employment BL* is the working status of applicants before applying. *Wage BL* is the wage of applicants before applying. *Elderly Fam. Member* is a dummy variable equal to 1 if the family has an elderly family member when applying and 0 if not. *Disabled Fam. Member* is a dummy variable equal to 1 if the family has an handicapped family member when applying and 0 if not. *Vulnerability index* is the average percentile of the applicant's family vulnerability with respect to the Chilean population. Each dot represents the mean of the pre-determined covariates for the applicants in particular bin. The bandwidth is estimated using the procedure proposed by Calonico et al. (2014).

Table 2: Balance Test

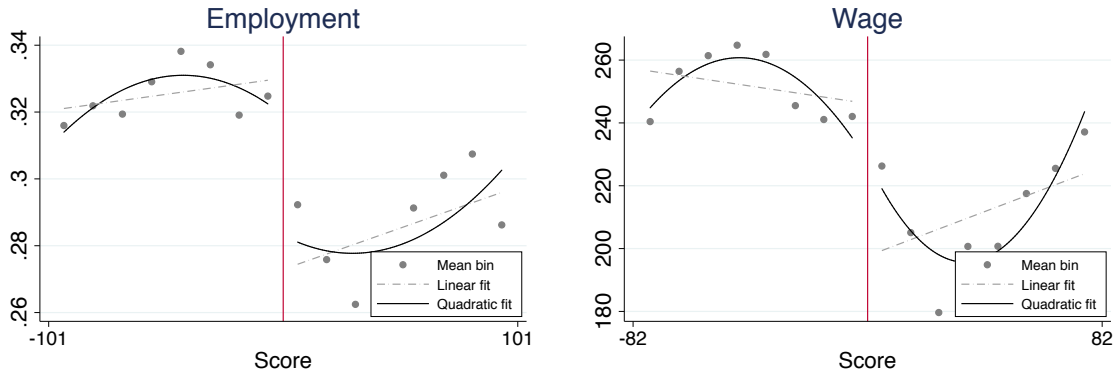
VARIABLES	Age		Female		Employment BL		Wage BL		Elderly Fam.	Member	Disabled Fam.	Member	Vulnerability index	
	Linear (1)	Quad. (2)	Linear (3)	Quad. (4)	Linear (5)	Quad. (6)	Linear (7)	Quad. (8)	Linear (9)	Quad. (10)	Linear (11)	Quad. (12)	Linear (13)	Quad. (14)
<i>LATE Results</i>														
Homeownership LATE	0.198 (0.290)	0.377 (0.452)	0.00389 (0.0116)	-0.00859 (0.0185)	-0.0257* (0.0141)	-0.0177 (0.0229)	-5.926 (8.287)	-9.273 (13.50)	-0.00271 (0.00692)	-0.00621 (0.0104)	0.00628 (0.00840)	0.00123 (0.0126)	-0.208 (0.143)	0.213 (0.235)
R-squared	0.010	0.009	0.008	0.007	0.024	0.024	0.029	0.030	0.004	0.003	0.005	0.004	0.780	0.776
<i>ITT Results</i>														
Homeownership ITT	0.117 (0.176)	0.224 (0.265)	0.000420 (0.00724)	-0.00473 (0.0107)	-0.0160* (0.00863)	-0.0104 (0.0131)	-3.775 (5.085)	-5.344 (7.712)	-0.00184 (0.00436)	-0.00378 (0.00638)	0.00393 (0.00528)	0.00100 (0.00780)	-0.112 (0.0884)	0.0908 (0.128)
R-squared	0.010	0.010	0.011	0.011	0.024	0.024	0.030	0.030	0.003	0.003	0.005	0.005	0.780	0.780
Observations	29,934	29,934	49,853	49,853	34,054	34,054	33,348	33,348	61,277	61,277	62,259	62,259	40,768	40,768
BANDWIDTH	50	50	89	89	58	58	57	57	109	109	111	111	72	72
OFFER ROUND FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
REGION FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Notes: Data are for applicants of legal working age, four years after the rounds of offers. The unit of observation is one applicant of legal working age. The legal working age starts at 15 years. Legal retirement age is 60 for women and 65 for men. *Age* is the age in years of applicants. *Female* is the a dummy variable equal to 1 if the applicant is female and 0 if not. *Employment BL* is the working status of applicants before applying. *Wage BL* is the wage of applicants before applying. *Elderly Fam. Member* is a dummy variable equal to 1 if the family has an elderly family member when applying and 0 if not. *Disabled Fam. Member* is a dummy variable equal to 1 if the family has an handicapped family member when applying and 0 if not. *Vulnerability index* is the average percentile of the applicant's family vulnerability with respect to the Chilean population. Standard errors are clustered at the family level. *** p<0.01, ** p<0.05, * p<0.1

6 Results

6.1 The Effect of Homeownership on Employment and Wages

Figure 4: The Effect of Homeownership on Employment and Wages



Notes: Data are for applicants of legal working age, four years after the rounds of offers. The unit of observation is one applicant of legal working age. The legal working age starts at 15 years. Legal retirement age is 60 for women and 65 for men. For employment graphs, we use as an outcome variable a dummy of 1 if the applicant is employed and 0 if he/she is not. For the wage graph we use the nominal wage in US dollars. Each dot represents the mean of the outcome for a particular bin. The bandwidth is estimated using the procedure proposed by Calonico et al. (2014).

The left panel of Figure 4 displays the relationship between employment level and homeownership around the cut-off. This panel shows that applicants who received a housing voucher - those whose application scores put them just above the eligibility threshold - are on average less employed than applicants who did not receive one. Columns 1 and 2 of Table 3 confirm these results and show that homeownership decreases employment by between 3.85 and 5.33 p.p. The effect is statistically significant in all specifications. This suggests that homeownership has a negative causal effect on employment. Moreover, this result is robust to different bandwidths as shown in Figure A1 in the Appendix.

It is worth noting that the level of employment is around 34% in the control group. This means that, for the most conservative measure, homeownership decreases the level of employment by around 10%. Moreover, the low level of employment is the result of using a sample of extremely poor applicants, comprised mostly of females. This is not

surprising, given that comparable levels of employment are found in studies focusing on similar programs, population, time span and using similar datasets, such as Moving to Opportunity (Sanbonmatsu et al., 2014).

Next, we attempt to analyze whether homeownership has an effect on wages. Since homeownership affects the likelihood of being employed, we cannot study its effect on the wages of employed applicants: the populations employed to the left and to the right of the threshold are not comparable. Instead, we conduct the analysis across the whole sample, assigning a wage of 0 to unemployed individuals. The right panel of Figure 4 does not show a clear discontinuity around the threshold for salaries of applicants. Table 3 shows that homeownership has a negative impact on wages, which is not robust across our specification (Columns 3 and 4). The results on wages seem ambiguous, not allowing us to draw conclusions about the impact of homeownership on wages.

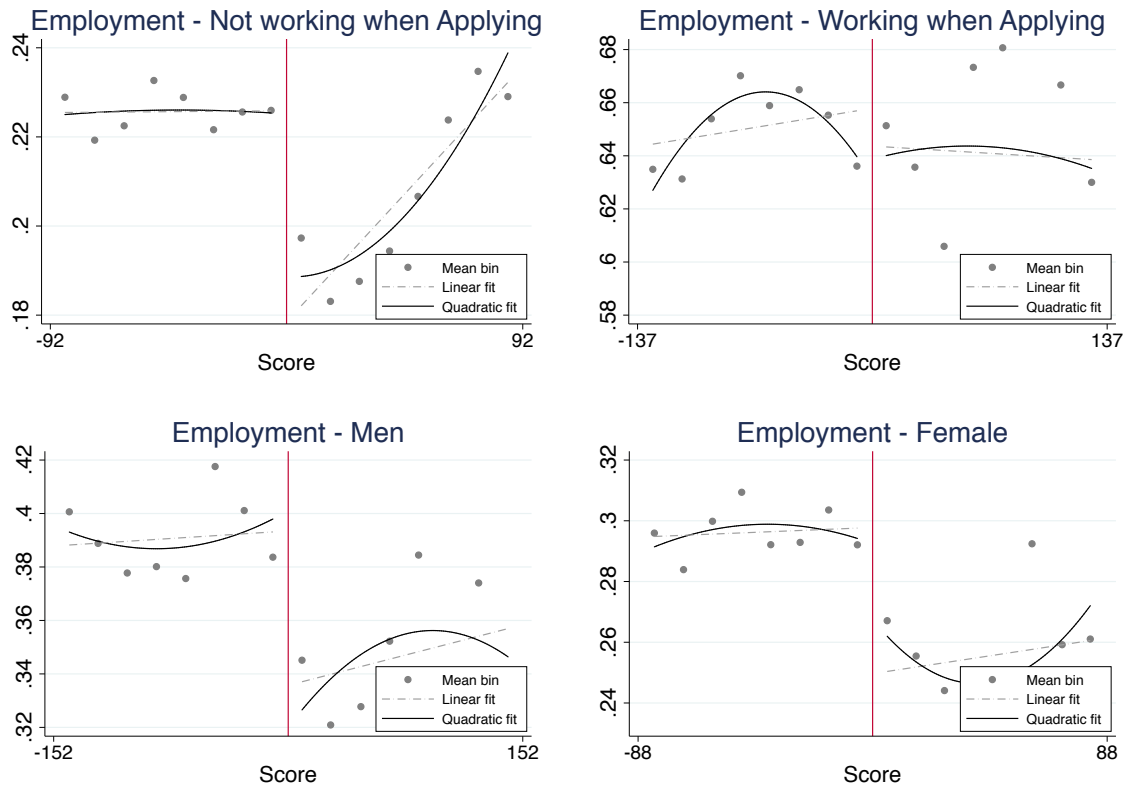
Table 3: Effect of Homeownership on Employment and Wages

VARIABLES	Employment (Linear) (1)	Employment (Quad.) (2)	Wage (Linear) (3)	Wage (Quad.) (4)
<i>LATE Results</i>				
Homeownership	-0.0533*** (0.0115)	-0.0385** (0.0185)	-40.71*** (12.44)	-2.765 (20.58)
R-squared	0.163	0.163	0.215	0.213
<i>ITT Results</i>				
Homeownership	-0.0343*** (0.00727)	-0.0237** (0.0108)	-25.74*** (7.797)	-2.982 (11.68)
R-squared	0.164	0.164	0.215	0.215
Observations	56,330	56,330	45,448	45,448
BANDWIDTH	100	100	81	81
CONTROLS	YES	YES	YES	YES
OFFER ROUND FE	YES	YES	YES	YES
REGION FE	YES	YES	YES	YES

Notes: Data are for applicants of legal working age, four years after the rounds of offers. The unit of observation is one applicant of legal working age. The legal working age starts at 15 years. Legal retirement age is 60 for women and 65 for men. Standard errors are clustered at the family level. Controls are gender, age, vulnerability level, working status before applying, wage before applying, elderly family member, and disabled family member.*** p<0.01, ** p<0.05, * p<0.1

6.2 The Effect of Homeownership on Employment by Working Status When Applying and Gender

Figure 5: The Effect of Homeownership on Employment by Working Status when Applying and by Gender



Notes: Data are for applicants of legal working age, four years after the rounds of offers. The unit of observation is one applicant of legal working age. The legal working age starts at 15 years. Legal retirement age is 60 for women and 65 for men. For employment graphs, we use as an outcome variable a dummy of 1 if the applicant is employed and 0 if he/she is not. Each dot represents the mean of the outcome for a particular bin. The bandwidth is estimated using the procedure proposed by Calonico et al. (2014).

Looking at the heterogeneous effects of homeownership on employment, Figure 5 shows that the effect is stronger for applicants who were not working when they applied for the voucher (top left panel) compared to applicants who were working at the time of application (top right panel). Table 4 confirms these results and shows a significant effect on non-working applicants by between -6.6 and -4.9 p.p. For the group of applicants who were employed when applying, the point estimate on employment - in the linear and quadratic

specifications - is around one third the size of the previous one and is not significant. These results suggest that the observed negative impact on employment is stronger in its effect of preventing individuals from obtaining formal employment than it is in leading those who are already employed away from their work.

We do not find robust evidence showing that the effect is different for men than for women. The bottom panels of Figure 5 show a sharp decrease in employment at the cut-off for both groups. Table 4 shows that in the linear specification, homeownership has a similar negative impact on both groups.²² These results vary in our quadratic specification as the decrease in employment for women becomes non-significant. However, as seen in the graph, this is most probably due to the overfitting of this specification rather than a real effect. Since results for gender are not as conclusive as previous results, they do not enable us to draw any conclusions about the impact of homeownership on men as compared to women.

Table 4: Effect of Homeownership on Employment by Working Status When Applying and by Gender

VARIABLES	Not Working Before App.		Working Before App.		Men		Female	
	Employment (Linear) (1)	Employment (Quad.) (2)	Employment (Linear) (3)	Employment (Quad.) (4)	Employment (Linear) (5)	Employment (Quad.) (6)	Employment (Linear) (7)	Employment (Quad.) (8)
<i>LATE Results</i>								
Homeownership	-0.0655*** (0.0131)	-0.0487** (0.0211)	-0.0224 (0.0248)	0.0162 (0.0369)	-0.0596*** (0.0187)	-0.0833*** (0.0300)	-0.0426*** (0.0143)	-0.0181 (0.0219)
R-squared	0.010	0.009	0.040	0.038	0.202	0.200	0.133	0.132
<i>ITT Results</i>								
Homeownership	-0.0415*** (0.00821)	-0.0297** (0.0122)	-0.0160 (0.0157)	0.00884 (0.0223)	-0.0364*** (0.0113)	-0.0475*** (0.0164)	-0.0273*** (0.00916)	-0.0114 (0.0136)
R-squared	0.012	0.012	0.041	0.041	0.203	0.203	0.133	0.133
Observations	40,114	40,114	16,458	16,458	27,621	27,621	33,039	33,039
BANDWIDTH	91	91	136	136	151	151	87	87
CONTROLS	YES	YES	YES	YES	YES	YES	YES	YES
OFFER ROUND FE	YES	YES	YES	YES	YES	YES	YES	YES
REGION FE	YES	YES	YES	YES	YES	YES	YES	YES

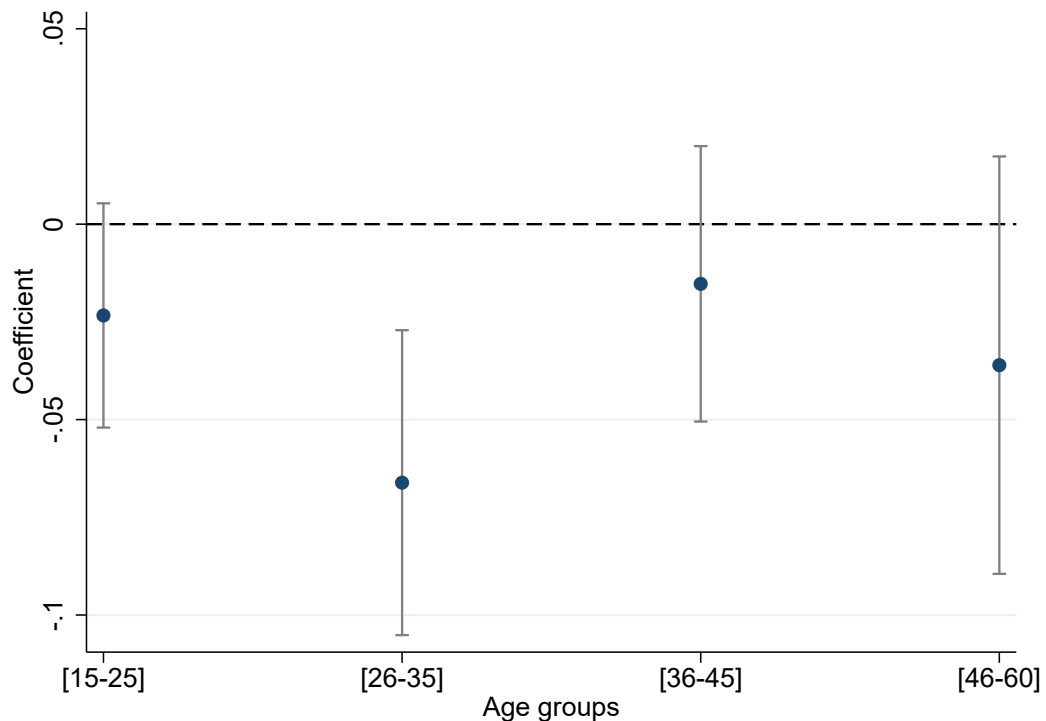
Notes: Data are for applicants of legal working age, four years after the rounds of offers. The unit of observation is one applicant of legal working age. The legal working age starts at 15 years. Legal retirement age is 60 for women and 65 for men. Standard errors are clustered at the family level. Controls are gender, age, vulnerability level, working status before applying, wage before applying, elderly family member, and disabled family member.*** p<0.01, ** p<0.05, * p<0.1

²²One may however consider that women are more affected than men when the point estimate is scaled up by the employment level in each group.

6.3 Effect of Homeownership on Employment Levels by Age Group

Figure 6 presents the effect of homeownership on employment by age and shows that the effects are mainly driven by applicants between 26 and 35 years old. These results are in line with our previous findings that the effect of homeownership arises mainly through the prevention of applicants from accessing formal employment. It is thus not surprising that this group is the most strongly affected, and the older group, which has generally already entered formal employment, is rather unaffected.

Figure 6: Effect of Homeownership on Employment by Age Group



Notes: Data are for applicants of legal working age, four years after the rounds of offers. The unit of observation is one applicant of legal working age. The legal working age starts at 15 years. Legal retirement age is 60 for women and 65 for men. We use as an outcome variable a dummy of 1 if the applicant is employed and 0 if he/she is not. Each dot represents the point estimate of the local linear regression (as in Equation 3) in a bandwidth around the cut-off for applicants who were in each age group four years after applying. The confidence intervals are calculated at a 95% confidence level.

7 Potential Mechanisms

In this section we analyze the possible mechanisms driving these effects. Two possible explanatory mechanisms are considered: labor spatial mobility and changes in housing status.

7.1 Spatial Mobility

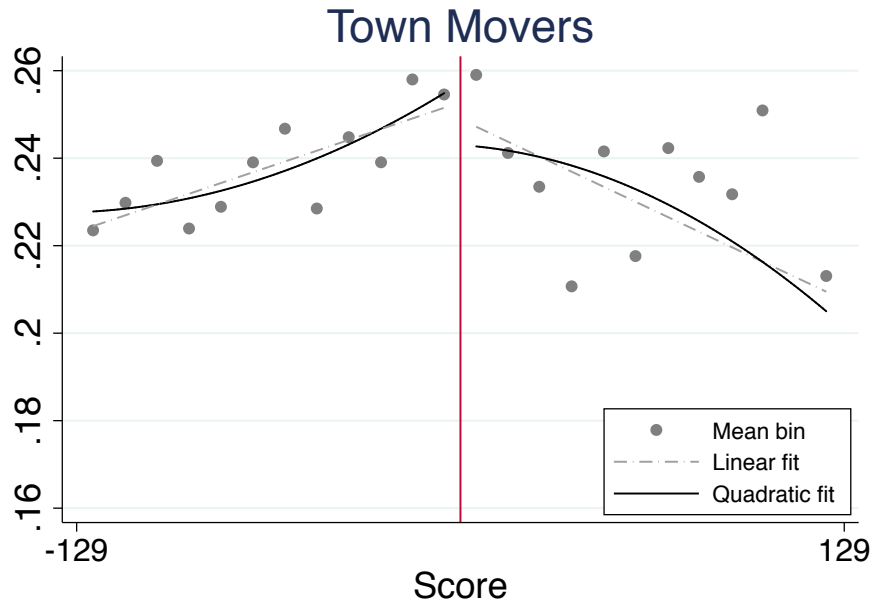
As described in the introduction, some scholars have argued that the reduced mobility of homeowners - the so-called lock-in effect - is a mechanism through which homeownership could reduce employment. One way of testing this hypothesis is to observe the impact of homeownership on the decision of applicants to move to a different town. To do this, we estimate Equation 3, but using as a dependent variable a dummy indicator equal to 1 if the applicant moved to a different town four years after the round of offers and equal to 0 if they did not.

Figure 7 and Table 5 provide evidence suggesting that families who did not receive a voucher do not tend to move to another town in a higher proportion than those who did receive one. These results imply that, in our context, the reduced mobility of homeowners does not seem to be the main mechanism driving the negative effect of homeownership on employment.

Similar results regarding mobility were previously found in other contexts and using similar populations. Families in the non-experimental arm of the Moving to Opportunity program, in which families were free to choose the location of their new house, did not generally move far from their previous location (Sanbonmatsu et al., 2014). The authors explained these results by claiming that families place a high importance on the social networks established in their place of residency, and that this encourages them to stay in the same area.

The evidence presented here could also suggest that homeownership does not have an effect on movement across neighborhoods. Therefore, the program studied here seems to differ substantially from the experimental branch of the Moving To Opportunity program in the USA, which requires households to move to a different neighborhood.

Figure 7: Effect of Homeownership on Labor Market Movers



Notes: Data are for applicants of legal working age, four years after the rounds of offers. The unit of observation is one applicant of legal working age. The legal working age starts at 15 years. Legal retirement age is 60 for women and 65 for men. *Town Movers* uses a dummy of 1 as an outcome variable if the applicant moved to another town and 0 if not. For the lower panels, we use a dummy of 1 as an outcome variable if the applicant is employed and 0 if not. Each dot represents the mean of employment for a particular bin. The bandwidth is estimated using the procedure proposed by Calonico et al. (2014).

7.2 Transitions in Housing Status

Previous to accessing their own home, applicants were either renting or living with a hosting family, often their parents or close family members.²³ In the first case, applicants who transition from renting into homeownership mechanically cease making monthly payments to landlords, and thus receive a monthly positive unearned income shock. According to standard labor models this should increase their reservation wage and decrease employment levels.²⁴

In the second case, applicants who transition from living with a hosting family into homeownership should face an increase in their time devoted to performing house-related tasks (such as child care), given the decrease in support from the hosting family. In this

²³80% of hosting families are close family members such as grandparents or siblings, and 20% of all Chilean families live with a hosting family. (CASEN, 2013).

²⁴This homeownership program does not allow recipients to take out a mortgage (see Section 2.1).

Table 5: Effect of Homeownership on Labor Market Movers

VARIABLES	Linear (1)	Quad. (2)
<i>LATE Results</i>		
Homeownership LATE	-0.0208	-0.00880
	(0.0176)	(0.0258)
R-squared	0.051	0.050
<i>ITT Results</i>		
Homeownership ITT	0.0139	-0.00641
	(0.0111)	(0.0161)
R-squared	0.051	0.051
Observations	63,199	63,199
BANDWIDTH	128	128
CONTROLS	YES	YES
OFFER ROUND FE	YES	YES
REGION FE	YES	YES

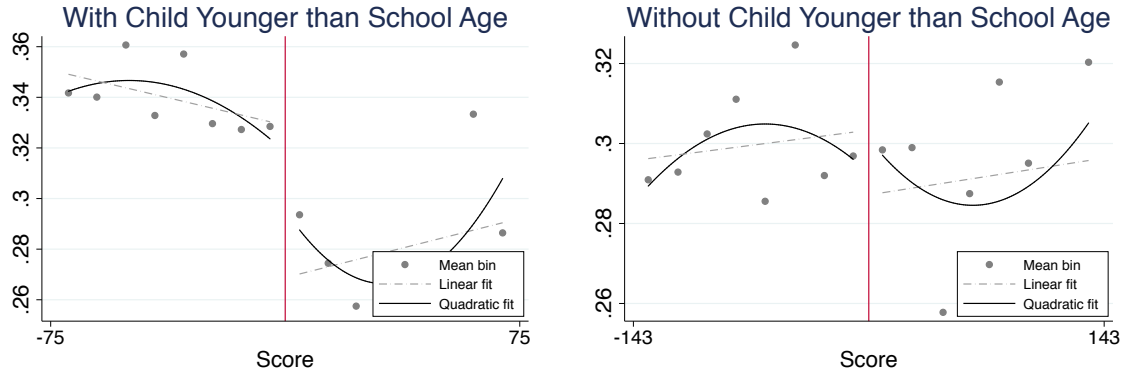
Notes: Data are for applicants of legal working age, four years after the rounds of offers. The unit of observation is one applicant of legal working age. The legal working age starts at 15 years. Legal retirement age is 60 for women and 65 for men. Standard errors are clustered at the family level. *Town Movers* uses a dummy of 1 as an outcome variable if the applicant moved to another town and 0 if not. Controls are for gender, age, vulnerability level, working status before applying, wage before applying, elderly family member, and disabled family member. *** p<0.01, ** p<0.05, * p<0.1

case, standard labor models also predict an increase in the reservation wage.

As we cannot directly observe the fixed costs of housework, we analyzed the differences in employment between families with children younger than school age (6 years old) and those without at the time of application.²⁵ Figure 7 shows a sharper drop in employment for families with a child below school age than for families without. Table 5 reports point estimates that are more than twice the size for families with a young child. These results support the hypothesis that the transition from living with a hosting family to owning a house increases home-based fixed costs and consequently the reservation wage.

²⁵This refers to families with a child of school age or older, as well as families with no children, at the time of application.

Figure 8: Effect of Homeownership on Employment for Families With and Without Children Younger than School Age When Applying



Notes: Data are for applicants of legal working age, four years after the rounds of offers. The unit of observation is one applicant of legal working age. The legal working age starts at 15 years. Legal retirement age is 60 for women and 65 for men. The outcome is a dummy variable equal to 1 if the applicant is employed and 0 if not. Each dot represents the mean of employment for a particular bin. The bandwidth is estimated using the procedure proposed by Calonico et al. (2014).

To summarize, the evidence presented in this section suggests that spatial mobility is not the main driver of the reduction in employment. Rather, the increase in applicants' reservation wages is a likely potential mechanism driving the effects on employment levels.

8 Conclusion

The various and at times contradictory theories concerning homeownership and its effect on employment levels mean that these concepts still face much debate. Whilst homeownership continues to be encouraged by governments in most OECD countries, we do not yet have a full understanding of its wider impacts on people's employment levels.

In this paper, we have exploited data from a Chilean government housing program that assigns vouchers for purchasing a home with an unpredicted cut-off point. Using a fuzzy regression discontinuity, we found that homeownership decreases employment by between 3.85 and 5.33 percentage points. We further observed that the effect comes mostly from individuals not entering the labor market, rather than exiting it.

Regarding the mechanism at play, we observe that the reduced spatial mobility of home-

Table 6: Effect of Homeownership on Employment for Families With and Without Children Younger than School Age When Applying

VARIABLES	With Child Younger than School Age		Without Child Younger than School Age	
	Linear (1)	Quad. (2)	Linear (3)	Quad. (4)
<i>LATE Results</i>				
Homeownership LATE	-0.0641*** (0.0152)	-0.0241 (0.0251)	-0.0262 (0.0228)	-0.00950 (0.0328)
R-squared	0.164	0.164	0.160	0.160
<i>ITT Results</i>				
Homeownership ITT	-0.0399*** (0.00955)	-0.0155 (0.0142)	-0.0162 (0.0135)	-0.00626 (0.0194)
R-squared	0.165	0.165	0.160	0.160
Observations	31,015	31,015	25,168	25,168
BANDWIDTH	74	74	142	142
CONTROLS	YES	YES	YES	YES
OFFER ROUND FE	YES	YES	YES	YES
REGION FE	YES	YES	YES	YES

Notes: Data are for applicants of legal working age, four years after the rounds of offers. The unit of observation is one applicant of legal working age. The legal working age starts at 15 years. Legal retirement age is 60 for women and 65 for men. Standard errors are clustered at the family level. Controls are for gender, age, vulnerability level, working status before applying, wage before applying, elderly family member, and disabled family member. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

owners is not the main driver of the decrease in employment. This finding contradicts previous theoretical literature on this topic. Rather, we find that the transition in housing status is more likely to drive the effect through an increase in the reservation wage of family members, in turn leading them to supply less labor to the market.

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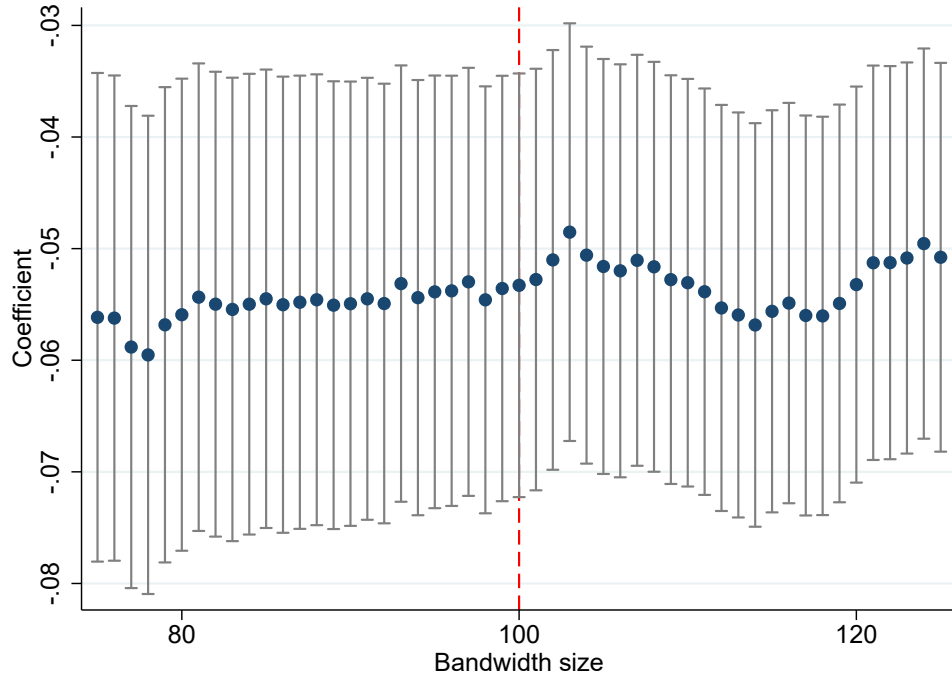
Appendix A. Appendix

Table A1: First Stage

VARIABLES	Homeownership			
	Linear (1)	Quad. (2)	Linear (3)	Quad. (4)
Homeownership	0.634*** (0.0118)	0.633*** (0.0118)	0.591*** (0.0175)	0.592*** (0.0175)
Observations	44,997	44,997	44,997	44,997
R-squared	0.519	0.519	0.520	0.520
BANDWIDTH	80	80	80	80
CONTROLS	NO	NO	YES	YES
OFFER ROUND FE	YES	YES	YES	YES
REGION FE	YES	YES	YES	YES

Notes: Data are for applicants of legal working age and four years after the rounds of offers. The unit of observation is one applicant. The legal working age starts at 15 years, while legal retirement age is 60 for women and 65 for men. Standard errors are clustered at the family level. *** p<0.01, ** p<0.05, * p<0.1

Figure A1: Homeownership Effect at Different Bandwidths



Notes: Data are for applicants of legal working age and four years after the rounds of offers. The unit of observation is one applicant. The legal working age starts at 15 years, while legal retirement age is 60 for women and 65 for men. Each dot represents the point estimate of a regression discontinuity using the sample in the bandwidth. The confidence intervals are set at 95% confidence.