Home Ownership as a Labor Market Friction *

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June 25, 2014

Abstract

This paper estimates the effect of home ownership on individual workers' unemployment and wage growth, as well as other labor market outcomes. Because of higher moving costs, home owners will be less willing than renters to relocate for work and could therefore face longer unemployment spells. To elaborate on this hypothesis, credited to Oswald (1996), I build a simple search model and obtain a set of labor market predictions to test. The current microeconomic literature has reached mixed results regarding home ownership's impact, with most studies concluding that home ownership reduces unemployment. I argue that the instruments used are likely to be invalid because of, among other reasons, Tiebout (1956) type sorting into housing markets. I use an instrumental variable free of the endogeneity present in other work: the county level home ownership rate when and where the worker grew up. This IV affects workers' preferences for housing but not, conditional on my covariates, their labor market ability. My results indicate that home ownership is a significant hindrance to mobility, and homeowners suffer longer unemployment spells and slower wage growth because of it.

1 Introduction

Labor is geographically mobile, but imperfectly so. Moving is costly in terms of both money and effort, so workers will prefer jobs in their local labor market. Home owners are particularly unwilling to relocate - the challenge of selling a house is an additional friction to moving that renters do not face. Owners may experience greater psychic costs to moving as well, since they must abandon a dwelling they invested in and a community they made themselves part of. This

*I am grateful to Gregorio Caetano and Joshua Kinsler for their insight and guidance I thank Mark Bils and seminar participants at the University of Rochester Applied Seminar (2013) for helpful comments. All remaining errors are my own

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mobility friction has labor market implications. Home ownership could cause longer unemployment spells by constraining job seekers to search only in their local labor markets. With a limited set of opportunities, the jobless home owner would have to search longer to find a good match.

Alternatively, home ownership could improve labor market outcomes. The financial responsibilities associated with mortgage payments and home upkeep could motivate owners to search more intensively when unemployed than their renting counterparts. Moreover, as hypothesized in Munch et al. (2006), employers might prefer owners, since they are less likely to move away (and therefore quit). Theory cannot give us an unambiguous prediction of how home ownership affects individual unemployment spells.

To estimate the effect empirically, I must deal with several potential sources of bias. Housing tenure is not randomly assigned in the population, so owners and renters may differ in ways unobservable to the econometrician. For example, high-ability workers may be more willing to take on mortgage debt if they are confident in the future demand for their labor. This positive correlation between innate worker ability and home ownership probability could lead to a spurious inference that home ownership reduces unemployment.

Another possible source of bias is the simultaneity between labor market outcomes and housing tenure decisions. Workers, regardless of ability, may delay purchasing a home until they have a stable job. In this case employment status is causing housing tenure, the reverse of the relationship we want to identify. Even looking at within-worker variation, the naive econometrician could again spuriously infer a negative causal effect of home ownership on unemployment probability.

Recognizing the endogeneity of housing tenure in the unemployment function, the empirical literature has sought instrumental variables to identify the causal relationship. A variety of candidate instruments have been proposed; regional home ownership rates and laws affecting the housing market are popular. The common thread between the IVs used is that they influence a worker's home ownership through the local supply (or price) of owner occupied housing. The validity of such instruments is questionable, as households are not randomly assigned to labor markets. The Tiebout (1956) sorting model suggests households will self-segregate into municipalities based on their income and the local amenities. The availability of houses to purchase is one such amenity, and willingness to pay is likely correlated with a household's employment prospects. Therefore, local housing markets are endogenous to workers' labor market prospects, suggesting instruments based on them are likely to be invalid.

I overcome these endogeneity issues by exploiting a variable that does not depend on a worker's current housing market. Childhood environment has a powerful effect on an individual's later decisions and aspirations. Rowlands and Gurney (2000) and Blaauboer (2011), among others, present evidence that children are socialized into their preferences for housing tenure. Ermisch and Di Salvo (1997) and Boehm and Schlottmann (1999) find that growing up in an owner-occupied house increases the child's adult probability of homeownership. I use the owner-occupancy rate from the county and time period in which

the individual grew up as an instrument for his or her later homeownership. Controlling for the unemployment rate in that county (as well as other determinants of unemployment) ensures my estimates are not contaminated by average county ability or economic conditions. Moreover, since this home ownership rate is determined before the individual enters the labor market there can be no issue of simultaneity.

Unemployment is not the only outcome that we might expect home ownership to influence. To formalize our thinking of how workers and firms respond to the geographic mobility constraint engendered by home ownership, I build a simple model of job search based on Burdett and Mortensen (1998). This model replicates the central theoretical prediction of Oswald (1996): home ownership causes longer periods of unemployment. It also predicts that home ownership will cause slower wage growth, lower reservation wages and less frequent job-to-job transfers.

My reduced form results confirm the model's predictions, showing that home ownership is an important friction to mobility and to finding work. Owning a home lengthens spells of unemployment by 15 weeks for the median worker and reduces the probability of relocating by 19 percentage points. Home owners, *ceteris paribus*, will stay with the same firm over a year longer than renters and experience an eight percentage point slower wage growth. From a policy maker's perspective, any benefit of regulations intended to encourage home ownership should be weighed against these concrete private costs.

This paper is organized as follows: Section 2 reviews the previous literature on this subject. Section 3 presents a model of housing tenure and job search to generate some testable predictions and provide a conceptual framework for my empirical findings. Section 4 describes the data used in the estimation. Section 5 presents the identification strategy and describes the estimating process. Section 6 shows the results. In Section 7 I provide some robustness checks for my identifying and modeling assumptions. In Section 8 I discuss the unintended consequences of policies affecting owner-occupancy rates. Section 9 concludes.

2 Literature Review

A large and well known literature addresses the theory and empirics of search frictions in the labor market. Mortensen (1970) formalized the idea that such frictions are the cause of structural unemployment. Later research has found that unemployment is not the only outcome affected. Burdett and Mortensen (1998) show that with on-the-job search, this friction will generate wage dispersion even without worker heterogeneity. In an empirical application of this model, Postel-Vinay and Robin (2002) find that around 50% of the wage dispersion in France is caused by frictions. Van den Berg and van Vuuren (2010) show that high search frictions lead to lower wages, and Flinn (2002) finds that faster offer arrival rates lead to greater wage dispersion at the country level.

The idea that home ownership causes unemployment was notably expounded upon in Oswald (1996) and is often referred to as the Oswald Hypothesis. Using

within country and cross country comparisons, Oswald (1999) found evidence that across OECD countries, increases in home ownership rates predicted increases in unemployment rates. Similar results held across states in the US. Green and Hendershott (2001a) refine Oswald's method and conclude the relationship appears to hold for populations of middle aged individuals and non-heads of households. Garcia and Hernandez (2004) reach the opposite conclusion looking at data across regions in Spain. As Green and Hendershott point out, all of these macro level studies have difficulty correcting for the endogeneity of home ownership rates.

A variety of micro level estimation strategies have been implemented to resolve the selection bias issue. So far these have produced mixed conclusions. A popular approach is to use two stage estimation methods, with the first stage estimating the selection into home ownership. Different exclusion restrictions in the second stage lead to different results. Green and Hendershott (2001b) use state and year dummies as excluded variables in the second stage, maintaining that these will influence households' tenure choices but otherwise have no impact on employment. They find a positive effect of ownership on length of unemployment spells, but of much smaller magnitude than implied by Oswald (1999). Van Vuuren (2007) and Leuvensteijn and Koning (2003) use the local rates of home ownership as their excluded variable and find that home ownership shortens unemployment. Munch et al. (2008) combine this same instrument, as well as the ownership share in the individual's region of birth, with an individual level fixed effect to clear out time invariant selection bias. They find home ownership shortens unemployment spells, similarly contradicting the Oswald hypothesis. Coulson and Fisher (2008) use differences in state tax treatments of mortgage payments and the proportion of free-standing versus multi-unit dwellings. Once again, they find home ownership to decrease unemployment probability. Munch et al. (2006) and Taskin and Yaman (2012) use the restrictiveness of local building regulations and, operating from different data sets, find evidence refuting and supporting the Oswald hypothesis, respectively.

As pointed out in Coulson and Fisher (2008), local home ownership rates may be poor instruments for individual housing tenure. By including firm behavior in their model, they show that home ownership rates can affect job creation and wage posting. The state dummies utilized by Green and Hendershott (2001b), intended to capture local variation in user cost of owning and renting, may similarly be picking up local labor market conditions. In general we should question the validity of any instrument based on the local environment, as households will sort into markets based on their desire to own or rent, which is tied to their employment prospects. As in the framework of Tiebout (1956), a household's selection into a market will be determined by its willingness to pay for the local characteristics. This sorting behavior creates an endogeneity problem between job market prospects and local housing market conditions.

Sorting behavior is not the only reason these instruments are likely to be invalid. Tax and zoning laws, housing structures and ownership rates could all be influenced by local economic conditions. Adding a fixed effect to the estimator does not solve the problem. While individual level fixed effects can clear out

any time-invariant ability difference between owners and renters, this strategy leaves the reverse causality problem unsolved. The unobservable shocks to an individual's employment prospects will remain. If these shocks cause changes in housing tenure, fixed effects estimators will confound the effects of employment on home ownership with the effect of home ownership on employment.

3 Search and Matching Model

Oswald (1996) hypothesizes that home ownership rates cause unemployment by restricting the mobility of homeowners and therefore limiting their access to non-local jobs. Unemployment is not the only labor market outcome we would expect to see affected by such a mobility friction, however. In this section I detail a simple model of job search in which home owners are mobility constrained. I use this model to generate predictions which I will test in the empirical portion of the paper. The following model is based on Burdett and Mortensen (1998), with a few modifications standard in the literature regarding the Oswald hypothesis.

There is a measure 1 of infinitely lived workers in the economy split into two regions. Workers are either type o, owners, or type r, renters. Owners are assigned to a region and may not move. Renters move costlessly between regions to maximize their utility. When employed, a worker's flow utility is equal to the wage rate, w, and zero when unemployed. Employers post wages and cannot distinguish between types of workers, so both types face a common distribution of wage offers, $F(w)$. For some internal rate of return, ρ, the discounted lifetime utility for an unemployed worker of type t is

$$\rho V_0^t = \lambda_0^t \left[\int max\{V_0^t, V_1^t(x)\} dF(x) - V_0^t \right] \tag{1}$$

where λ_0^t is the arrival rate of offers when a worker of type t is unemployed. Similarly,

$$\rho V_1^t(w) = w + \lambda_1^t \left[\int max\{V_1^t(w), V_1^t(x)\} dF(x) - V_1^t(w) \right] + \delta[V_0^t - V_1^t(w)] \tag{2}$$

is the value of employment at wage w, where λ_1^t is the arrival rate of offers when a worker of type t is employed and δ is the exogenous job destruction rate. Since $V_1^t(\cdot)$ is increasing in w and V_0^t is independent of it, there exist reservations wages R_t for both types.

I model the offer arrival rates as proportional to the measure of firms in the economy, M_v. Firms can enter freely, but pay a vacancy posting cost, ν. Entering firms choose a region to locate in and a wage to post. All filled vacancies pay the firm a constant flow of revenue, p. The flow profit for a firm posting a vacancy at wage w is

$$\pi(w) = (p - w) l(w | R_o, R_r, F) - \nu \tag{3}$$

where $l(w|R_o, R_r, F)$ is the measure of workers per firm earning wage w. In equilibrium it takes the form

$$\begin{aligned} l(w|R_o, R_r, F) =& 1\{w \geq R_o\} \frac{1 + K_1^o}{1 + K_0^o} \frac{M_o K_0^o}{M_v[1 + K_1^o(1 - F(w))]^2} \\ &+ 1\{w \geq R_r\} \frac{1 + K_1^r(1 - F(R_r)}{1 + K_0^r(1 - F(R_r))} \frac{(1 - M_o)K_0^r}{M_v[1 + K_1^r(1 - F(w))]^2} \end{aligned}$$

where M_o is the measure of owners in the population and $K^t = \lambda^t/\delta$. The free entry condition implies $\pi(w) = 0$ for all w with a positive density of firms.

The population of homeowners is split evenly between the two regions, so the wage offer distribution is the same in both areas. Renters can accept any offer but owners can field offers only from their home region. Renters therefore receive offers they could accept at twice the rate of owners, $\lambda_0^r = 2\lambda_0^o$ and $\lambda_1^r = 2\lambda_1^o$.

While the solution to the model has some very elegant functional forms in Burdett and Mortensen (1998), the addition of a second type makes the solution analytically complex. As in Coulson and Fisher (2008) I parameterize my model and present some numerical results. Following Burdett and Mortensen (1998) I take the limit as ρ approaches 0. The following parameterization is admittedly arbitrary, but the qualitative results are robust to a variety of calibrations.

Parameterization	
M_o	0.5
K_0^o	2
λ_0^o/λ_1^o	2

The key features of the parameterization are (1) M_o is large enough that firms posting $w < R_r$ earn non-negative profits, and (2) the job finding rate is higher when unemployed ($\lambda_0^o/\lambda_1^o > 1$) so there is an opportunity cost to accepting an offer.

As in Oswald (1996), this model predicts home ownership causes longer unemployment spells. Unemployed owners receive offers at a lower rate than renters ($\lambda_0^o < \lambda_0^r$) and therefore stay unemployed longer. Figure 1 presents the probability density functions of the length of unemployment spells for owners and renters.

Because of their longer unemployment durations, owners lower their reservation wage. They therefore receive lower wages, on average, when first coming out of unemployment. Figure 2 plots the density of accepted wage offers out of unemployment for owners and renters. When employed, renters receive new offers at a higher rate than owners, as owners can only accept offers from their home region. Renters therefore have a shorter expected tenure at their current firm. Figure 3 plots the density of expected time at current firm. With a higher arrival rate of new job offers, renters move up the wage distribution more quickly than owners. In Figure 4 I plot the expectation of wage growth rate as a function of current wage.

Figure 1: Model Length of Unemployment: Owners vs. Renters

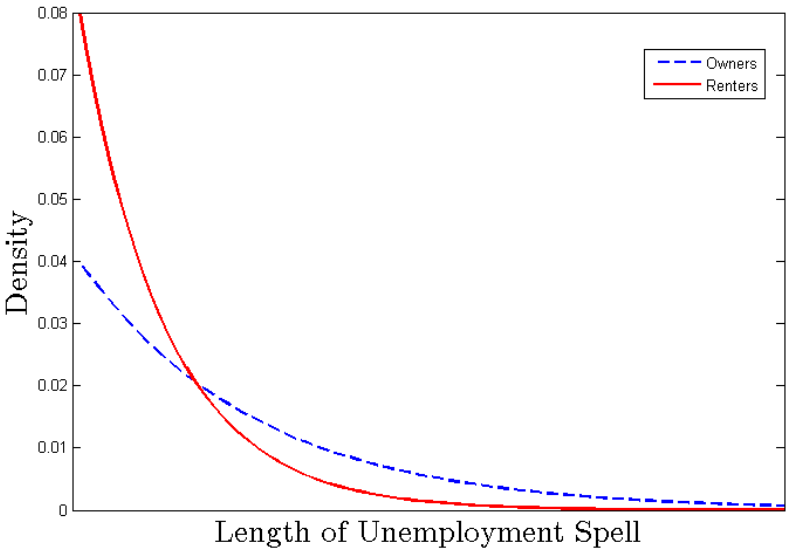


Figure 2: Model Wage out of Unemployment: Owners vs. Renters

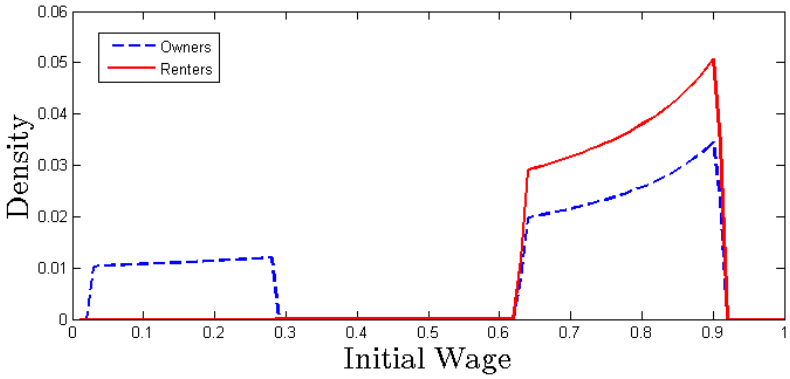


Figure 3: Model Length of Single Job Spell: Owners vs. Renters

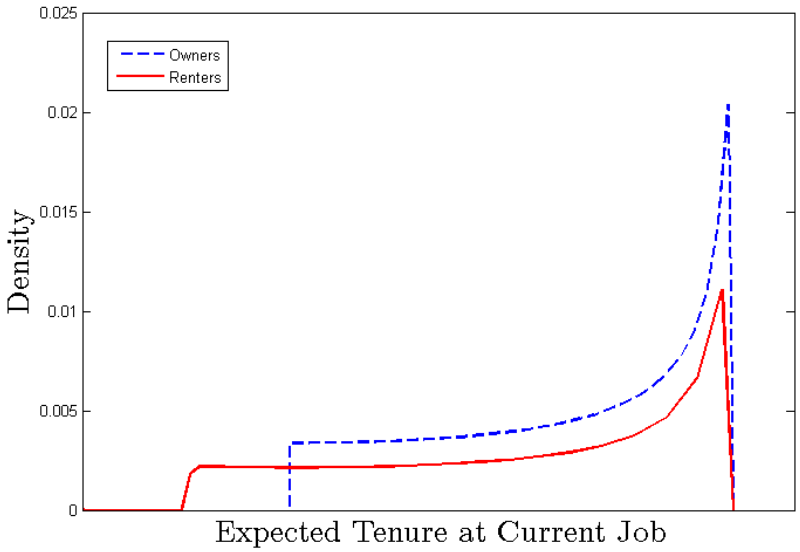
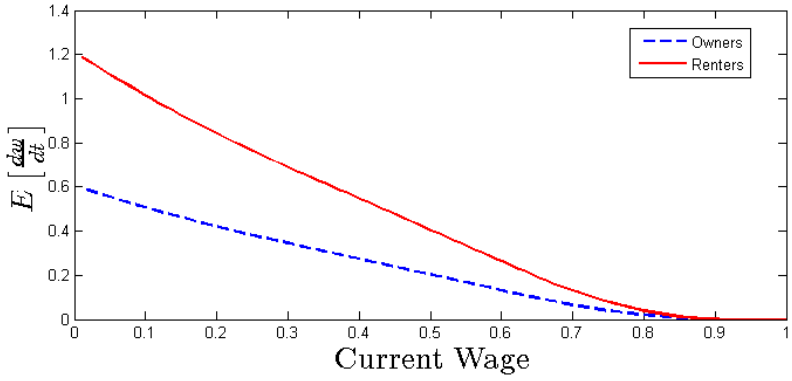


Figure 4: Model Wage Growth: Owners vs. Renters



The labor market costs of home ownership can extend beyond unemployment. These effects are all generated by the mobility restriction. In the Results section we will see the models predictions are largely borne out, suggesting that home ownership's effect on labor market outcomes are explained by a reduction in worker's willingness to accept non-local jobs.

4 Data

The data I use for my study comes from two sources: the Bureau of Labor Statistics, U.S. Department of Labor. (2012) 1979 National Longitudinal Survey of Youth (NLSY79) and the Geolytics, Inc. (2003) Neighborhood Change Database (NCDB). The NLSY79 is a yearly panel following a cohort of individuals who were in their teens or early twenties in 1979. The NLSY79 survey is sponsored and directed by the U.S. Bureau of Labor Statistics and conducted by the Center for Human Resource Research at The Ohio State University. Interviews are conducted by the National Opinion Research Center at the University of Chicago. As well as including a rich set of demographic information, the survey includes yearly questions on housing tenure and a weekly employment history panel. The Geocode supplement to the NLSY79 links each individual/year observation to a county of residence, as well as county of birth and county of residence at age 14 (even if the individual was older than 14 at the time of the first interview). County level data comes from the NCDB. This database links information from the decennial censuses of 1970 through 2000 at the census tract level. The key county level variables I take from the NCDB are: proportion of households that are owner-occupied, unemployment rate, and average income. Other variables used include average house price, marriage and fertility rates, and the proportion of residents who moved in between 1975-1980.

The first wave of interviews from the NLSY79 collects information on the subject's parents and home life. They report the employment status and typical hours per week and weeks per year worked by both parents, if present. Each subject also takes the Armed Forces Qualification Test (AFQT) and their age-corrected score is reported. The AFQT is a standardized test of mathematical and verbal skills and is often used in the labor literature to proxy for ability.

After dropping observations with missing data, the estimation subsample consists of 6,334 individuals. Descriptive statistics of the background demographics are reported in Table 1. Education is reported as years of schooling completed. I take this value from the year the subject turned 25. Information on parental employment is taken from the time of the 1979 interview. County level values are taken from 1980, with dollar amounts left in nominal terms.

I simplify tenure status into a binary variable, indicating that subject owns his or her residence, is in the process of buying it, or is married to the homeowner. Renters or those with other arrangements are lumped together in the other category. I only keep observations from years in which the subject is the head of household or spouse of the head. I use housing tenure and employment data from the years 1986-2004. Keeping only the observations for which no data

Table 1: Summary Statistics

Frequency	Observation Level	Variable	Value	Standard Deviation
Fixed (as of 1979)	Individual			
		Age by 1979	17.6	(2.23)
		Black	0.25	(0.43)
		Hispanic	0.17	(0.38)
		Female	0.51	(0.50)
		Education	13.1	(2.35)
		AFQT	42.8	(28.6)
	County			
		Home Ownership Rate	0.68	(0.16)
		Unemployment Rate	0.068	(0.025)
		Average House Price	$39,670	(21,722)
		Average Household Income	$19,496	(3868)
		Proportion of Recent Movers	0.47	(0.19)
		Marriage Rate	0.56	(0.13)
		Fertility Rate	0.51	(0.12)
Yearly	Individual			
		Home Owner	0.31	(0.46)
		Age	30.5	(4.86)
		Married	0.55	(0.50)
		Any Children	0.56	(0.50)

N = 6,334

Table 2: Correlations

	Unemployment Rate	Homeownership Rate	Average Household Income	Average House Price
Homeownership Rate	-0.0969	·		
Average Household Income	-0.2791	0.0660	·	
Average House Price	-0.3283	-0.1215	0.6923	·
Proportion of Recent Movers	0.1732	0.0584	0.0416	-0.2978

Notes: Data is from 1980 and weighted by frequency in the NLSY79

is missing, I have 68,211 individual-interview year pairs.

The county level data, presented in Table 2, shows that high home ownership rates are associated with stronger labor markets. Unemployment is lower and incomes are higher in counties with greater fractions of owner-occupiers.

During each interview, NLSY79 subjects are asked to give an accounting of their weekly labor market status from the last year. I include in the panel only weeks in which the subject claimed to be in the labor force, and was either employed or unemployed. I do this to put the spotlight on the Oswald hypothesis, which predicts home ownership is a friction to those who are currently searching. Later in the results section, I will show home ownership does not significantly affect labor force participation decisions.

I observe 7,667,054 individual/week pairs in which the individual was in the labor force and his or her employment status was recorded that week and the next. In Figure 5, I plot the cumulative frequency of the length of unemployment spells. This is a subsample of the observable weeks - only unemployment spells that begin and end in employment, with no weeks unaccounted for in between, were included. From an initial sample of 499,464 weeks of unemployment this leaves 349,338. They are grouped in 26,070 unemployment spells, averaging 13.4 weeks. For estimation purposes, I treat the move from unemployment to employment as a weekly hazard rate. This allows me to use more of the data and eliminates a source of sample-selection bias (longer unemployment spells could be more likely to have missing weeks, and thus be discarded).

Wage data was trimmed by throwing out observations in which hourly wages below $1.00 or about $1000.00 were reported. For the wage growth data, I excluded any observations in which wages were reported to increase or decrease by more than a factor of 2. Employment related descriptive statistics are included in Table 3, for the whole sample and by housing tenure status.

Home ownership is associated with lower probability of unemployment, higher wages, and a speedier return to work when unemployed. Either the Oswald hy-

Figure 5: Sample Density of Unemployment Spells

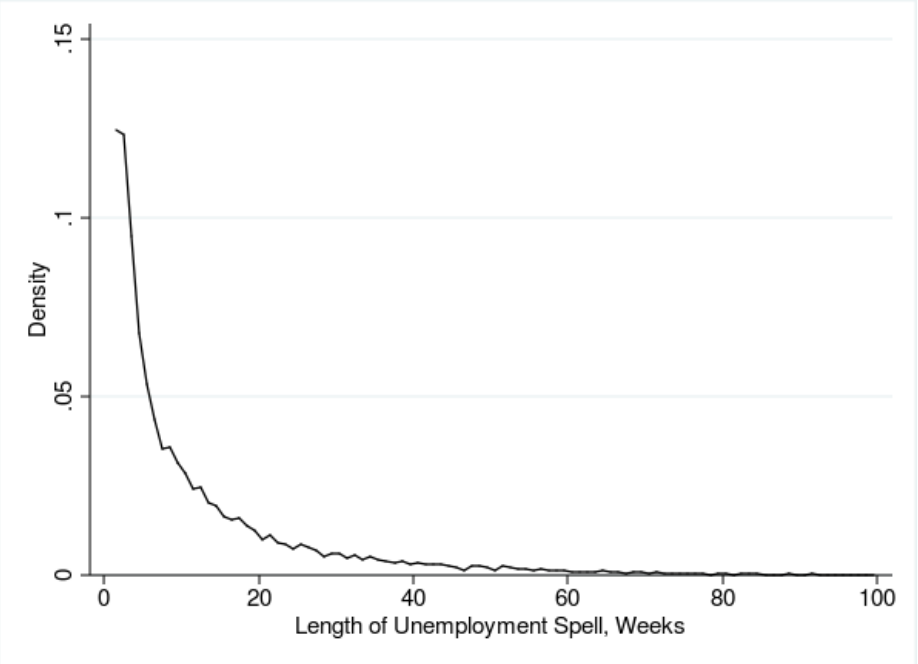


Table 3: Employment Statistics

Variable	Full Sample	Owners	Non-owners
Unemployed	0.0651	0.0281	0.104
Weekly Hazard Rate: Unemployment to Employment	0.0641	0.0649	0.0639
Hourly Real Wage, Year 2004 Dollars	$11.03	$13.88	$10.28
Yearly % Change in Nominal Wage, 1980-1994	10.24	10.21	10.32

pothesis is wrong, or home owners are a selected sample.

5 Identification and Estimation

The Oswald hypothesis proposes a mechanism by which home ownership can cause higher unemployment rates. Home owners, when unemployed and searching for a job, are restricted to their local labor market. They will therefore spend more time searching until an acceptable offer is uncovered. The main prediction at the micro level, then, is that the causal effect of home ownership is to lower the job finding rate. I test this by modeling the movement from unemployment to employment as a weekly hazard rate. For individual i who is unemployed in week $t-1$,

$$e_{it} = \begin{cases} 1, & \text{if } e_{it}^* > 0 \\ 0, & \text{otherwise} \end{cases} \tag{4}$$

where e_{it} equals 1 if i is employed in week t and 0 if i remains unemployed. The latent variable e_{it}^* is a function of i's characteristics X and housing tenure h.

$$e_{it}^* = \beta_0 + \boldsymbol{X_{it}\beta_1} + \beta_2 h_{it} + c_i^e + \epsilon_{it} \tag{5}$$

where c^e and ϵ_t represent permanent and time varying unobservable factors, respectively.

Housing tenure, h, is similarly modeled as a binary outcome depending on a latent variable

$$h_{it} = \begin{cases} 1, & \text{if } h_{it}^* > 0 \\ 0, & \text{otherwise} \end{cases} \tag{6}$$

$$h_{it}^* = \alpha_0 + \boldsymbol{Z_{it}\alpha_1} + c_i^h + \mu_{it} \tag{7}$$

where c^h and μ_t represent the permanent and time varying unobservable factors. By construction $E[\epsilon] = E[\mu] = 0$.

Identification of β_2, the parameter of interest, will be biased by correlations between the unobservable components $c_i^e + \epsilon_{it}$ and $c_i^h + \mu_{it}$. The bias can be corrected, however, if we can observe components of $\mathbf{Z}$ not in $\mathbf{X}$ and uncorrelated with c^e and ϵ.

The literature has experienced difficulty finding such an instrument, a variable that is convincingly unrelated to the unobservables in the employment status function. One useful characteristic of a candidate instrument is for its value to be determined before the individual reaches adulthood. In this way we can be sure to rule out endogeneity due to reverse-causality. Even if employment status (or changes in expectation about said status) can directly cause changes in housing tenure, these transitory shocks cannot be correlated with a predetermined variable. There remains the concern of correlation with the permanent component, c_i^e.

Childhood environment can be an important shaper of a person's preferences. Ermisch and Di Salvo (1997) and Boehm and Schlottmann (1999) both

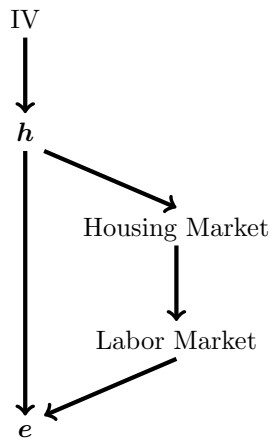
present evidence that growing up in an owner occupied household increases an individual's later propensity to own a home. The probability a child grew up in an owner occupied house is correlated with the home ownership rate in his or her home county. Local home ownership rates, as well as the individual household's tenure status, could influence the child's future aspirations for home ownership. I use the fraction of households living in owner-occupied residences from the county the individual lived in at age 14 as my instrument. A similar instrument was previously used in Munch et al. (2008). In that paper, however, the variable was combined with other current regional characteristics, including the local owner-occupancy rate. As noted previously, the validity of such instruments is suspect. In this paper the home county owner-occupancy rate is the only variable included in Z but excluded from X.

We may be concerned that correlations with unobservable ability would cause this instrument to be invalid. Home owners have better labor market outcomes that non-owners, so it is reasonable to suspect counties with high owner-occupancy rates would have higher average ability. This ability could be transmitted intergenerationally.

A set of control variables helps me overcome these sources of endogeneity. Along with their county's home ownership rate at age 14, I observe the unemployment rate and average income. When estimating employment equations for some time t I also include the time t values for these aggregate measures from i's home (not current) county. My instrument is valid unless there is some factor correlated with i's childhood county homeownership rate that influences i's time t unemployment but is orthogonal to the unemployment rate in that county, either at time t or when i was 14, or the county average income and housing price. My controls should completely capture the relevant portions of the unobservable term - county level ability differences or labor market conditions that cause unemployment - because I directly observe the unemployment rates. As a robustness check I run my estimator on the subsample of observations in which the individual does not live in his or her home county. The results are essentially unchanged.

What if the owner-occupancy rate is really proxying for preferences over other major life choices, such as mobility, marriage or fertility? Households that have a high idiosyncratic moving cost may choose to own their homes since they know they are unlikely to relocate. If this moving cost is inheritable my instrument may be contaminated by a correlation with mobility preferences. Similar stores can be told for marital status or having children. To test for such biases, I include a set of additional county level controls. These are the proportion of local households that moved in the last five years, the marriage rate and the fertility rate. These variables should explain a significant fraction of the variation in preferences over mobility, marriage and fertility, respectively. If there is an endogeneity issue between unobservable preferences in (5) and my instrument, including these controls should reduce this correlation and change the estimates of β_2. We can see from the Results section that including these variables has a negligible impact on the estimates, indicating such preferences are not an important source of endogeneity. Likewise, including the average house price does

Figure 6: Illustration of Treatment Effect Through Location Choice



not materially affect the estimates. This suggests that unobserved economic variables highly correlated with housing price, such as household wealth, are not driving my results.

I also include a set of individual characteristics in X. These additional explanatory variables were chosen to avoid the reverse causality problem. Since the unobservables, ϵ_{it} and μ_{it}, are likely correlated across time, any covariates affected by i's past employability or housing tenure will be endogenous in the employment and housing selection equations. For example, many studies include marital status and the presence of children as factors affecting housing tenure. We would expect people's fertility and marriage choices to be functions of their labor market prospects, i.e. correlated with ϵ. If $E[\epsilon_{it-1}\mu_{it}] \neq 0$, including marital status and presence of children in $\mathbf{Z}$ and $\mathbf{X}$ would bias the estimate $\hat{\lambda}(\mathbf{Z})$ and $\hat{\boldsymbol{\beta}}$ would be inconsistent. As a practical matter, including these two covariates has a small affect on my results and does not change the qualitative conclusions. An interesting set of covariates I avoid are current county characteristics. This is because the local labor market conditions are part of the treatment effect. As illustrated in Figure 6, the instrument influences a worker's choice of housing tenure. The desire to own will influence the worker's choice of where to locate; she must choose an area where there are homes for sale. The choice of home ownership therefore has a causal effect on the worker sorting into a particular labor market. In addition, the mobility friction due to home ownership could effectively trap workers in a particular market. If there is a negative labor demand shock, renters will be more willing to move away. An effect of reduced mobility is therefore greater exposure to local demand shocks, so local unemployment rates should be part of the dependent variable, not controls.

5.1 Estimation

Estimation is accomplished using the control function approach. I assume the unobservables $c_i^e + \epsilon_{it}$ and $c_i^h + \mu_{it}$ follow a jointly normal distribution. Probit estimation of (7) provides an expectation of the unobservables for each individual from the inverse Mills ratio, $\lambda(\mathbf{Z})$,

$$E[c_i^h + \mu_{it}|h, \mathbf{Z}] = \lambda(\mathbf{Z_{it}}) = \begin{cases} \dfrac{\phi(\alpha_0 + \boldsymbol{Z_{it}\alpha_1})}{1 - \Phi(\alpha_0 + \boldsymbol{Z_{it}\alpha_1})}, & \text{if } h_{it} = 1 \\ -\dfrac{\phi(\alpha_0 + \boldsymbol{Z_{it}\alpha_1})}{\Phi(\alpha_0 + \boldsymbol{Z_{it}\alpha_1})}, & \text{if } h_{it} = 0 \end{cases} \tag{8}$$

where ϕ and Φ are the standard normal probability and cumulative density functions, respectively.

By including $\hat{\lambda}(\mathbf{Z})$ as a regressor in (5), we now have

$$e_{it}^* = \beta_0 + \boldsymbol{X_{it}\beta_1} + \beta_2 h_{it} + \beta_3 \hat{\lambda}(\mathbf{Z}) + \eta_{\mathbf{it}} \tag{9}$$

where $\eta_{it} = c_i^e + \epsilon_{it} - \hat{\lambda}(\mathbf{Z})$. Under the identifying assumptions, $E[\mathbf{X}\eta] = \mathbf{0}$ and $E[h\eta] = 0$ so probit estimation of $\boldsymbol{\beta}$ in (9) is consistent. The coefficient on the inverse Mills ratio, β_3 is the correlation between the unobservable components in (5) and (7). The estimate of this parameter indicates the sign and magnitude of the endogeneity problem corrected.

Maximum likelihood estimation is used on probit equations (7) and (9). Standard errors are obtained via bootstrap to account for estimation errors introduced in the first stage. Bootstrap draws are clustered at the individual level to allow for the random effects, c_i

6 Results

Results from the first stage show that the instrument is relevant to explaining housing tenure. Table 4 contains the results from the probit of equation (7).

At average levels of these variables, the predicted probability of homeownership in a given year is about 30%, with a standard deviation of 18 percentage points. Increasing the proportion of homeowners in i's home county from 1980 by a standard deviation, all else equal, raises the predicted probability of homeownership to 37%.

Before we get to the second stage results, it is useful to look at estimates from a naive probit regression of (5). The results of this probit, estimated without including the control function, are presented in column (I) of Table 5. Differences between these and the control function results will give a sense of the bias present in other estimates.

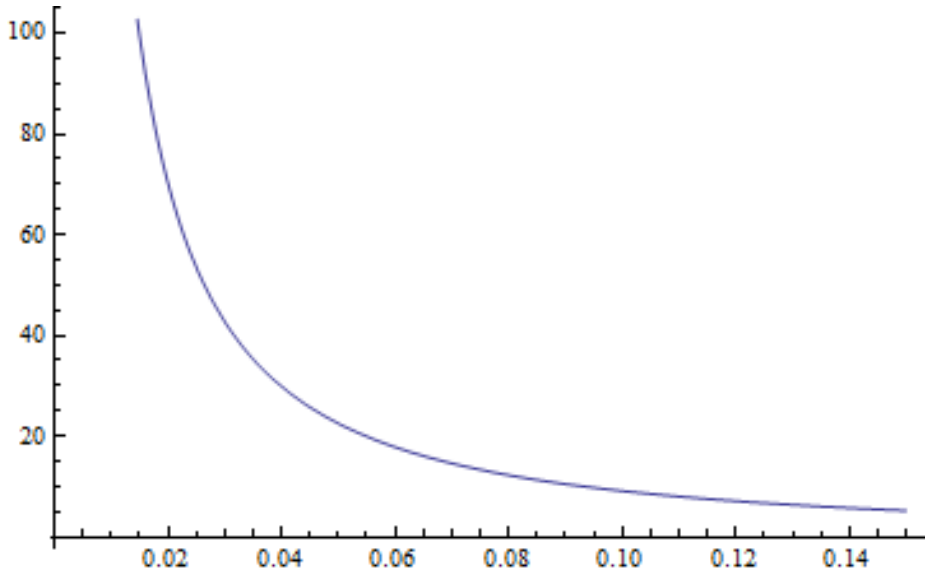
The average individual in the sample, when unemployed one week, has a 6.41% chance of being employed the next week if she stays in the labor force. The naive results imply these odds would improve to 6.99% if the individual became a homeowner. Coulson and Fisher (2002) found similar results using a method that did not take into account endogeneity of housing tenure.

Table 4: First Stage

Variable	Probit of Home Ownership	Standard Error
Proportion of Homeowners in Home County, 1980	1.05**	(0.24)
Female	0.25**	(0.05)
Age	0.16**	(0.002)
Age^2	-0.001**	(0.0003)
High School	0.24**	(0.08)
Some College	0.18	(0.10)
College	0.20	(0.11)
Mother's Education	0.028**	(0.010)
Father's Education	-0.004	(0.008)
AFQT Percentile	0.005**	(0.001)
Hispanic	-0.008	(0.079)
Black	-0.501**	(0.067)
Average Income in Home County, 1980	-0.019	(0.010)
Unemployment Rate in Home County, 1980	-0.416	(1.421)
Unemployment Rate in Home County, Current	0.372	(1.71)
Average House Price in Home County, 1980	-0.0021	(0.0025)
Proportion of Recent Movers in Home County, 1980	0.776*	(0.367)
Marriage Rate in Home County, 1980	0.170	(0.215)
Fertility Rate in Home County, 1980	-0.163	(0.186)
N	4,668	
N·T	375,448	

Notes: **: Significant at the 1% level, *: Significant at the 5% level. Standard errors clustered at the individual level. Average prices and incomes in thousands of nominal dollars. Additional controls include dummies for single and multi parent household and if mother and father worked part time, full time and more than 35 weeks a year.

Figure 7: Weeks of Unemployment
Predicted Treatment Effect



Turning now to the second stage, I estimate equation (9) using the predicted values of $\lambda(\mathbf{Z})$ calculated from estimating (7). Results are presented in columns (II) and (III) of Table 5. There is a striking difference between the control function and the naive estimates. Home ownership now has a very detrimental effect on the job finding rate. Buying a house would reduce i's probability of finding a job within a week from 6.41% to 3.13%, using the values from column III. We can see the source of this difference from the coefficient on $\lambda(\mathbf{Z})$. The unobservable terms in (5) and (7) are positively - and strongly- correlated.

In Figure 7 I plot the treatment effect of home ownership - the expected additional length of an unemployment spell caused by owning. This is graphed as a function of the individual's (untreated) hazard rate out of unemployment. The mean predicted hazard rate in the sample population is 0.064, with 99% falling between 0.02 and 0.14. Clearly, the effect of housing tenure on unemployment spells is significant economically as well as statistically. Home ownership can cause workers to remain unemployed for months longer than if they rented.

If home ownership constrains individuals in their job search when unemployed, it may have other detrimental labor market effects. Workers who own their homes may not be able to accept lucrative job-to-job transfers if they involve a move. When unemployed they may also lower their reservation wages as a response to more limited prospects.

Table 6 shows the results of regressing log hourly wages and yearly growth

Table 5: Second Stage

Variable	Probit of Entering Employment (I)	(II)	(III)
Home Ownership	0.045**	-0.342**	-0.356**
	(0.015)	(0.071)	(0.072)
$\hat{\lambda}(\mathbf{Z})$		0.224**	0.232**
		(0.041)	(0.040)
Female	0.031**	0.054**	0.055**
	(0.012)	(0.014)	(0.012)
Age	0.026**	0.03**	0.03**
	(0.0055)	(0.005)	(0.005)
Age^2	-0.0007**	-0.0007**	-.0007**
	(0.00009)	(0.00008)	(0.00008)
High School	0.032	0.048*	0.049*
	(0.017)	(0.020)	(0.023)
Some College	0.064**	0.075**	0.074**
	(0.020)	(0.020)	(0.026)
College	0.116**	0.129**	0.131**
	(0.026)	(0.029)	(0.030)
AFQT Percentile	0.002**	0.0030**	0.0031**
	(0.0003)	(0.0003)	(0.0003)
Hispanic	0.049**	0.053*	0.044*
	(0.0192)	(0.022)	(0.021)
Black	-0.125**	-0.174**	-0.170**
	(0.0153)	(0.017)	(0.018)
Average Income in Home	-0.00017	-0.0006**	-0.00033
County, 1980	(0.00024)	(0.0002)	(0.0002)
Unemployment Rate in Home	0.059	0.091	0.197
County, 1980	(0.35)	(0.389)	(0.368)
Unemployment Rate in Home	-2.16**	-2.53**	-2.46**
County, Current	(0.392)	(0.433)	(0.411)
Average House Price in Home			0.00002
County, 1980			(0.00005)
Proportion of Recent Movers			-0.290**
in Home County, 1980			(0.074)
Marriage Rate in Home			0.059
County, 1980			(0.106)
Fertility Rate in Home			0.017
County, 1980			(0.147)
N		4,668	
N·T		375,448	

Notes: **: Significant at the 1% level. *: Significant at the 5% level. Standard errors clustered at the individual level. First and second stages bootstrapped together. Average prices and incomes in thousands of nominal dollars. Additional controls include parental education and dummies for single and multi parent household and if mother and father worked part time, full time and more than 35 weeks a year

in log wages against housing tenure and a set of covariates. We face a similar endogeneity issue as in the employment equation - people with better labor market prospects (whether measured by reemployment rate or hourly wage) are more likely to own their home. The same control function approach, using the same exclusion restriction as before, should correct the bias from straightforward OLS. Columns (II) and (IV) contain the results of the control-function estimator. Columns (I) and (III) are naive estimates ignoring the endogeneity of home ownership, and are presented for purposes of comparison.

Home ownership appears to cause substantially slower wage growth. The effect on wage levels is ambiguous, however. To get a more complete picture of how housing tenure affects labor market prospects, I restrict my sample to individuals who experienced unemployment some time since their last interview. The wage data from this group should give us an idea of the quality of jobs that workers get when coming off an unemployment spell. If home ownership's main effect is to reduce the choice set for the unemployed, home owners will have a lower reservation wage and we should see a negative effect of owning. Alternatively, the longer unemployment spells caused by home ownership might be the result of a higher reservation wage - which should appear as a positive effect of owning.

According to column (II) of Table 7, home ownership has a very negative effect on the reservation wages of the unemployed. As seen in column IV, its effect on wage growth is of similar magnitude, suggesting that the past wages of renters and owners who become unemployed are also similar. This is consistent with the theory that home ownership reduces the choice set of available jobs or the rate of job finding - home owners will be willing to settle for less appealing jobs as their unemployment spells lengthen.

As suggested above, home ownership could slow wage growth by preventing workers from accepting higher-paying jobs if they are in another area. Unwilling to relocate, home owners would remain with the same job longer than renters, who could field a broader set of job offers. Central to these predictions and the Oswald hypothesis is the idea that home ownership acts as a mobility constraint. In Tables 8 and 9 I present estimates of the effect of home ownership on probability of moving and length of current job tenure, both with and without the control function as a regressor.

From these tables we can see housing tenure is an important factor for explaining mobility between both jobs and residences. All else equal, a homeowner is expected to work at the same job over a year longer than a renter. The same friction that prevents unemployed homeowners from moving to find new work also applies to the employed. We can see the source of this friction from the results on moving residences. About 19% of the sample moves between interviews. From this baseline probability, the effect of ownership is to reduce the odds of moving to around 3%.

So far I have not paid any attention to the process by which workers become unemployed. Overall unemployment depends not only on the rate at which people gain employment but also the rate at which they lose it. While the Oswald hypothesis is silent on the subject of separations, the net effect of home

Table 6: OLS with and without Control Function

	Log Hourly Wage		Yearly Growth in Log Wage	
Variable	(I)	(II)	(III)	(IV)
Home Ownership	0.142**	0.058	-0.0037	-0.087**
	(0.011)	(0.071)	(0.0064)	(0.032)
$\hat{\lambda}(\mathbf{Z})$		0.0489		0.048**
		(0.037)		(0.018)
Female	-0.20**	-0.195**	-0.0008	0.004
	(0.009)	(0.0086)	(0.004)	(0.005)
Age	0.051**	0.052**	0.012**	0.014**
	(0.004)	(0.0038)	(0.0024)	(0.0026)
Age^2	-0.0006**	-0.0006**	-.0002**	-0.002**
	(0.00007)	(0.00006)	(0.00004)	(0.00004)
High School	0.042**	0.047**	0.0020	0.007
	(0.014)	(0.017)	(0.007)	(0.008)
Some College	0.075**	0.077**	0.0098	0.013
	(0.017)	(0.022)	(0.008)	(0.008)
College	0.167**	0.168**	0.032**	0.034**
	(0.021)	(0.022)	(0.010)	(0.012)
AFQT Percentile	0.0031**	0.0031**	0.0002	0.0002*
	(0.0003)	(0.0002)	(0.0001)	(0.0001)
Hispanic	0.0422**	0.040**	0.0041	0.0017
	(0.015)	(0.014)	(0.0067)	(0.006)
Black	-0.0396**	-0.05**	-0.003	-0.15*
	(0.013)	(0.015)	(0.005)	(0.006)
Average Income in Home	0.00033	0.0003	-0.0001	0.0001
County, 1980	(0.0002)	(0.0002)	(0.00009)	(0.0001)
Unemployment Rate in Home	0.007	0.027	0.20	0.221
County, 1980	(0.339)	(0.355)	(0.146)	(0.161)
Unemployment Rate in Home	0.078	0.03	-0.232	-0.279
County, Current	(0.368)	(0.379)	(0.163)	(0.173)
Average House Price in Home	0.0002**	0.0002**	-0.00004*	-0.00005*
County, 1980	(0.00004)	(0.00004)	(0.00002)	(0.00002)
Proportion of Recent Movers	0.041	0.047	-0.0039	0.002
in Home County, 1980	(0.068)	(0.072)	(0.028)	(0.173)
Marriage Rate in Home	-0.051	-0.45	-0.018	-0.12
County, 1980	(0.041)	(0.040)	(0.017)	(0.018)
Fertility Rate in Home	0.035	0.032	-0.015	-0.018
County, 1980	(0.037)	(0.040)	(0.016)	(0.014)
N	4,563		4,453	
N·T	20,165		17,199	

Notes: **: Significant at the 1% level. *: Significant at the 5% level. Standard errors clustered at the individual level. First and second stages bootstrapped together. Average prices and incomes in thousands of nominal dollars. Dependent variable is in natural logs of year 2004 real wages. Additional controls include parental education and dummies for single and multi parent household and if mother and father worked part time, full time and more than 35 weeks a year

Table 7: Subsample of Recently Unemployed

	Log Hourly Wage		Yearly Growth in Log Wage	
Variable	(I)	(II)	(III)	(IV)
Home Ownership	0.150**	-0.192*	-0.0009	-0.162**
	(0.011)	(0.081)	(0.007)	(0.037)
$\hat{\lambda}(\mathbf{Z})$		0.195**		0.092**
		(0.044)		(0.021)
Female	-0.202**	-0.182**	-0.0015	0.0077
	(0.009)	(0.011)	(0.0043)	(0.0044)
Age	0.0008	0.0008	-0.0002	-0.0002
	(0.0005)	(0.0006)	(0.0003)	(0.0003)
Age^2	0.0002**	0.0004**	.00002**	0.00004**
	(0.00001)	(0.00003)	(0.000005)	(0.00001)
High School	0.035*	0.055**	0.001	0.011
	(0.014)	(0.016)	(0.007)	(0.008)
Some College	0.065**	0.076**	0.009	0.015
	(0.017)	(0.017)	(0.009)	(0.009)
College	0.164****	0.172**	0.0345**	0.039**
	(0.010)	(0.024)	(0.0107)	(0.011)
AFQT Percentile	0.0031**	0.0034**	0.00015	0.0003**
	(0.0002)	(0.0003)	(0.00011)	(0.0001)
Hispanic	0.036*	0.027**	0.0033	-0.001
	(0.015)	(0.035)	(0.007)	(0.007)
Black	-0.037**	-0.081**	-0.0036	-0.025***
	(0.012)	(0.014)	(0.0058)	(0.007)
Average Income in Home	0.003	0.002	-0.0014	-0.0009
County, 1980	(0.002)	(0.002)	(0.0009)	(0.001)
Unemployment Rate in Home	-0.156	-0.06	0.204	0.243
County, 1980	(0.333)	(0.367)	(0.158)	(0.152)
Unemployment Rate in Home	-0.230	0.053	-0186612	-0.267
County, Current	(0.362)	(0.745)	(0.174)	(0.188)
Average House Price in Home	-0.002**	0.0020**	0.0005*	-0.0006**
County, 1980	(0.0004)	(0.0004)	(0.0002)	(0.0002)
Proportion of Recent Movers	0.052	0.077	-0.009	0.0003
in Home County, 1980	(0.066)	(0.075)	(0.031)	(0.030)
Marriage Rate in Home		-0.044	-0.016	-0.005
County, 1980		(0.038)	(0.017)	(0,025)
Fertility Rate in Home		0.033	-0.015	-0.021
County, 1980		(0.034)	(0.016)	(0.016)
N	1,909		1,717	
N·T	3,725		3,215	

Notes: **: Significant at the 1% level. *: Significant at the 5% level. Standard errors clustered at the individual level. First and second stages bootstrapped together. Average prices and incomes in thousands of nominal dollars. Dependent variable is in natural logs of year 2004 real wages. Additional controls include parental education and dummies for single and multi parent household and if mother and father worked part time, full time and more than 35 weeks a year

Table 8: Mobility Constraints

Variable	Probit of Relocating in the Next Year (I)	(II)	(III)
Home Ownership	-0.595**	-0.920**	-1.386**
	(0.036)	(0.237)	(0.319)
$\hat{\lambda}(\mathbf{Z})$		0.192	0.210*
		(0.144)	(0.188)
Female	0.025	0.048	0.029
	(0.031)	(0.036)	(0.041)
Age	0.26**	0.27**	0.15**
	(0.033)	(0.032)	(0.028)
Age^2	-0.0034**	-0.0034**	-.0018**
	(0.0005)	(0.0005)	(0.0004)
High School	-0.08	-0.060	-0.06
	(0.047)	(0.049)	(0.062)
Some College	-1.35*	-0.122*	-0.160*
	(0.057)	(0.057)	(0.065)
College	-0.161*	-0.161*	-0.187*
	(0.070)	(0.074)	(0.089)
AFQT Percentile	-0.0007	-0.00038	0.00051
	(0.0008)	(0.0008)	(0.0008)
Hispanic	0.060	0.067	-0.035
	(0.050)	(0.051)	(0.052)
Black	-0.001	-0.065	-0.130
	(0.041)	(0.064)	(0.077)
Average Income in Home	0.0003	-0.0004	0.0008
County, 1980	(0.0007)	(0.0007)	(0.0006)
Unemployment Rate in Home	1.55	1.29	1.41
County, 1980	(0.876)	(0.881)	(0.923)
Unemployment Rate in Home	-1.84	-1.98	-3.46**
County, Current	(1.07)	(1.04)	(1.04)
Average House Price in Home			-0.0001
County, 1980			(0.0001)
Proportion of Recent Movers			-0.671**
in Home County, 1980			(0.225)
Marriage Rate in Home			0.059
County, 1980			(0.140)
Fertility Rate in Home			0.120
County, 1980			(0.143)
N		3,658	
N·T		12,304	

Notes: *: Significant at the 5% level. Standard errors clustered at the individual level. First and second stages bootstrapped together. Average prices and incomes in thousands of nominal dollars. Additional controls include parental education and dummies for single and multi parent household and if mother and father worked part time, full time and more than 35 weeks a year

Table 9: Job Switching Constraints

Variable	OLS of Weeks at Current Job (I)	(II)	(III)
Home Ownership	35.75**	62.01*	68.8*
	(3.95)	(29.02)	(32.61)
$\hat{\lambda}(\mathbf{Z})$		-11.16	-15.20
		(15.71)	(18.06)
Female	-12.27**	-16.11**	-16.81**
	(3.61)	(4.81)	(4.94)
Age	0.871	-26.05	-27.29
	(2.86)	(2.72)	(2.70)
Age^2	0.049	0.48	0.50
	(0.048)	(0.040)	(0.046)
High School	8.93	10.01*	8.90
	(4.23)	(5.09)	(5.01)
Some College	12.26*	6.28	5.86
	(5.37)	(5.01)	(5.80)
College	10.55	2.04	0.85
	(6.13)	(7.43)	(6,22)
AFQT Percentile	0.228*	0.151	0.144
	(0.092))	(0.090)	(0.092)
Hispanic	5.76	2.83	4.58
	(4.35)	(4.42)	(5.62)
Black	-11.47**	-2.67	-2.27
	(3.97)	(5.21)	(5.90)
Average Income in Home	-0.860	-0.131	-1.61
County, 1980	(0.860)	(0.723)	(0.788)
Unemployment Rate in Home	221.57*	241.77*	332.3*
County, 1980	(100.32)	(115.36)	(132.48)
Unemployment Rate in Home	-361.97**	-340.91*	-416.46**
County, Current	(125.51)	(133.74)	(131.18)
Average House Price in Home			0.206
County, 1980			(0.151)
Proportion of Recent Movers			70.40**
in Home County, 1980			(25.15)
Marriage Rate in Home			-4.36
County, 1980			(14.71)
Fertility Rate in Home			-3.96
County, 1980			(13.46)
N		3,475	
N·T		10,395	

Notes: **: Significant at the 1% level.*: Significant at the 5% level. Standard errors clustered at the individual level. First and second stages bootstrapped together. Average prices and incomes in thousands of nominal dollars. Additional controls include parental education and dummies for single and multi parent household and if mother and father worked part time, full time and more than 35 weeks a year

ownership should be measured by its influence on both these rates. I re-estimate equation (9) for the sample of individual/week pairs in which the worker is employed at time $t-1$, and show the results in Table 10.

Home ownership's effect on the probability of an individual becoming unemployed is not significantly different from zero. Taking the point estimate at face value, column (IV) would suggest an increase of around 0.1 percentage points in the weekly hazard rate of unemployment.

In addition to selection into unemployment, we may be concerned about selection out of the labor force. If unemployed individuals with poor odds of finding work get discouraged and leave the sample, my estimates of the job finding rate would be positively biased. I estimate the effect of home ownership on leaving the labor force to test for the presence of such a bias. To do this, I again take the framework of equation (9), using the sample of individual/weeks in which the worker was in the labor force, employed or not. The outcome variable e_{it} is replaced by an indicator for whether the worker remained in the labor force the next week. Results are presented in Table 11, from which we can see that there is no significant effect of housing tenure on remaining in the labor force. I conclude that labor force participation is not an important source of bias for my re-employment rate estimates.

In sum, my results confirm and elaborate upon the Oswald hypothesis: home ownership is a significant friction in the labor market.

7 Robustness Checks

In this section I use additional estimates to lend support to my identification arguments.

7.1 Drop Observations in Which i Lives in Home State

Lagged home ownership rates may predict future labor demand at the regional level. Many individuals live near their childhood home for some or all of their working lives. For these individuals, the instrument (home county owner-occupancy rate) predicts their current labor market not only through their individual housing tenure. To ensure my estimates are not spuriously attributing this effect to home ownership, I re-estimate (9) on the subsample of observations in which i does not live in her home state.

I show the results from the first stage of estimation at the individual/year level in Table 12. We can see that the home county owner-occupancy rate has substantial influence on housing tenure decisions even for individuals who have moved far away.

Results from the second stage are presented in Table 13. From column (III) we can see that the key estimate, the coefficient on home ownership, is not significantly different from the value estimated from the main sample. While the point estimate is larger in magnitude, the qualitative inference is essentially unchanged.

Table 10: Sample of Employed Workers

Variable	Probit of Remaining Employed (I)	(II)	(III)
Home Ownership	0.074**	0.174	-0.075
	(0.012)	(0.310)	(0.396)
$\hat{\lambda}(\mathbf{Z})$		-0.060	0.092
		(0.189)	(0.244)
Female	-0.164**	-0.179**	-0.160**
	(0.010)	(0.022)	(0.025)
Age	0.058**	0.058**	0.055**
	(0.0049)	(0.005)	(0.004)
Age^2	-0.0003**	-0.0003**	-.0003**
	(0.00007)	(0.00008)	(0.00008)
High School	0.073	0.066*	0.086*
	(0.017)	(0.033)	(0.037)
Some College	0.074**	0.065	0.089*
	(0.018)	(0.036)	(0.046)
College	-0.012	-0.025	0.013
	(0.022)	(0.057)	(0.070)
AFQT Percentile	0.0004	0.0002	0.0006
	(0.0003)	(0.0005)	(0.0007)
Hispanic	-0.045**	0.051**	-0.045**
	(0.0156)	(0.016)	(0.015)
Black	-0.088**	-0.075*	-0.102**
	(0.014)	(0.039)	(0.045)
Average Income in Home	-0.00019	-0.0002	-0.0002
County, 1980	(0.00022)	(0.0002)	(0.0003)
Unemployment Rate in Home	-0.171	-0.207	-0.039
County, 1980	(0.32)	(0.598)	(0.706)
Unemployment Rate in Home	-0.241	-0.020	-0.453
County, Current	(0.330)	(0.934)	(1.04)
Average House Price in Home			-0.00003
County, 1980			(0.00004)
Proportion of Recent Movers			0.084
in Home County, 1980			(0.070)
Marriage Rate in Home			0.060
County, 1980			(0.078)
Fertility Rate in Home			-0.048
County, 1980			(0.061)
N		4,662	
N·T		1,352,207	

Notes: **: Significant at the 1% level. *: Significant at the 5% level. Standard errors clustered at the individual level. First and second stages bootstrapped together. Average prices and incomes in thousands of nominal dollars. Additional controls include parental education and dummies for single and multi parent household and if mother and father worked part time, full time and more than 35 weeks a year

Table 11: Sample of All Labor Force Participants

	Probit of Remaining in Labor Force		
Variable	(I)	(II)	(III)
Home Ownership	-0.042	0.0001	0.0039
	(0.042)	(0.189)	(0.173)
$\hat{\lambda}(\mathbf{Z})$		-0.022	-0.031
		(0.097)	(0.091)
Female	-0.104**	-0.103**	-0.105**
	(0.024)	(0.025)	(0.025)
Age	0.344**	0.344**	0.350**
	(0.013)	(0.005)	(0.013)
Age^2	-0.005**	-0.005**	-.0049**
	(0.0002)	(0.0002)	(0.0002)
High School	0.035	0.035*	0.048
	(0.037)	(0.038)	(0.040)
Some College	-0.017	-0.018	-0.006
	(0.042)	(0.044)	(0.042)
College	-0.086	-0.089*	-0.068
	(0.049)	(0.043)	(0.052)
AFQT Percentile	-0.002**	-0.002**	-0.0023**
	(0.0005)	(0.0007)	(0.0006)
Hispanic	-0.068	-0.069	-0.062
	(0.038)	(0.036)	(0.044)
Black	-0.085**	-0.084**	-0.092**
	(0.031)	(0.029)	(0.029)
Average Income in Home	0.0098*	-0.006	0.011
County, 1980	(0.0049)	(0.0002)	(0.004)
Unemployment Rate in Home	1.88	1.89**	1.99
County, 1980	(1.01)	(0.701)	(1.11)
Unemployment Rate in Home	-1.43	-1.411	-1.42
County, Current	(1.07)	(0.037)	(1.25)
Average House Price in Home			-0.001
County, 1980			(0.001)
Proportion of Recent Movers			-0.147
in Home County, 1980			(0.199)
Marriage Rate in Home			-0.085
County, 1980			(0.044)
Fertility Rate in Home			-0.092
County, 1980			(0.029)
N		4,491	
N·T		1,653,928	

Notes: **: Significant at the 1% level. *: Significant at the 5% level. Standard errors clustered at the individual level. First and second stages bootstrapped together. Average prices and incomes in thousands of nominal dollars. Additional controls include parental education and dummies for single and multi parent household and if mother and father worked part time, full time and more than 35 weeks a year

Table 12: First Stage, Subsample not in Home State

Variable	Probit of Home Ownership	Standard Error
Proportion of Homeowners in Home County, 1980	0.720**	(0.221)
Female	0.254**	(0.043)
Age	0.003	(0.003)
Age^2	-0.0013**	(0.00004)
High School	0.258**	(0.080)
Some College	0.130	(0.091)
College	0.098	(0.098)
Mother's Education	0.023*	(0.010)
Father's Education	-0.009	(0.007)
AFQT Percentile	0.004**	(0.001)
Hispanic	-0.054	(0.76)
Black	-0.613**	(0.062)
Average Income in Home County, 1980	-0.015	(0.009)
Unemployment Rate in Home County, 1980	0.335	(1.358)
Unemployment Rate in Home County, Current	-0.358	(1.622)
Average House Price in Home County, 1980	-0.001	(0.002)
Proportion of Recent Movers in Home County, 1980	0.358	(0.303)
Marriage Rate in Home County, 1980	0.205	(0.192)
Fertility Rate in Home County, 1980	-0.281	(0.166)
N	3,962	
N·T	11,894	

Notes: **: Significant at the 1% level, *: Significant at the 5% level. Standard errors clustered at the individual level. Average prices and incomes in thousands of nominal dollars. Additional controls include dummies for single and multi parent household and if mother and father worked part time, full time and more than 35 weeks a year.

Table 13: Second Stage, Subsample not in Home State

Variable	Probit of Entering Employment (I)	(II)	(III)
Home Ownership	0.064*	-0.681**	-0.616*
	(0.030)	(0.207)	(0.255)
$\hat{\lambda}(\mathbf{Z})$		0.446**	0.409**
		(0.119)	(0.145)
Female	0.043	0.083*	0.078*
	(0.026)	(0.033)	(0.036)
Age	0.043	0.066*	0.068**
	(0.034)	(0.029)	(0.026)
Age^2	-0.001**	-0.0007**	-.0011**
	(0.0003)	(0.0004)	(0.0004)
High School	-0.007	0.037	0.030
	(0.045)	(0.050)	(0.050)
Some College	0.046	0.094	0.075
	(0.053)	(0.071)	(0.069)
College	-0.022	0.075	0.057
	(0.062)	(0.078)	(0.072)
AFQT Percentile	0.002**	0.0027**	0.003**
	(0.0007)	(0.0009)	(0.0008)
Hispanic	0.083	0.075	0.078
	(0.048)	(0.060)	(0.060)
Black	-0.043	-0.154*	-0.126*
	(0.038)	(0.061)	(0.055)
Average Income in Home	-0.0012	-0.007	0.011
County, 1980	(0.0037)	(0.004)	(0.006)
Unemployment Rate in Home	1.201	1.703*	1.575
County, 1980	(0.681)	(0.843)	(0.852)
Unemployment Rate in Home	-2.043**	-2.320**	-2.286*
County, Current	(0.735)	(0.887)	(1.105)
Average House Price in Home			-0.0016
County, 1980			(0.0016)
Proportion of Recent Movers			-0.090
in Home County, 1980			(0.276)
Marriage Rate in Home			0.111
County, 1980			(0.156)
Fertility Rate in Home			-0.253
County, 1980			(0.144)
N		1,267	
N·T		52,395	

Notes: **: Significant at the 1% level. *: Significant at the 5% level. Standard errors clustered at the individual level. First and second stages bootstrapped together. Average prices and incomes in thousands of nominal dollars. Additional controls include parental education and dummies for single and multi parent household and if mother and father worked part time, full time and more than 35 weeks a year

7.2 Correlations with Observed Ability Measures

We may be concerned that there is some aspect of unobserved ability, correlated with the instrument, biasing the estimates. If there is a correlation between the instrument and an observed ability measure, conditional on other controls, we might reason by analogy that such a correlation could exist with unobserved ability. I regress an observed measure of ability, the AFQT score, on my instrument and the full vector of covariates. Results are presented in table 14.

The coefficient on the instrument (proportion of homeowners) is not nearly significant, either statistically or practically. The point estimate implies a one standard deviation increase in the instrument reduces AFQT by two thousandths of a standard deviation. If unobservable ability is endogenous to my instrument conditional on the controls, it must be a form of ability orthogonal to test scores.

7.3 Robustness to Specification Choice

I would like to ensure that my results are not an artifact of model (mis)specification. To test this, I reestimate the effect of home ownership on unemployment using a linear probability model of tenure choice. I report first stage results in Table 15. We can see that the instrument has a significant positive effect on home ownership, just as in Table 4.

In the second stage I use two stage least squares to estimate the effect of housing tenure on weeks spent unemployed per year, with the same instrument as the excluded variable. Results are presented in Table 16. In column (I) I show the naive results, which predictably credit home ownership with reducing time spent unemployed. Column (II) shows the reduced form effect of the instrument, the proportion of home owners in i's home county. A one standard deviation increase in home county home ownership rate is associated with 5 to 6 additional days of unemployment every year. Columns (III) and (IV) contain the results of the IV estimator. The point values are implausibly large, with very wide confidence intervals. One takeaway from this exercise is that a linear probability model is a poor specification for my first stage. It does, however, provide evidence that variation in the data is driving identification in my preferred model, not simply structural assumptions.

In another second stage regression (not shown) I estimate the weekly reemployment probability (equation (9)) as a linear probability model. The sign of the estimates is the same as in my preferred specification, with similar magnitudes. The results are not close to statistical significance at standard levels, however. This is unsurprising, as reemployment is a rare event and linear probability models perform particularly poorly at the tail end of distributions, where marginal effects are highly non-linear.

Table 14: Ability Correlation

Variable	OLS of AFQT	Standard Error
Proportion of Homeowners in Home County, 1980	-0.002	(0.177)
Female	-0.75*	(0.022)
Age	0.045**	(0.008)
Age^2	0.0004**	(0.0001)
High School	0.508**	(0.029)
Some College	0.934**	(0.034)
College	1.432**	(0.038)
Hispanic	-0.307**	(0.034)
Black	-0.806**	(0.026)
Average Income in Home County, 1980	0.00028	(0.0044)
Unemployment Rate in Home County, 1980	1.14	(0.94)
Unemployment Rate in Home County, Current	-2.46*	(1.12)
Average House Price in Home County, 1980	-0.0001	(0.001)
Proportion of Recent Movers in Home County, 1980	0.208	(0.150)
Marriage Rate in Home County, 1980	0.026	(0.088)
Fertility Rate in Home County, 1980	-0.018	(0.088)
N	4,492	

Notes: **: Significant at the 1% level. *: Significant at the 5% level. Average prices and incomes in thousands of nominal dollars. Additional controls include parental education and dummies for single and multi parent household and if mother and father worked part time, full time and more than 35 weeks a year. AFQT score and Proportion of Homeowners in Home County, 1980 have both been rescaled in terms of their sample standard deviation.

Table 15: First Stage, Linear Probability Model

Variable	OLS of Home Ownership	Standard Error
Proportion of Homeowners in Home County, 1980	0.119**	(0.031)
Female	0.055**	(0.007)
Age	-0.0003	(0.0004)
Age^2	0.0003**	(0.00001)
High School	0.051**	(0.010)
Some College	0.029*	(0.013)
College	0.021	(0.015)
Mother's Education	0.004**	(0.002)
Father's Education	-0.002*	(0.001)
AFQT Percentile	0.0009**	(0.0002)
Hispanic	-0.022	(0.012)
Black	-0.122**	(0.009)
Average Income in Home County, 1980	-0.003*	(0.0015)
Unemployment Rate in Home County, 1980	0.072	(0.280)
Unemployment Rate in Home County, Current	-0.183	(0.321)
Average House Price in Home County, 1980	-0.0003	(0.0003)
Proportion of Recent Movers in Home County, 1980	0.073	(0.054)
Marriage Rate in Home County, 1980	0.034	(0.030)
Fertility Rate in Home County, 1980	-0.035	(0.027)
N	5,544	
N·T	23,555	

Notes: **: Significant at the 1% level, *: Significant at the 5% level. Standard errors clustered at the individual level. Average prices and incomes in thousands of nominal dollars. Additional controls include dummies for single and multi parent household and if mother and father worked part time, full time and more than 35 weeks a year.

Table 16: Second Stage, Linear Specification

	Weeks Unemployed per Year			
	OLS		2SLS	
Variable	(I)	(II)	(III)	(IV)
Home Ownership	-1.562**		24.400	12.928
	(0.309)		(12.763)	(9.572)
Proportion of Homeowners		3.589**		
in Home County, 1980		(1.387)		
Female	-1.834**	-1.949**	-3.654**	-2.829**
	(0.286)	(0.287)	(1.003)	(0.769)
Age	-0.009	- 0.006	0.025	0.013
	(0.021)	(0.020)	(0.033)	(0.028)
Age^2	0.007**	0.003**	-.007	-0.002
	(0.0008)	(0.0007)	(0.005)	(0.004)
High School	-0.123	0.282	-1.760	-1.090
	(0.481)	(0.483)	(0.023)	(0.838)
Some College	-1.015	-1.129*	-2.092*	-1.630*
	(0.571)	(0.573)	(0.938)	(0.763)
College	-1.722**	-1.805**	-1.982*	-2.060**
	(0.663)	(0.665)	(0.923)	(0.788)
AFQT Percentile	-0.028**	-0.029**	-0.055**	-0.044**
	(0.008)	(0.008)	(0.019)	(0.015)
Hispanic	-0.642	-0.459	0.995	0.313
	(0.460)	(0.463)	(1.131)	(0.823)
Black	1.953**	2.327**	-0.170**	4.587**
	(0.416)	(0.410)	(0.018)	(1.777)
Average Income in Home	0.085	0.080	0.131	0.122
County, 1980	(0.061)	(0.062)	(0.076)	(0.078)
Unemployment Rate in Home	14.17	9.946	22.314	15.667
County, 1980	(9.51)	(9.806)	(12.898)	(10.968)
Unemployment Rate in Home	21.26*	28.235*	9.572	19.297
County, Current	(10.32)	(11.474)	(14.851)	(12.034)
Average House Price in Home				-0.005
County, 1980				(0.015)
Proportion of Recent Movers				3.466
in Home County, 1980				(2.360)
Marriage Rate in Home				3.566**
County, 1980				(1.383)
Fertility Rate in Home				-1.199
County, 1980				(1.313)
N		3,436		
N·T		8,817		

Notes: **: Significant at the 1% level. *: Significant at the 5% level. Standard errors clustered at the individual level. Average prices and incomes in thousands of nominal dollars. Additional controls include parental education and dummies for single and multi parent household and if mother and father worked part time, full time and more than 35 weeks a year

7.4 Comparison to Other Instruments

To see the consequences of using invalid instruments, I replicate some of the previous estimates using a candidate instrument drawn from the literature. In my opinion the best such instrument is the strictness of local zoning ordinances. This variable was used in Munch et al. (2006) and adapted to US data in Taskin and Yaman (2012). As a measure of strictness I use the Wharton Residential Land Use Regulatory Index (WRLURI) developed in Gyourko et al. (2008). Following Taskin and Yaman (2012), I instrument for the worker's housing tenure using their current state average WRLURI value. Table 17 shows that there is a significant first stage - an increase of one standard deviation in the index causes a 2 percentage point drop in the likelihood of home ownership for an average individual.

Turning to the second stage, I still estimate a negative effect of home ownership on the reemployment rate. This is countered by a very positive effect on the probability of remaining unemployed - these values are seen in columns (I) and (II) of table 18, respectively. The overall estimated effect is a decrease in unemployment. Table 19 compares predicted unemployment rates using the different instruments and the naive estimator. Matching flows into unemployment to outflows, the average individual in the sample has a predicted probability of unemployment of 5.5%. Using current state WRLURI as an instrument, the model predicts home ownership would reduce this probability to 4.5%. Contrast this with the predictions using home county home ownership rates as an instrument. Using my estimated coefficients, the model predicts the probability of unemployment increases to 10.5%. The choice of instrument is clearly crucial[1].

8 Discussion

My results argue for a reevaluation of regulations intended to encourage home ownership, an apparent aim of several US government policies. One example: interest payments on mortgages are deductible from federal income taxes. Another: the Housing and Community Development Act of 1992, which was implemented to extend housing loans to underprivileged borrowers who would otherwise not qualify. In the wake of this policy, home ownership rates increased sharply after a decade of stability. Figure 8 plots this rate over the period 1984-2005.

What were the private costs of such a policy? My results suggest these new home owners would face some negative labor market consequences. Let us compare the consequences for two different groups, chosen to be representative of the upper and lower extremes. White females with completed college degrees are among the least vulnerable. Suppose this group increased its home ownership rate by 5 percentage points, as the overall population did between 1994 and

[1] Other outcome variables exhibit much smaller differences on the estimates of interest between my instrument and WRLURI. This suggests the unobservables correlated with WRLURI are less important in determining wages than in unemployment.

Table 17: First Stage, WRLURI as IV

Variable	Probit of Home Ownership	Standard Error
WRLURI	-0.104**	(0.030)
Female	0.245**	(0.036)
Age	0.003	(0.002)
Age^2	0.001**	(0.00003)
High School	0.274**	(0.066)
Some College	0.142	(0.076)
College	0.040	(0.083)
Mother's Education	0.016*	(0.008)
Father's Education	-0.014*	(0.006)
AFQT Percentile	0.004**	(0.0009)
Hispanic	-0.035	(0.058)
Black	-0.574**	(0.052)
Average Income in Home County, 1980	-0.003	(0.007)
Unemployment Rate in Home County, 1980	-0.144	(1.095)
Unemployment Rate in Home County, Current	-0.289	(1.245)
Average House Price in Home County, 1980	-0.0027	(0.0017)
Proportion of Recent Movers in Home County, 1980	0.309	(0.260)
Marriage Rate in Home County, 1980	0.276	(0.256)
Fertility Rate in Home County, 1980	-0.092	(0.299)
N	4,691	
N·T	18,453	

Notes: **: Significant at the 1% level, *: Significant at the 5% level. Standard errors clustered at the individual level. Average prices and incomes in thousands of nominal dollars. Additional controls include dummies for single and multi parent household and if mother and father worked part time, full time and more than 35 weeks a year.

Table 18: Second Stage, WRLURI as IV

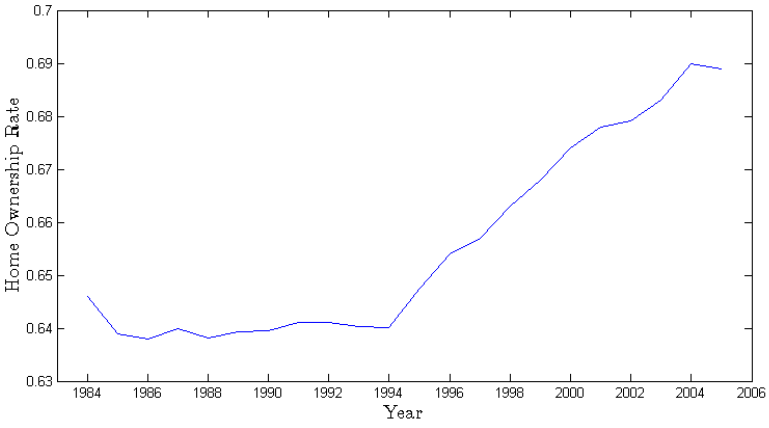
Variable	Probit of Entering Employment (I)	Probit of Remaining Employed (II)
Home Ownership	-0.438*	0.331*
	(0.124)	(0.149)
$\hat{\lambda}(\mathbf{Z})$	0.299**	-0.168*
	(0.070)	(0.084)
Female	0.068**	-0.050*
	(0.020)	(0.020)
Age	0.045**	0.045**
	(0.013)	(0.0001)
Age^2	-0.0008**	-0.0002**
	(0.0002)	(0.0001)
High School	0.048	-0.057
	(0.026)	(0.031)
Some College	0.054	-0.052
	(0.034)	(0.037)
College	0.059	-0.096*
	(0.038)	(0.042)
AFQT Percentile	0.003**	0.00005
	(0.0005)	(0.0005)
Hispanic	0.038	-0.277**
	(0.027)	(0.028)
Black	-0.185	-0.175**
	(0.030)	(0.032)
Average Income in Home	-0.0066	0.008*
County, 1980	(0.0045)	(0.003)
Unemployment Rate in Home	0.5271	-0.090
County, 1980	(0.455)	(0.605)
Unemployment Rate in Home	-2.703**	0.464
County, Current	(0.584)	(0.655)
Average House Price in Home	-0.00026	-0.001
County, 1980	(0.0008)	(0.001)
Proportion of Recent Movers	-0.257*	0.357**
in Home County, 1980	(0.123)	(0.140)
Marriage Rate in Home	0.009	-0.240**
County, 1980	(0.081)	(0.083)
Fertility Rate in Home	-0.185	-0.083
County, 1980	(0.060)	(0.078)
N	3,537	4,239
N·T	225,026	749,343

Notes: **: Significant at the 1% level. *: Significant at the 5% level. Standard errors clustered at the individual level. First and second stages bootstrapped together. Average prices and incomes in thousands of nominal dollars. Additional controls include parental education and dummies for single and multi parent household and if mother and father worked part time, full time and more than 35 weeks a year

Table 19: Comparison of Exclusion Restrictions

	Baseline	With Estimated Treatment Effect		
		Naive	Home County Home Ownership Rate as IV	WRLURI as IV
Unemployment Rate	5.5%	4.95%	10.5%	4.5%

Figure 8: Historical Home Ownership Rates



2004. Member of this group, when unemployed, would spend on average 4 days longer in unemployment than without the policy in place. Their wages coming out of unemployment would be higher on average than their previous years' wages, for both renters and homeowners (by 12% and 4% respectively).

In comparison, black males with only a high school education are much more vulnerable. Suppose this group was induced to increase its home ownership rate by 5%. When unemployed, members of this group would spend a week and half longer looking for work, on average. Their wages coming out of unemployment were already expected to decrease slightly from last year (-0.7%) but the new home owners would expect to see a drop of around 9%. Since the Housing and Community development act was targeted at "traditionally underserved" communities, the new home owners it created were oversampled from minority and low income populations. The welfare costs were likely to be even higher among this group, whose labor market outcomes were already below average.

9 Conclusion

Home ownership is generally considered a positive condition in American society. It is thought to give the owner a greater stake in the community and promote personal responsibility. Through favorable tax treatment and regulations of the lending industry, the U.S. government has encouraged its expansion. I find there are important negative consequences to home ownership, however, so we may question if this is sound policy.

Previous works in the literature have come to conflicting conclusions regarding home ownership's effect on labor market outcomes. This paper shows it causes unemployment by providing a friction to the mobility of labor. I find that the effect of owning a home is to reduce individual's probability of entering employment when unemployed, cause slower wage growth, lower reservations wages when unemployed, and lengthen spells at the same job. All these outcomes can be explained by home ownership's effect of reducing the propensity to move residences.

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