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Does homeownership hinder labor market activity? Evidence from housing privatization and restitution in Brno*

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We study the effects of homeownership on labor force participation and unemployment. We exploit housing privatization and restitution after the fall of communism as a source exogenous assignment of homeowner/renter status, using a unique dataset from the city of Brno, Czech Republic. We do not find any evidence of homeownership hindering labor force participation. In fact, our estimates suggest that homeownership reduces unemployment by four to six percentage points. Homeownership appears to decrease the risk of unemployment by about one third to one half, relative to renters. The estimated effects on labor force participation are systematically around zero.
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1 Introduction

Government policies tend to prop up homeownership; via tax deductions, subsidies, privatization of public housing stock, and so on. This is controversial. On the one hand, some economists suggest that homeownership is associated with positive externalities, making homeowners "better citizens" (DiPasquale and Glaeser 1999; Huber and Montag 2018). However, others have pointed out that homeownership is likely to increase the

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mobility costs and may reduce labor market flexibility, leading to higher unemployment (Oswald 1996). Whether subsidization of homeownership from taxpayer's pockets is justified, or whether homeownership should be discouraged instead, thus depends on the way it affects the greater economic system. This paper focuses on the effects of homeownership on labor market activity measured by labor force participation and unemployment.

This is not the first paper trying to address this question. However, the evidence gathered so far remains mixed: Aggregate-level studies tend to find a positive correlation between unemployment and the share of owner-occupied housing, both within and across countries (e.g. Blanchflower and Oswald 2013; Green and Hendershott 2001; Oswald 1996). Micro-data estimates, by contrast, typically find that homeownership is associated with better labor market outcomes, mainly unemployment, its duration, and wages (see e.g. Battu, Ma, and Phimister 2008; Coulson and Fisher 2009; Munch, Rosholm, and Svarer 2006). Adding to the mixture, while many studies tend to find homeowners to be less mobile than renters, the recent evidence on the effects of property taxes suggests the labor market-related mobility is unaffected (Hilber and Lyytikäinen 2017; Slemrod, Weber, and Shan 2017).[1]

However, since homeownership is not randomly assigned, identifying its true (causal) effects is challenging. In fact, the decision whether to become homeowner is one the most significant and consequential decisions people make in their lifetime. It is therefore likely to be influenced by various factors, including those related to individuals' labor market performance. A number of strategies, with varying degree of credibility, have been suggested to address this issue. The examples include using instruments such as regional homeownership rates (DiPasquale and Glaeser 1999), tax deductions and same-sex siblings (Coulson and Fisher 2009), and inheritance at young age (Gardner, Pierre, and Oswald 2001), or exploiting changes and notches in property taxes (Hilber and Lyytikäinen 2017; Slemrod, Weber, and Shan 2017). Recently, housing privatization has been proposed as an exogenous source of variation in homeownership (Broulíková et al. 2018; Huber and

[1] See also Broulíková, Huber, Montag, and Sunega (2018) and the literature cited therein.

Montag 2018; Sodini, Van Nieuwerburg, Vestman, and von Lilienfeld-Toal 2016). This is where our paper adds.

Building up on a previous cross-country study by Broulíková et al. (2018), which used housing privatization to study the effects of homeownership on mobility and unemployment in post-communist economies, this paper studies the labor-market effects of homeownership in the context of housing privatization and restitution in Brno, second largest city in the Czech Republic with about 370,000 inhabitants. Housing privatization and restitution were part of the reforms following the fall of communism and resulted in a transfer of property rights over housing stock that was—from the point of view of the sitting tenants—to a large extent exogenous. Privatization resulted in tenants gaining ownership rights over the houses they inhabited. Restitution returned housing estates to the owners who were expropriated by the communist regime and turned the tenants into renters in privately owned houses.

Specifically, a part of the housing stock, which was nationalized after the 1948 communist coup d'état, was returned to their rightful owners (hence "restituted") early after the 1989 Velvet Revolution. The remaining public housing stock was transferred to municipalities. Municipalities then typically decided to privatize part of this housing property, usually on very attractive terms. Thus, individuals living in restituted houses would end up being renters in privately owned housing and were *de facto* excluded from housing privatization. At the same time, some individuals living in the publicly owned housing could privatize their unit and become homeowners at a relatively low cost. Since these reforms and the subsequent transfers of property rights could not have been foreseen when people moved in (i.e. typically before the fall of communism), housing privatization and restitution created a variation in homeownership status that can be regarded as exogenous.

We have collected a unique data on privatized and restituted houses in Brno and matched it with 1991 and 2001 census data. Focusing on one city is beneficial for our identification. Unlike in other countries, housing privatization in the Czech Republic was decentralized to the municipality level (Broulíková et al. 2018). One advantage is thus that the housing

privatization in Brno was governed by a single set of rules. It also allows us to control for granular neighborhood and house characteristics. Additionally, the population, labor market, and housing conditions of one city are likely to be more homogeneous compared to broader populations studied in country-wide or cross-country studies, mitigating concerns related to unobserved heterogeneity. Finally, the city of Brno also started to privatize its houses in 1998, relatively late in the comparison to other major cities in Czech Republic. The late start of the privatization gave less time to the inhabitants to possibly change their tenure status between privatization of their housing unit and the 2001 census, which we use to measure labor market activity.[2]

We show that in 1991, i.e. before the reforms begun, renters living in subsequently restituted houses were statistically similar to the tenants in houses that were not subject to restitution and thus remained in the public housing stock. Thus, restitution appears to have affected the households randomly. By contrast, housing privatization was managed by the municipalities themselves and in the case of Brno it appears to be non-random. For instance, individuals in houses that were later designated for privatization were significantly better educated than the people in the housing stock that remained public throughout 2000s.

Empirically, we address the concerns pertaining to the selection of houses into privatization by matching privatized houses with restituted houses on pre-reform (1991) house-level characteristics. In addition, households in the houses designated for privatization were not obliged buy their unit (although, according to our data, over 91 percent of individuals living in privatized houses did privatize). We address the selection into privatization at the household level by instrumenting households' homeownership status with the privatization status of the house in which their apartment is located.

Our results are easy to summarize: We do not find homeownership to be causing higher unemployment. In fact, our preferred estimates (IV regressions on matched sample) for unemployment are consistently in between -4 and -6 points, relative to renters.

[2]We note that previous research documents relatively low mobility in the Czech Republic, but also in Central and Eastern European countries in general (see Andrienko and Guriev 2004; Broulíková et al. 2018; Fidrmuc 2004; Fidrmuc and Huber 2007).

Homeownership thus appears to decrease the risk of unemployment by about one half. The estimated effects on labor force participation are always around zero. These results are robust to alternative specifications and do not depend on matching parameters.

2 Background and identification strategy

2.1 Housing Privatization and Restitution

During communism, housing markets in former Eastern Bloc countries, including Czechoslovakia, were very limited. Mortgages did not exist. Individuals would typically build houses themselves, or as cooperative members, using family savings and government-provided loans. There was no private rental market. The entire rental housing stock was in the public ownership and rental units were allocated by public authorities on a permanent basis.[3]

Figure 1 provides a timeline of the processes that determined the housing tenure structure in the Czech Republic, and specifically in Brno, after the fall of communism. One of the fist reforms was the restitution of private ownership rights expropriated in the aftermath the 1948 communist coup d'état. With regard to the housing property, this process was almost completed by 1993 (Sýkora 2003). It is important to note that the restitution turned the tenants in the restituted housing estates into renters in privately owned houses. Renters in the restituted housing stock were thus excluded from the subsequent privatization of public housing. Because restitution of their house could not have been foreseen when they moved in, the ensuing renter status was exogenous to them.

The ownership of the public housing stock ineligible for restitution was transferred to municipalities already in 1991. Municipalities in the Czech Republic were free to set their own housing policy and most had decided to privatize a significant part of their housing

[3]Gebhardt (2013) even argues that in this environment, there was no practical difference between owning and renting and that the homeownership status was essentially random.

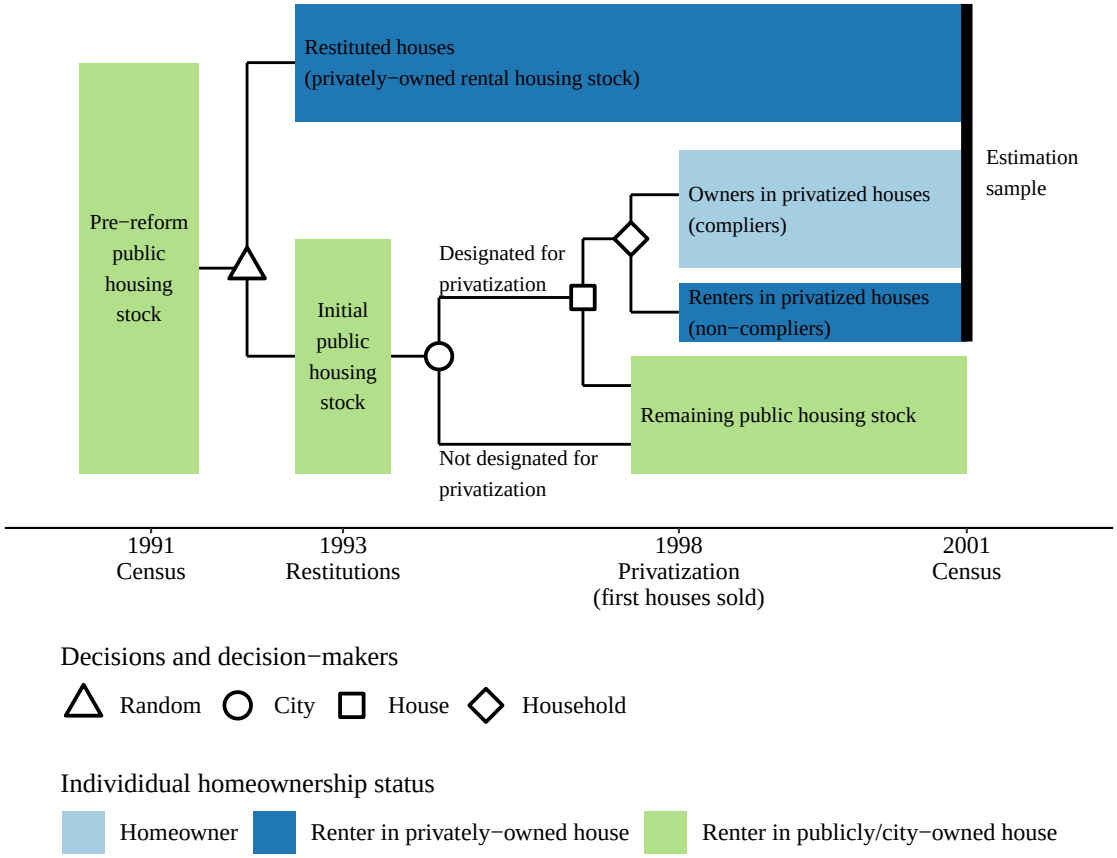


Figure 1: Housing reforms in Brno after the fall of communism.

stock. By 2002, about half of the publicly-owned housing stock, approximately 15 percent of the total, was privatized.[4]

Municipalities almost always decided to privatize to sitting tenants. However, Czech tenants in public housing did not have the "right to buy" and the decision as to which housing units will be offered for privatization was entirely determined by municipalities themselves (Sýkora 2003). Individual households therefore had no control over the assignment of the eligibility to privatize their homes. Simultaneously, those entitled to privatize were not obliged to do so. However, highly attractive prices, together with limited market supply of housing, rendered privatization a rational choice.

The legal framework for housing privatization in Brno was adopted in 1996 and did not change until 2001. Housing estates designated for privatization were announced in a series

[4]For further details on housing privatization in Eastern Europe, including the Czech Republic, see Broulíková et al. (2018) and the sources cited therein.

of directives by the Brno City Municipality starting in 1996 (henceforth "the Directives").[5] The first house was privatized in 1998; by 2000, 79 apartment buildings, 46 in Brno city centre, were privatized.

Privatization in Brno was not a bidding process. The purchase prices were set administratively and were rather favorable.[6] The initial Directive 3/1996 stipulates that, for apartment buildings with six or more housing units, the first in the order of preference were legal persons representing at least one half of the tenants, typically cooperatives (coops) established for the purpose of privatization.[7] If this first privatization attempt was unsuccessful, the estate could be sold to a legal person representing highest share of tenants. The last possibility was to sell the house to a tenant who offered the highest price. However, our data suggest that privatization to coops was the dominant form, representing at least 84 percent of the privatized houses in Brno.

Individual households living in houses undergoing privatization were not obliged to participate. In such a case, they would continue being renters, except the privatizing coop would become their new landlord. In reality, less than ten percent of tenants in privatized houses in our sample are renters, suggesting high participation rate and strong preference to

[5]The Directives are available at the Brno city's website at https://www.brno.cz/sprava-mesta/dokumenty-mesta/vyhlasky-a-narizeni/ (last accessed on January 30, 2019). Houses assigned for privatization are listed in directives: 3/1996, 11/1996, 9/1997, 21/1997, 32/1997, 11/1998, 14/1998, 23/1998, 24/1998, 10/1999, 17/1999, 1/2000, and 9/2001.

[6]Specifically, the purchase price was determined as follows. The baseline administrative price was set based on a directive of the Ministry of Finance (directive no. 178/1994). If the privatizing entity paid upfront, the purchase price was subject to a discount of 34 percent relative to the administrative price. Alternatively, the estate could be privatized on credit, in which case the purchase price was increased by nine percent, relative to the administrative price. 30 percent of the purchase price would then have to be paid upfront and the remainder in five yearly installments (with no additional interest charged). Importantly, the privatizing entity was entitled to be reimbursed for any investment expenditures into the house, up to the 40 percent of the purchase price. In summary, those paying upfront would effectively received a discount of 60.4 percent $[= 100 - (100 - 34) \times 0.6]$, while those privatizing on credit would receive a discount of 34.6 percent $[= 100 - (100 + 9) \times 0.6]$, relative to the administrative price (ignoring the implicit discount due to the prices being set administratively, inflation, and the zero interest rate).

[7]Houses with up to five housing units were privatized "per partes", i.e. apartments were sold directly to individual households without the need to establish a coop. These were typically villa apartments located in historically wealthy German district of Černá Pole. German property was be vacated due to the expulsion of Germans in the aftermath of World War II and subsequently inhabited by Czechoslovaks. Because of this, such property was not subject to restitution and we therefore lack a natural control group for these houses. Because of these differences in privatization rules and specific history, we focus on the more typical apartment buildings with six or more housing units. As a robustness check, we re-estimate our regressions with these smaller houses included, the results do not change appreciably.

Figure 2: Privatized (on the left) and restituted (on the right) apartment buildings in Čápkova street, Brno. Source: Google Maps.

privatize. Finally, privatizers were free to sell their apartments. However, their ability to do so was probably quite limited as Czech banks did not provide mortgages for coop-owned housing units, limiting the demand.

The outcome of restitution and privatization can be nicely illustrated with Figure 2 depicting Čápkova street near the center of Brno. Property rights over the apartments in the buildings on the left hand side were privatized, resulting in private homeownership by individual households, while those across the street were were restituted, and the tenants therein were excluded from privatization, becoming renters in privately owned houses. These policy shocks form the basis of our identification strategy.

2.2 Pre-reform characteristics of the housing stock

While the assignment of renter status in restituted housing and in public housing was plausibly as-good-as-random, the ensuing privatization of public housing in Brno, particularly in its early stages, may have not been a clean experiment. Specifically, we were unable to ascertain the exact mechanism of selection of houses designated for privatization.[8]

[8]The selection procedure was not regulated by the law or a city directive and is not documented in public sources. In an attempt to ascertain the exact procedure, we have contacted five city officials, including the

And since we have no evidence that this was done randomly, we are concerned that the selection criteria could well be correlated with neighborhood or house characteristics, and thus potentially with labor market outcomes. Furthermore, privatization was a continuous process and it is possible that the early privatizers differed from the rest. This is of concern because our data on labor market activity comes from 2001, relatively early after the housing privatization in Brno had begun. Note, however, that since the object of privatization were entire houses, within-house individual characteristics only matter to the extent to which they affect house-level or neighborhood characteristics correlated with privatization.

In order to gauge our concerns, we have compared pre-reform characteristics of individuals living in subsequently restituted and privatized houses, using data from the 1991 Czechoslovak Population Census aggregated at the house level. The results are reported in Table 1. Columns (1) and (2) report pre-reform labor market activity and other characteristics of populations inhabiting restituted houses and public housing, respectively. The differences in means are reported in column (7). With regard to labor force participation, there is a statistically significant 2.2 percentage points difference (using the five-percent threshold to determine statistical significance). Although there is a small (0.4 percentage points), and marginally significant, difference in the unemployment rate, we note that this is not very informative as Czech economy in 1991 was at an very early stage of economic transition and unemployment as we know it from market economies was a relatively new and rare phenomenon. By looking at the remaining characteristics, there are no differences in gender composition or age. At the same time, renters in restituted houses appear slightly better educated, more often born in Brno, and live in slightly smaller houses (measured by the total number of apartments). However, these differences, while statistically significant, tend to be substantively small and overall the two populations appear quite similar.

A different picture emerges when houses in the public housing stock are compared by their privatization designation in the columns (3) and (4) of Table 1. The differences in means are reported in column (8). The labor force participation was almost six percentage

former Deputy Mayor, who were involved in the decision chain at the time. We have met with and interviewed two of them, however they did not recall the details dating over 20 years back.

Table 1: Apartment buildings in Brno in 1991, means by privatization and restitution status

	Restituted	Initial Public Housing Stock					Differences	
		All	Privatization Assignment as of 2001				(1) − (2)	(3) − (4)
			Not Designated	Designated for Privatization				
				All	Privatized before 2001	Not privatized before 2001		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Economically active (share)	0.528	0.506	0.499	0.561	0.580	0.552	0.022***	−0.061***
	(0.006)	(0.004)	(0.005)	(0.011)	(0.020)	(0.014)	(0.008)	(0.012)
Unemployed (share)	0.027	0.023	0.023	0.024	0.022	0.026	0.004**	−0.001
	(0.002)	(0.001)	(0.001)	(0.003)	(0.005)	(0.004)	(0.002)	(0.003)
Male (share)	0.443	0.442	0.441	0.451	0.461	0.446	0.0009	−0.010
	(0.003)	(0.002)	(0.002)	(0.006)	(0.011)	(0.007)	(0.004)	(0.006)
Age	49.555	50.034	50.279	47.931	47.288	48.235	−0.479	2.349***
	(0.256)	(0.171)	(0.184)	(0.431)	(0.760)	(0.525)	(0.308)	(0.468)
Primary education (share)	0.555	0.573	0.586	0.467	0.444	0.477	−0.018*	0.119***
	(0.007)	(0.005)	(0.005)	(0.015)	(0.026)	(0.018)	(0.009)	(0.016)
Secondary education (share)	0.286	0.282	0.278	0.319	0.317	0.320	0.004	−0.041***
	(0.005)	(0.004)	(0.004)	(0.010)	(0.015)	(0.012)	(0.006)	(0.010)
Tertiary education (share)	0.158	0.145	0.136	0.214	0.239	0.202	0.014**	−0.078***
	(0.005)	(0.003)	(0.003)	(0.011)	(0.021)	(0.012)	(0.006)	(0.011)
Born in Brno (share)	0.534	0.498	0.495	0.527	0.558	0.511	0.036***	−0.031***
	(0.006)	(0.004)	(0.004)	(0.011)	(0.014)	(0.014)	(0.007)	(0.012)
Number of apartments	11.436	12.011	11.952	12.517	11.435	13.031	−0.575**	−0.566
	(0.200)	(0.135)	(0.143)	(0.400)	(0.561)	(0.521)	(0.241)	(0.424)
Houses	599	1368	1225	143	46	97		

Note: Designation to privatization according the 1996–2001 Directives of the Brno City Municipality (see footnote 5 on p. 7). Robust standard errors are in parentheses: $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$. Data source: The 1991 Czechoslovak Population Census.

points higher in houses designated for privatization than in houses not designated. There was no difference in unemployment at this point. The small (one percentage point) difference in gender composition is not statistically significant. However, individuals in houses designated for privatization were 2.3 years older and significantly better educated. The proportion of people with only primary education in houses designated for privatization was 12 percentage points lower than in houses that were not designated. As a consequence, the proportion of individuals with secondary education was four percentage points higher and the share of those with tertiary education was about eight percentage points higher (i.e. by about one half). Similar to those in restituted houses, individuals living in houses designated for privatization were also three percentage points more likely to be born in Brno. The difference in the number of apartments is not statistically significant. In summary, the population living in houses designated for privatization appears to be very different from the population in houses that were not designated, particularly in terms of the educational endowment.

2.3 Identification strategy

Table 1 suggests that there were substantial pre-reform differences within the public owned housing stock broken down by the subsequent privatization assignment, and so housing privatization in Brno cannot be regarded as random. However, the population that lived in restituted houses in 1991 does not appear to be very different from the population in houses that remained in municipal ownership and was later available for privatization, and thus restitution can be regarded as-good-as random. These findings are consistent with the institutional determinants of both types of reforms: Restitution was a nation-wide policy giving ownership entitlements to the original owners, regardless of the will or composition of the tenants living in restituted houses, whereas housing privatization was determined at the municipal level, in our context by the Brno City Municipality, on house-by-house basis.

Restituted houses thus represent a natural control sample for estimating the counterfactual for the effect of homeownership obtained via privatization. The advantage of using

restituted houses, rather than the remaining houses in the public housing stock, is that restitution was not a municipal decision and thus factors (potentially unobservable) that could have driven the municipality-level decision to privatize specific houses were absent. In addition, individuals living in restituted houses never had a prospect of privatization, thus expectation of privatization could not have affected their behavior.

Our identification of the effect of homeownership on labor market activity therefore relies on the comparison of homeowners living in privatized houses and renters living in restituted houses. In order to address the potential selection bias at the house level (i.e. designation for privatization by the municipality and the house-level decision to privatize), we use a matching procedure to construct a sample of restituted houses that are observationally similar to privatized houses in the same neighborhood. The house-level variables determining the matches are the characteristics listed in Table 1.

In addition, individual households living in houses undergoing privatization could opt not to participate and keep their renter status. We filter out the within-house selection to homeownership at the household level by instrumenting homeownership status with the privatization status of the house.

The identification of the effect of homeownership relies on three assumptions: (i) The houses in the two matched samples only differ by their privatization status (i.e. the matching is successful in producing the counterfactual sample), resulting in random assignment of the instrument, (ii) privatization affects individuals' labor market activity only through their homeownership status (exclusion restriction), and (iii) assignment of a house to privatization changes (increases) the likelihood of a household privatizing for all households (monotonicity).

3 Data

3.1 Dataset construction

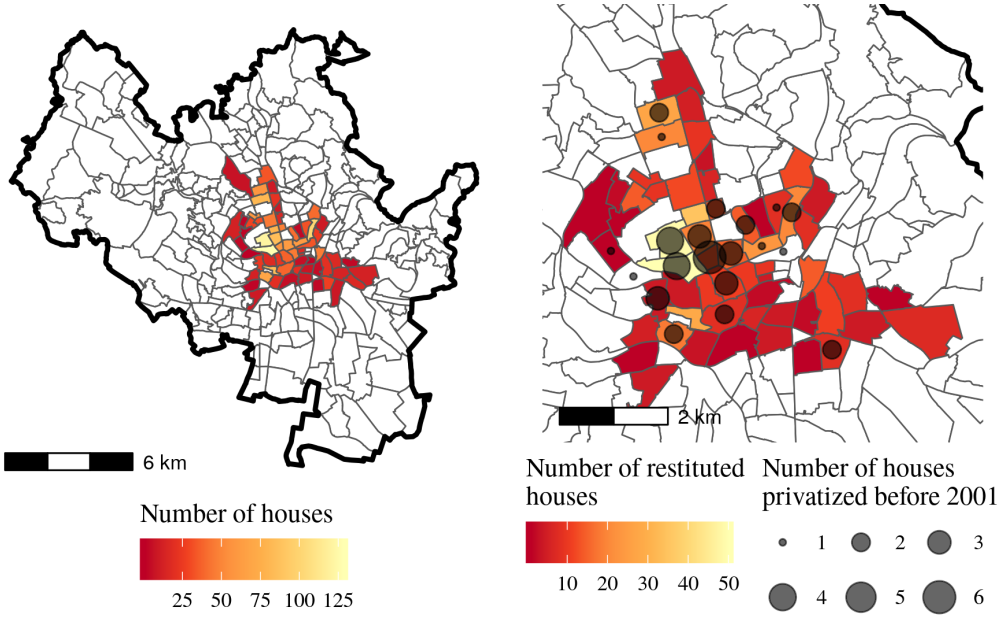
The construction of our dataset was done in several steps: We begun with the full list of houses in Brno from the censuses. This list was matched with a list of privatized houses provided to us by the Brno City Municipality. From the Directives, we have extracted the information on which houses were designated for privatization and added this information to the list. Next, restituted houses were identified using 1991 and 2001 censuses.[9]

In order to meet the anonymization requirements of the Czech Statistical Office, the list was restricted to houses from clusters of four or more houses in the proximity of 250m from each restituted house. Because restituted houses are predominantly concentrated around the city centre, this resulted in a sample of privatized houses, restituted houses, and houses in the public housing stock, which copies the historical center of the city and adjacent neighborhoods. Our sample thus contains 46 out of 79 apartment buildings privatized in Brno between 1998 and 2000. The location of houses in our data is shown in Figure 3.

The resulting list of houses was then sent back to the Czech Statistical Office, where it was merged with individual-level and house-level data from 1991 and 2001 censuses to produce a dataset on labor market activity and characteristics of individuals living therein. The received dataset contains individual, household, and house characteristics collected in the census (labor market status, homeownership status, age, gender, education, place of birth, household type, the number of households living in an apartment, number of apartments in a house, and anonymized house ID), as well as identifiers of 64 neighborhoods with an average area of 0.3 km^2. We note that individual IDs are not available in census

[9]Restitution covered only houses confiscated after the 1948 communist coup d'état, a restituted house can be thus identified in census data if it satisfies the following three criteria: (i) the house was build prior to 1948; (ii) between the 1991 and 2001 censuses the ownership status of the house changed from public to private; and (iii) it was not included in the list of privatized houses.

We note that houses build between 1945 and 1948 (i.e. between the end of World War II and the communist coup) are not identified in the census. Thus we are *de facto* looking at houses built before 1945. However, the construction immediately after the war was probably very limited as Brno suffered very little war-related housing stock damage and a substantial part of housing stock was vacated mainly due to the post-war expulsion of ethnic Germans, who represented about 19 percent of Brno's pre-war population.



(a) Full sample of houses

(b) Privatized and restituted houses

Figure 3: Panel (a) shows the location of all restituted houses and houses in the public housing stock (irrespective of their privatization status) in our data. Panel (b) shows houses that were privatized before 2001 and restituted houses, from which we construct the control sample of renters. Thin lines indicate neighborhoods as defined by the Czech Statistical Office. Data sources: Brno City Municipality, Czech Statistical Office, Arcdata Prague.

data and apartment IDs were inconsistent across the two censuses. Because the number of other available characteristics is limited, it is not possible to reliably match apartments, households, or individuals across 1991 and 2001.

3.2 Estimation sample and summary statistics

As noted above, we focus on apartment buildings, i.e. houses with six or more apartment units, dropping the apartment villas from the main estimation sample. We also exclude houses that were not privatized to legal persons (coops) but to individuals.[10] Finally, we drop apartments with more than one households living in and non-family households (e.g.

[10]As this information is not available in the data from the Brno City Municipality, we identify these houses using the number of owners living in the house in 2001. House is excluded from the sample if none or only one household reported being an owner, six houses altogether.

Table 2: Working age (18 to 60 years) individuals in Brno in 2001, means by privatization and restitution status of the house

	Restituted	Public Housing Stock				Difference
		Privatized before 2001	Privatized in 2001 or later	Never privatized	All	(1) − (2)
	(1)	(2)	(3)	(4)	(5)	(6)
Economically active (=1)	0.786	0.787	0.795	0.786	0.792	−0.001
	(0.005)	(0.017)	(0.004)	(0.005)	(0.003)	(0.018)
Unemployed (=1)	0.099	0.060	0.097	0.116	0.103	0.039***
	(0.004)	(0.010)	(0.003)	(0.004)	(0.002)	(0.010)
Male (=1)	0.487	0.494	0.475	0.484	0.479	−0.007
	(0.006)	(0.020)	(0.005)	(0.006)	(0.004)	(0.021)
Age	39.453	39.476	39.109	39.032	39.092	−0.023
	(0.155)	(0.492)	(0.122)	(0.146)	(0.092)	(0.516)
Primary education (=1)	0.409	0.307	0.399	0.473	0.425	0.102***
	(0.006)	(0.019)	(0.005)	(0.006)	(0.004)	(0.020)
Secondary education (=1)	0.367	0.365	0.378	0.341	0.363	0.002
	(0.006)	(0.020)	(0.005)	(0.006)	(0.004)	(0.021)
Tertiary education (=1)	0.225	0.328	0.223	0.187	0.212	−0.104***
	(0.005)	(0.019)	(0.004)	(0.005)	(0.003)	(0.020)
Born in Brno (=1)	0.646	0.668	0.633	0.634	0.635	−0.023
	(0.006)	(0.019)	(0.005)	(0.006)	(0.004)	(0.020)
Household type: Complete family (=1)	0.628	0.690	0.622	0.618	0.623	−0.062***
	(0.006)	(0.019)	(0.005)	(0.006)	(0.004)	(0.020)
Household type: Incomplete family (=1)	0.205	0.206	0.222	0.215	0.219	−0.001
	(0.005)	(0.017)	(0.004)	(0.005)	(0.003)	(0.017)
Household type: One-person household (=1)	0.167	0.104	0.155	0.167	0.158	0.063***
	(0.005)	(0.013)	(0.004)	(0.005)	(0.003)	(0.013)
Owner (=1)	0.000	0.913	0.000	0.000	0.033	−0.913***
	(0.000)	(0.012)	(0.000)	(0.000)	(0.001)	(0.012)
Individuals	6,088	597	9,552	6,611	16,760	
Households	3,556	329	5,725	4,007	10,061	
Houses	599	46	774	548	1,368	

Note: Robust standard errors are in parentheses: $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$. Data collection and sample are described in Section 3.

cohabiting students), and households with unclear or inconsistent homeownership status, because it is not clear to whom the unit belongs or who is the main renter.[11]

The resulting dataset contains information from 46 houses that were privatized between 1998 and 2000, 599 restituted houses, and 1322 city-owned houses that were privatized later or never. Table 2 presents summary statistics of working-age (18 to 60 years old) individuals from the 2001 census, broken down by the privatization/restitution status. Looking at first two columns, there is no difference in labor force participation between individuals living in privatized houses and those in restituted houses. In fact, labor force

[11]Unclear or inconsistent homeownership status pertains to individuals who do not state that they are renters nor owners (1.6% of households), individuals who declared that they are owners but live in city-owned houses as of 2001 census (0.6% of households), and owners living in restituted houses (1.1% of households). Dropping owners living in restituted houses may also result in dropping some households who restituted the specific property and live there.

participation is almost the same for all of the public housing stock. However, when we look at unemployment, individuals living in privatized houses exhibit four percentage points lower risk of being unemployed than renters living in restituted houses. Individuals living in privatized houses also have four percentage points lower unemployment compared to renters in public housing stock that was designated for privatization but privatized later or never.

There are almost no differences in gender composition or age between individuals from privatized houses and those from restituted houses. At the same time, as in 1991, individuals living in privatized houses in 2001 possess significantly better education than those living in restituted houses; or than individuals in the remainder of public housing stock. The difference in the proportion of individuals born in Brno is not statistically significant. Households in privatized houses are more likely to be complete-family households and less likely to be one-person households and these differences are statistically significant. Finally, over 91 percent of households living in privatized houses are homeowners, indicating low share of non-compliers.

4 Estimation and results

4.1 Baseline OLS estimates

To estimate the effect of homeownership, consider a regression in the form

$$y_i = \alpha HO_i + \boldsymbol{\beta}' \boldsymbol{x_i} + \boldsymbol{\gamma_n} + e_i, \tag{1}$$

where y_i is the outcome of interest, i.e. labor force participation indicator or unemployment status indicator, of individual i, HO_i is her homeownership status indicator, $\boldsymbol{x_i}$ is a vector of controls (dummies for secondary and tertiary education, gender, age dummies, dummies for household types), $\boldsymbol{\gamma_n}$ is a full set of neighborhood dummies (includes the intercept), and e_i is the unexplained residual. We estimate alternative specifications of this regression for

individuals living in houses that were privatized before 2001 and individuals in restituted houses. The standard errors that we report are clustered at the house level.

Table 3 presents alternative specifications of our benchmark OLS estimates of regression (1) for our two outcomes, labor force participation and unemployment. Column (1) suggests that homeowners (privatizers) exhibit about one percentage point higher labor force participation than renters (in restituted and privatized houses), but the difference is not statistically, nor substantively, significant. Including neighborhood dummies in column (2) results in the difference dropping almost to zero. In column (3), we add controls for education and the point estimate becomes negative, although not statistically significant. The regression in column (4) controls for other characteristics (gender composition, household composition, dummy for being born in Brno, and a full set of age dummies) and in column (5) we add the neighborhood dummies again, yet the result remain close to zero.

Columns (6) through (10) repeat the same exercise for unemployment. The regression in column (6) suggests that homeowners have about six percent, or one-half, lower unemployment rate than renters (in restituted and privatized housing, which is picked up by the constant). Including neighborhood dummies in column (7) results in slightly lower estimate, but the difference between the two estimates is not statistically significant, suggesting that differences in neighborhood composition do not explain the difference between privatizers and renters in restituted housing and that privatization was not driven by neighborhood characteristics. When we add indicators for secondary and tertiary education, the difference between privatizers and renters drops by about two percentage points, comparing columns (6) and (8). Thus the large differences in education between privatizers and renters in restituted housing may explain about one third of the unemployment differential, however the difference in the two coefficient estimates is not statistically significant. In column (9) we add controls for individual and household characteristics and in column (10) we again add neighborhood dummies, but the point estimates remain essentially the same.

Table 3: Homeownership and labor market activity (OLS), individuals from houses privatized before 2001 and all restituted houses

	Active Labor Force (=1, working age sample)					Unemployed (=1, labor force sample)				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Homeowner (=1)	0.009	0.002	−0.007	−0.002	−0.005	−0.060***	−0.052***	−0.038***	−0.036***	−0.038***
	(0.015)	(0.016)	(0.015)	(0.014)	(0.016)	(0.014)	(0.014)	(0.014)	(0.013)	(0.013)
Secondary education (=1)			−0.005	0.026**	0.027**			−0.123***	−0.123***	−0.119***
			(0.012)	(0.011)	(0.011)			(0.012)	(0.012)	(0.012)
Tertiary education (=1)			0.133***	0.095***	0.097***			−0.178***	−0.157***	−0.153***
			(0.012)	(0.011)	(0.011)			(0.011)	(0.011)	(0.011)
Male (=1)				0.157***	0.157***				0.001	0.0001
				(0.009)	(0.009)				(0.008)	(0.008)
Born in Brno (=1)				−0.004	−0.005				0.004	0.007
				(0.009)	(0.009)				(0.010)	(0.010)
Incomplete family (=1)				0.028**	0.028**				0.066***	0.063***
				(0.012)	(0.012)				(0.013)	(0.013)
One-person family (=1)				0.015	0.014				0.051***	0.051***
				(0.012)	(0.013)				(0.013)	(0.013)
Constant	0.786***		0.758***			0.127***		0.215***		
	(0.005)		(0.009)			(0.006)		(0.011)		
Age dummies	–	–	–	Yes	Yes	–	–	–	Yes	Yes
Neighborhood dummies	–	Yes	–	–	Yes	–	Yes	–	–	Yes
Observations	6,685	6,685	6,685	6,685	6,685	5,256	5,256	5,256	5,256	5,256
R^2	0.00004	0.009	0.020	0.219	0.224	0.003	0.021	0.054	0.092	0.102

Note: In specifications with neighborhood or age dummies, constant is not reported. Standard errors clustered at the house level are in parentheses: $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

To summarize, homeowners and renters appear to exhibit similar level of labor force participation. Importantly, the OLS estimates do not indicate that homeowners would be facing higher unemployment risk. To the contrary, homeowners' unemployment risk is significantly smaller.

4.2 IV estimates on matched sample

In order to address the fact that the housing privatization in Brno was not a random experiment, we use propensity score matching to generate a control group from the sample of individuals living in restituted houses. Specifically, we match our sample of privatized houses with observationally similar houses that underwent restitution, using the pre-reform 1991 census data. The matches are generated in three steps: First, propensity scores are computed using a logit model explaining the privatization status of a house with the 1991 house-level characteristics listed in Table 1. In the second step, potential matches for each house are selected based on two criteria: the maximum geographic distance and the caliper (the maximum difference in the propensity scores between matches, measured by standard deviations).[12] In the third step, the best match for each privatized house is selected from the set of potential matches based on the propensity score (if the set of potential matches is non-empty). Matches are selected with replacement, so that one restituted house can be a match for one or more privatized houses, as long as it is the best match for both.[13]

We report results for the combination of parameters that is most strict, while keeping all privatized houses in the sample: the maximum distance of 700 meters and the caliper of 0.7. The balance tests, reported in Table A1 in the Appendix, do not indicate any significant

[12]We do not know the exact address or coordinates of each house, only the neighborhood, as depicted in Figure 3. The location of each house in our data thus corresponds to the centroid of the respective neighborhood in which the house is located. The average area of these neighborhoods is 0.3km^2 (a circle covering the same area would have a radius of 309m).

[13]This is accounted for in our standard errors, since we cluster on house ID. If more than one control is selected for a single privatized house, the observations are re-weighted accordingly.

Table 4: Homeownership and labor market activity, IV estimates for individuals living in matched houses

	Active Labor Force (=1, working age sample)					Unemployed (=1, labor force sample)				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Homeowner (=1)	0.022	0.020	0.013	0.006	0.003	−0.057**	−0.061***	−0.044*	−0.047**	−0.060***
	(0.025)	(0.027)	(0.026)	(0.022)	(0.025)	(0.024)	(0.021)	(0.023)	(0.022)	(0.022)
Secondary education (=1)			−0.024	0.028	0.032			−0.097***	−0.106***	−0.092***
			(0.035)	(0.031)	(0.032)			(0.028)	(0.028)	(0.029)
Tertiary education (=1)			0.095***	0.077***	0.089***			−0.162***	−0.148***	−0.135***
			(0.034)	(0.027)	(0.030)			(0.026)	(0.026)	(0.029)
Male (=1)				0.155***	0.156***				0.034	0.030
				(0.021)	(0.022)				(0.021)	(0.021)
Born in Brno (=1)				0.018	0.016				−0.011	0.000007
				(0.024)	(0.025)				(0.023)	(0.024)
Incomplete family (=1)				−0.016	−0.007				0.070**	0.068**
				(0.026)	(0.027)				(0.032)	(0.030)
One-person family (=1)				0.008	0.021				0.008	0.011
				(0.032)	(0.034)				(0.028)	(0.030)
Constant	0.768***		0.754***			0.130***		0.210***		
	(0.017)		(0.022)			(0.017)		(0.026)		
Age dummies	–	–	–	Yes	Yes	–	–	–	Yes	Yes
Neighborhood dummies	–	Yes	–	–	Yes	–	Yes	–	–	Yes
Observations	1,238	1,238	1,238	1,238	1,238	960	960	960	960	960
R^2	0.001	0.018	0.015	0.255	0.265	0.012	0.063	0.056	0.140	0.172

Note: The sample is constructed by matching privatized houses with restituted houses on house-level characteristics using propensity score matching, see Section 4.2 for details. Individuals' homeownership status is instrumented with the privatization status of her house. In specifications with neighborhood or age dummies, constant is not reported. Standard errors clustered at the house level are in parentheses: $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

(substantively or statistically) differences between the sample of privatized houses and the matched sample of restituted houses.[14]

Table 4 reports our main estimates using the matched sample of houses and restituted houses. In these regressions, homeownership is instrumented with the privatization status of the respective house to filter out the endogeneity of the individual households' decision to privatize their apartment.[15]

The estimates of the effect of homeownership on labor force participation across the five specifications, reported in columns (1) through (5), are now always positive, suggesting homeowners have about 0.5 to two percentage points higher labor force participation than renters. However, these estimates are never statistically significant and are substantively small. For unemployment, the results appear more stable than the baseline OLS. The estimates in columns (6) through (10) suggest that homeowners exhibit about 4.5 to six percentage points lower unemployment rate, compared to renters, that is about one-half lower. All these coefficient estimates, except one, are statistically significant at five-percent level. Compared with the OLS estimates reported in Table 3, the IV estimates on matched sample, albeit slightly higher in the absolute terms, are quite similar and lead to the same conclusions.

4.3 Sensitivity analysis

The results reported in Table 4 are based on sample of privatized houses matched with observationally similar restituted houses with the restrictions of maximum distance of 700m and the caliper of 0.7. These values were selected as the most restrictive, while maintaining the full sample of 46 privatized houses. Nevertheless, the choice of these two parameters is not guided by any theory and is thus rather arbitrary. We have, therefore, re-run the matching procedure under alternative combinations of these two parameters and re-estimated our regressions on the resulting matched samples.

[14] An F-test of the joint hypothesis that there are no differences in characteristics between the sample of privatized and matched sample of restituted houses yields $F(8, 87) = 0.48$, implying p-value of 0.87.

[15] The first stage regressions are available in Table A2 in the Appendix.

Tables A3 and A4 in the Appendix report the coefficient estimates of the effect of homeownership on labor force participation and unemployment, respectively, under alternative matching parameter restrictions. The estimates are from regressions equivalent to specifications (5) and (10) in Table 4. The results for labor force participation under parameter sets neighboring the defaults are are qualitatively similar to the main estimates, suggesting zero effect. When the distance is restricted to 100m, the estimated effects are systematically negative, between -2 to -2.5 percentage points, but are never statistically significant. These estimates essentially compare houses in the same neighborhood, which limits the number (for low caliper) and quality (for high caliper) of matches.

The results for unemployment are always negative and significant, statistically (with one exception) as well as substantively. The estimates obtained under alternative parameter combinations are similar in magnitude to our estimate under the defaults. Thus, our findings are not an artifact of specific parameter values that determine the matches.

In a setting like ours, the identifying assumptions may be plausibly questioned. Privatization may affect labor market outcomes of individuals through externalities. For instance, homeowners may care more about their houses and the surroundings, increasing local property value. In Table 5 we, therefore, report reduced-form estimates, regressing labor market out on privatization status of individual's house. These estimates may be interpreted as "intention-to-treat" effects, capturing the overall effects of privatization, rather than the pure effect of homeownership. Only the first assumption of those described in Section 2.3, i.e. random assignment of privatization, is required for estimating the effect. In our context, this is to assume that our matching procedure succeeded in creating a valid control sample.

Because the compliance rate among individuals living in privatized houses was over 91 percent, resulting in a very first-stage relationship (reported in Table A2), the estimated intention-to-treat effects are very similar to our IV estimates. In fact, the point estimates of the effect of privatization on labor force participation in specifications (1) through (4) are very similar to the IV point estimates reported in Table 4. The effects on unemployment

Table 5: Homeownership and labor market activity, intention-to-treat (reduced-form) estimates for individuals living in matched houses

	Active Labor Force (=1, working age sample)					Unemployed (=1, labor force sample)				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Living in privatized house (=1)	0.020	0.018	0.012	0.005	0.003	−0.052**	−0.056***	−0.040*	−0.043**	−0.056***
	(0.023)	(0.025)	(0.023)	(0.020)	(0.023)	(0.022)	(0.020)	(0.021)	(0.020)	(0.021)
Secondary education (=1)			−0.023	0.028	0.032			−0.099***	−0.109***	−0.095***
			(0.034)	(0.031)	(0.032)			(0.028)	(0.028)	(0.029)
Tertiary education (=1)			0.096***	0.078***	0.089***			−0.164***	−0.151***	−0.138***
			(0.033)	(0.026)	(0.030)			(0.026)	(0.027)	(0.029)
Male (=1)				0.155***	0.156***				0.034	0.031
				(0.021)	(0.022)				(0.021)	(0.021)
Born in Brno (=1)				0.018	0.016				−0.011	−0.0008
				(0.024)	(0.025)				(0.023)	(0.024)
Incomplete family (=1)				−0.016	−0.007				0.069**	0.068**
				(0.026)	(0.027)				(0.032)	(0.030)
One-person family (=1)				0.008	0.020				0.007	0.012
				(0.032)	(0.034)				(0.028)	(0.030)
Constant	0.768***		0.754***			0.130***		0.211***		
	(0.017)		(0.022)			(0.017)		(0.026)		
Age dummies	–	–	–	Yes	Yes	–	–	–	Yes	Yes
Neighborhood dummies	–	Yes	–	–	Yes	–	Yes	–	–	Yes
Observations	1,238	1,238	1,238	1,238	1,238	960	960	960	960	960
R^2	0.0006	0.017	0.015	0.255	0.265	0.007	0.061	0.054	0.138	0.171

Note: The sample is constructed by matching privatized houses with restituted houses on house-level characteristics using propensity score matching, see Section 4.2 for details. In specifications with neighborhood or age dummies, constant is not reported. Standard errors clustered at the house level are in parentheses: $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

are slightly (i.e. about two tenths to one half of a percentage point) smaller than the corresponding IV estimates. All in all, these results corroborate our main finding that homeownership does not have detrimental effects on labor market activity.

4.4 Alternative explanations

The causal interpretation of our estimates of the effect of homeownership on labor force participation and unemployment rests on the assumption that our matching procedure produces a control sample of residents in restituted houses that represents the counterfactual to the residents in privatized houses. In other words, conditional on matching, that the privatization/restitution status of a house is as-good-as random.

The pattern of our results seems to support this assumption. Specifically, the results in Table 3 suggest that once education is controlled for, inclusion of other controls, including the full set of neighborhood dummies, does not affect the estimates. It seems that education captures the main differences between privatized and restituted houses. Furthermore, the results on the matched sample, reported in Table 4, are the very similar across the different specifications. This suggests that matching privatized houses with restituted houses on 1991 house-level characteristics does a good job in filtering out compositional specificities of the population living in privatized houses found in Table 1.

However, one may still be worried that the privatizers possess some unobservable characteristics that are positively correlated with labor market outcomes and unrelated to homeownership. One may, for instance, hypothesize that early privatizers could better organize themselves and agree on privatization of their houses. Or that early privatizers were wealthier, thus able to put down the initial payments sooner. Or that they were more-long term focused, thus having lower discount factor over the future wealth benefits from being owners. None of these traits is observable in our data, yet all would be suggestive of higher labor market aptitude among early privatizers. If so, early privatizers should exhibit better labor market outcomes regardless their homeownership status.

Table 6: Year of privatization and labor market outcomes of individuals living in privatized houses (OLS, 2000 is the omitted category)

	Economically active (=1, working age sample)	Unemployed (=1, labor force sample)
	(1)	(2)
Living in a house privatized in 1998 (=1)	0.004	−0.012
	(0.043)	(0.036)
Living in a house privatized in 1999 (=1)	−0.026	−0.033
	(0.039)	(0.039)
Secondary education (=1)	0.030	−0.065
	(0.051)	(0.045)
Tertiary education (=1)	0.081*	−0.117***
	(0.043)	(0.043)
Male (=1)	0.146***	0.028
	(0.032)	(0.026)
Born in Brno (=1)	0.019	0.011
	(0.031)	(0.028)
Incomplete family (=1)	0.034	0.056
	(0.040)	(0.047)
One-person family (=1)	0.051	0.004
	(0.043)	(0.044)
Age dummies	Yes	Yes
Neighborhood dummies	Yes	Yes
Observations	597	470
R^2	0.267	0.190

Note: The sample consists of individuals living in houses privatized between 1998 and 2000. Living in a house privatized in 2000 is the omitted category. Constants are not reported. Standard errors clustered at the house level are in parentheses: $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

To tap into these contentions, we have estimated OLS regressions for labor force participation and unemployment contrasting different cohorts of privatizers. These regressions, reported in Table 6, include dummies for years of privatization, with 2000 being the omitted category. Individuals that privatized as early as in 1998 do not exhibit different outcomes from those who privatized in 2000. Those who privatized in 1999 appear to have slightly lower level of labor force participation, but they also exhibit lower unemployment rate (neither of the two effects is statistically significant). The results suggest

that there is no systematic difference between early privatizers and those that privatized in 2000.

Another concern pertains to a possibility that our matching procedure fails to net out some unobserved characteristic that could have driven designation of houses for privatization, while also being relevant for individuals labor market performance. We use the information on the timing of privatization and run regressions analogous to those reported in Table 5 for houses privatized in 2001 and later in order to test for such compositional effects. The idea is that, as of 2001, early privatizers (i.e. those who privatized between 1998 and 2000) and late privatizers differed in their homeownership status. At the same time, if privatizers as a group were positively selected on some unobserved quality that correlates with labor market activity, i.e. if our results were driven by composition effects and not homeownership, we would expect to see a similar pattern of results when we look at those who privatized later.

The results of this exercise are reported in first four columns of Table 7. Specifically, columns (1) and (2) test for differences in labor force participation and unemployment between individuals living in publicly owned houses privatized between 2001 and 2005 and a matched sample from restituted houses (using the same matching procedure as for our main estimates). If anything, the labor force participation of these soon-to-be privatizers was smaller, although the 2.6 percent difference is substantively small and statistically not significant. The difference in unemployment is estimated to be essentially zero. The same regressions are also estimated on a matched sample of individuals living in houses privatized between 2006 and 2011. Here we observe somewhat higher labor force participation, but also higher unemployment, neither difference is statistically significant, however. In summary, we do not find much in support of the contention that privatizers were positively selected beyond of what our matching and regression controls can filter out.[16]

[16]We note that the pattern of these results is also inconsistent with the hypothesis discussed above, that early privatizers differed from later privatizers in terms of their unobserved ability.

Table 7: Labor market activity of individuals living in the public housing stock as of 2001, by designation and privatization status, and individuals in restituted houses, OLS estimates on matched samples

	Designated for privatization as of 2001						Not designated for privatization	
	Privatized in 2001–2005		Privatized in 2006–2011		Never privatized			
	Active Labor Force	Unemployed	Active Labor Force	Unemployed	Active Labor Force	Unemployed	Active Labor Force	Unemployed
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Living in city-owned house (=1)	−0.026	−0.0009	0.038	0.020	0.005	−0.007	0.008	0.0002
	(0.021)	(0.025)	(0.029)	(0.032)	(0.035)	(0.029)	(0.008)	(0.008)
Secondary education (=1)	−0.050*	−0.108***	0.054*	−0.055*	0.032	−0.062*	0.028***	−0.124***
	(0.027)	(0.034)	(0.031)	(0.032)	(0.033)	(0.033)	(0.008)	(0.010)
Tertiary education (=1)	0.046*	−0.161***	0.103***	−0.089***	0.074**	−0.086***	0.087***	−0.159***
	(0.024)	(0.028)	(0.033)	(0.030)	(0.035)	(0.031)	(0.008)	(0.009)
Male (=1)	0.127***	−0.030	0.177***	0.003	0.157***	−0.008	0.161***	−0.006
	(0.020)	(0.020)	(0.032)	(0.023)	(0.025)	(0.032)	(0.007)	(0.007)
Born in Brno (=1)	−0.026	0.032	0.028	0.016	0.062**	0.016	−0.003	−0.001
	(0.020)	(0.023)	(0.033)	(0.031)	(0.027)	(0.029)	(0.007)	(0.007)
Incomplete family (=1)	0.005	0.096***	0.027	0.037	0.023	0.029	0.013	0.064***
	(0.033)	(0.034)	(0.050)	(0.040)	(0.034)	(0.042)	(0.009)	(0.011)
One-person family (=1)	−0.002	0.066*	0.081**	0.050	0.035	−0.038	0.011	0.017*
	(0.027)	(0.035)	(0.038)	(0.054)	(0.043)	(0.038)	(0.010)	(0.010)
Age dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Neighborhood dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,171	930	593	490	797	625	26,908	21,113
R^2	0.301	0.128	0.299	0.210	0.273	0.181	0.212	0.105

Note: Designation to privatization according the 1996–2001 Directives of the Brno City Municipality (see footnote 5 on p. 7). The samples are constructed by matching the subsets of public housing stock houses with restituted houses on house-level characteristics using propensity score matching, see Section 4.2 for details. Constants are not reported. Standard errors clustered at the house level are in parentheses: $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Next, one may be concerned that being a renter in publicly-owned housing might be different from being a renter in restituted housing, perhaps the quality of houses can be different as restituted houses tend to be older and thus more affected by poor maintenance during the communist era. If that was the case, becoming an owner of a housing unit via privatization of public housing would be different from becoming an owner (hypothetically) of a housing unit in a restituted house. In such a case, renters in restituted houses might not be a valid control group. In columns (7) and (8) of Table 7 we thus look at differences between renters living in houses that were not designated for privatization and a matched sample of renters in restituted houses (using the same procedure). The point estimates for both labor force participation and unemployment are essentially zero (and are relatively tightly estimated due to large number of observations unemployment).

In columns (5) and (6) of Table 7, the same exercise is done for renters in houses that were designated for privatization, but never privatized. This was because they turned down the privatization offer.[17] These regressions test whether individuals in houses designated for privatization differed from other renters by some relevant characteristic not filtered out by our matching procedure and control variables. The results are again very close to zero. In summary, we do not find much support for the concern that being a renter in publicly-owned housing unit, regardless of the privatization designation, would be different from being a renter in a restituted houses.

Finally, our empirical strategy may be questioned on the ground that individuals living restituted houses do not represent a valid control group, since they might have changed their residence and so the sample of individuals that we observe in our data in 2001 is different from from the sample of individuals living in restituted houses in 1991. We note again that our data does not allow us to match individuals across the two censuses and thus we cannot track their movements. However, to address this potential drawback, we have looked at the change in characteristics between the two censuses within the sample of restituted houses and privatized houses. Table 8 reports the results. The only significant

[17]Our data covers houses that were privatized only up to 2015. However, around that time the city has decided it will not privatize any new houses and there were no privatizations since then.

Table 8: Differences in characteristics of working age individuals living in matched restituted and privatized houses between 2001 and 1991

	Difference in means 2001 and 1991		Difference in differences
	Restituted	Privatized	
Economically active	−0.067***	−0.028	0.039
	(0.018)	(0.020)	(0.027)
Unemployed	0.072***	0.036***	−0.036**
	(0.011)	(0.011)	(0.015)
Male	0.008	0.005	−0.003
	(0.012)	(0.013)	(0.018)
Age	1.198***	0.712	−0.486
	(0.460)	(0.537)	(0.703)
Primary education	−0.025*	−0.069***	−0.044*
	(0.015)	(0.020)	(0.025)
Secondary education	0.034**	0.048**	0.015
	(0.017)	(0.022)	(0.027)
Tertiary education	−0.008	0.021	0.029
	(0.024)	(0.017)	(0.029)
Born in Brno	0.061**	0.060***	−0.0004
	(0.027)	(0.018)	(0.032)
Individuals in 2001 census	864	744	
Individuals in 1991 census	882	750	

Note: Because the information on household type is not compatible between the 1991 and 2001 censuses, the sample does not exclude multifamily and non-family households, or households with unclear or inconsistent homeownership status. Standard errors clustered at the house level are in parentheses: $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

divergence in trends is related to the unemployment, which is consistent with what we found in this paper so far.[18]

5 Remarks

A natural question arises, why should homeownership, or privatization, increase labor market activity. We hypothesize that labor market activity could have been increased due to liquidity constraints faced by privatizing households. Houses were typically privatized with a substantial discount and only part of the price had to be paid upfront, with the remainder being repaid in subsequent installments. At the same time, Czech banks did not

[18] An F-test of the joint hypothesis that there are no differences in changes in characteristics (except the labor market outcomes) listed in Table 8 between the sample of privatized houses and matched sample of restituted houses yields $F(5, 86) = 0.20$, implying p-value of 0.96.

provide mortgages on coop-owned houses and so privatization was funded from savings or other types of loans. As a result, the related expenditures, whether paid upfront and subsequently, put strain on households' savings and income. A natural response would be to increase labor market activity, either on the extensive margin (labor force participation) or intensive margin (more intensive job search and/or lower reservation wages, leading to lower unemployment).

Two other papers have recently used housing privatization to study the effects of homeownership on labor market activity. Sodini et al. (2016) look at housing privatization within a sample of 46 buildings in Stockholm. They find that, among other things, homeownership increases labor mobility and labor income, which mostly driven by the intensive margin (harder work) accompanied by a small increase in labor participation. Their policy experiment happens when ongoing privatization is stopped by a change in the central government's policy. Thus some of houses who voted for privatization were eventually deprived of becoming homeowners. One explanation of their results can thus be that jilted expectations chilled motivation of these wannabe privatizers. Our results are generally consistent with theirs. In our context, however, there is no such a shock to expectations and thus we can rule out this channel. Broulíková et al. (2018) use housing privatization in post-communist countries to estimate the effects of homeownership on mobility and unemployment. They do not find any evidence of detrimental effects of homeownership on unemployment and only weak evidence that homeownership reduces mobility. Our findings, using more detailed data from privatization in Brno, complement and corroborate these earlier results.

One limitation of these three studies, however, is that they focus on direct effects on homeowners and renters do not address the possibility of externalities as suggested by Blanchflower and Oswald (2013) and recently studied by Laamanen (2017). Nevertheless, these recent studies using housing privatization tend to add weight on the part of the empirical literature suggesting that homeownership, and policies propping it up, such as housing privatization, do not have direct detrimental effects on the labor markets.

Further research opportunities exploiting housing privatization in other institutional settings, particularly in countries where privatization was more centralized (e.g. Baltic countries, former Eastern Germany, Slovenia, ex-Soviet Union countries), may provide insights into the labor market effects of homeownership. Especially valuable would be further research tapping into the possible externalities associated with homeownership. This is where the least is known as of now.

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Appendix

Table A1: Balance tests (means), matched houses in 1991

	Matched houses		
	Privatized	Restituted	Difference
Economically active (share)	0.585	0.596	−0.011
	(0.020)	(0.018)	(0.027)
Unemployed (share)	0.021	0.020	0.001
	(0.005)	(0.004)	(0.006)
Male (share)	0.461	0.448	0.012
	(0.010)	(0.011)	(0.015)
Age	47.220	47.494	−0.273
	(0.784)	(0.728)	(1.070)
Primary education (share)	0.443	0.438	0.005
	(0.027)	(0.029)	(0.039)
Secondary education (share)	0.313	0.329	−0.015
	(0.015)	(0.018)	(0.024)
Tertiary education (share)	0.244	0.233	0.010
	(0.021)	(0.021)	(0.029)
Born in Brno (share)	0.557	0.551	0.006
	(0.015)	(0.021)	(0.026)
Number of apartments	11.564	12.949	−1.385
	(0.566)	(0.837)	(1.010)
Propensity score	0.114	0.112	0.002
	(0.011)	(0.010)	(0.015)
Houses	46	46	

Note: The sample is constructed by matching privatized houses with restituted houses on pre-reform (1991) house-level characteristics, using propensity score matching with the maximum allowed distance 700m, see Section 4.2 for details. Robust standard errors are in parentheses.

Table A2: First-stage regressions results for IV estimates in Table 4, matched sample

	Homeowner (=1, working age sample)					Homeowner (=1, labor force sample)				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Living in privatized house (=1)	0.911***	0.919***	0.907***	0.908***	0.921***	0.920***	0.930***	0.916***	0.919***	0.935***
	(0.028)	(0.024)	(0.029)	(0.028)	(0.022)	(0.028)	(0.023)	(0.029)	(0.028)	(0.021)
Secondary education (=1)			0.045*	0.048**	0.046**			0.052**	0.058**	0.050**
			(0.023)	(0.022)	(0.023)			(0.020)	(0.022)	(0.021)
Tertiary education (=1)			0.066***	0.070***	0.057**			0.060**	0.067**	0.052**
			(0.025)	(0.026)	(0.023)			(0.028)	(0.029)	(0.025)
Male (=1)				0.002	0.003				−0.0007	−0.002
				(0.008)	(0.008)				(0.008)	(0.010)
Born in Brno (=1)				0.004	0.011				0.007	0.014
				(0.012)	(0.012)				(0.013)	(0.011)
Incomplete family (=1)				0.009	0.002				0.011	0.003
				(0.015)	(0.013)				(0.017)	(0.014)
One-person family (=1)				−0.019	−0.030				0.0005	−0.018
				(0.019)	(0.020)				(0.018)	(0.019)
Constant			−0.034**					−0.035**		
			(0.014)					(0.015)		
Age dummies	–	–	–	Yes	Yes	–	–	–	Yes	Yes
Neighborhood dummies	–	Yes	–	–	Yes	–	Yes	–	–	Yes
Neighborhood dummies	–	Yes	–	–	Yes	–	Yes	–	–	Yes
Observations	1,238	1,238	1,238	1,238	1,238	960	960	960	960	960
R^2	0.911	0.864	0.839	0.847	0.873	0.920	0.876	0.852	0.860	0.884

Note: The sample is constructed by matching privatized houses with restituted houses on house-level characteristics using propensity score matching, see Section 4.2 for details. Individuals' homeownership status is instrumented with the privatization status of her house. Standard errors clustered at the house level are in parentheses: $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A3: Estimates of the effect of homeownership on labor force participation under alternative matching parameters

	Maximum geographic distance (meters)			
Caliper	100	400	**700**	1000
0.1	-0.024	0.003	-0.013	-0.007
	(0.028)	(0.027)	(0.028)	(0.031)
	Np = 30	Np = 31	Np = 39	Np = 41
	Bp = 0.570, Pp = 0.967	Bp = 0.283, Pp = 0.954	Bp = 0.168, Pp = 0.896	Bp = 0.201, Pp = 0.892
0.2	-0.028	-0.004	-0.004	-0.006
	(0.024)	(0.024)	(0.027)	(0.028)
	Np = 36	Np = 36	Np = 44	Np = 45
	Bp = 0.437, Pp = 0.987	Bp = 0.230, Pp = 0.986	Bp = 0.234, Pp = 0.923	Bp = 0.195, Pp = 0.926
0.3	-0.024	-0.003	0.003	-0.006
	(0.025)	(0.026)	(0.026)	(0.028)
	Np = 39	Np = 39	Np = 45	Np = 45
	Bp = 0.546, Pp = 0.985	Bp = 0.311, Pp = 0.961	Bp = 0.188, Pp = 0.939	Bp = 0.195, Pp = 0.926
0.4	-0.026	-0.006	0.003	-0.006
	(0.025)	(0.025)	(0.026)	(0.028)
	Np = 40	Np = 40	Np = 45	Np = 45
	Bp = 0.507, Pp = 0.983	Bp = 0.286, Pp = 0.994	Bp = 0.188, Pp = 0.939	Bp = 0.195, Pp = 0.926
0.5	-0.022	-0.003	0.003	-0.006
	(0.025)	(0.025)	(0.026)	(0.028)
	Np = 41	Np = 41	Np = 45	Np = 45
	Bp = 0.520, Pp = 0.982	Bp = 0.295, Pp = 0.958	Bp = 0.188, Pp = 0.939	Bp = 0.195, Pp = 0.926
0.6	-0.022	-0.003	0.003	-0.006
	(0.025)	(0.025)	(0.026)	(0.028)
	Np = 41	Np = 41	Np = 45	Np = 45
	Bp = 0.520, Pp = 0.982	Bp = 0.295, Pp = 0.958	Bp = 0.188, Pp = 0.939	Bp = 0.195, Pp = 0.926
0.7	-0.020	-0.001	0.003	-0.003
	(0.024)	(0.024)	(0.025)	(0.027)
	Np = 42	Np = 42	Np = 46	Np = 46
	Bp = 0.579, Pp = 0.966	Bp = 0.338, Pp = 0.986	Bp = 0.173, Pp = 0.892	Bp = 0.163, Pp = 0.879
0.8	-0.020	-0.001	0.003	-0.003
	(0.024)	(0.024)	(0.025)	(0.027)
	Np = 42	Np = 42	Np = 46	Np = 46
	Bp = 0.579, Pp = 0.966	Bp = 0.338, Pp = 0.986	Bp = 0.173, Pp = 0.892	Bp = 0.163, Pp = 0.879
0.9	-0.020	-0.001	0.003	-0.003
	(0.024)	(0.024)	(0.025)	(0.027)
	Np = 42	Np = 42	Np = 46	Np = 46
	Bp = 0.579, Pp = 0.966	Bp = 0.338, Pp = 0.986	Bp = 0.173, Pp = 0.892	Bp = 0.163, Pp = 0.879

Note: The table reports coefficient estimates on the Homeowner dummy from IV regressions, corresponding to specification (5) in Table 4, estimated on samples of privatized and restituted houses matched under alternative maximum geographic distance and caliper settings. The default settings of maximum distance of 700m and caliper 0.7 are in bold. "Np" refers to the number of privatized houses in the matched sample (the full count of privatized houses in our data is 46). The balance of the matched samples of privatized and restituted houses is tested by paired t-tests of differences in matching variables, "Bp" reports the smallest p-value of these tests. "Pp" is the p-value of a t-test of difference in propensity scores between matched privatized and restituted houses. Standard errors clustered at the house level are in parentheses: $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A4: Estimates of the effect of homeownership on unemployment under alternative matching parameters

	Maximum distance (meters)			
Caliper	100	400	**700**	1000
0.1	-0.050**	-0.039*	-0.089***	-0.093***
	(0.025)	(0.022)	(0.023)	(0.030)
	Np = 30	Np = 31	Np = 39	Np = 41
	Bp = 0.570, Pp = 0.967	Bp = 0.283, Pp = 0.954	Bp = 0.168, Pp = 0.896	Bp = 0.201, Pp = 0.892
0.2	-0.055***	-0.044**	-0.064***	-0.089***
	(0.021)	(0.018)	(0.024)	(0.028)
	Np = 36	Np = 36	Np = 44	Np = 45
	Bp = 0.437, Pp = 0.987	Bp = 0.230, Pp = 0.986	Bp = 0.234, Pp = 0.923	Bp = 0.195, Pp = 0.926
0.3	-0.053**	-0.041**	-0.058**	-0.089***
	(0.021)	(0.018)	(0.023)	(0.028)
	Np = 39	Np = 39	Np = 45	Np = 45
	Bp = 0.546, Pp = 0.985	Bp = 0.311, Pp = 0.961	Bp = 0.188, Pp = 0.939	Bp = 0.195, Pp = 0.926
0.4	-0.052***	-0.042**	-0.058**	-0.089***
	(0.020)	(0.017)	(0.023)	(0.028)
	Np = 40	Np = 40	Np = 45	Np = 45
	Bp = 0.507, Pp = 0.983	Bp = 0.286, Pp = 0.994	Bp = 0.188, Pp = 0.939	Bp = 0.195, Pp = 0.926
0.5	-0.051**	-0.041**	-0.058**	-0.089***
	(0.020)	(0.017)	(0.023)	(0.028)
	Np = 41	Np = 41	Np = 45	Np = 45
	Bp = 0.520, Pp = 0.982	Bp = 0.295, Pp = 0.958	Bp = 0.188, Pp = 0.939	Bp = 0.195, Pp = 0.926
0.6	-0.051**	-0.041**	-0.058**	-0.089***
	(0.020)	(0.017)	(0.023)	(0.028)
	Np = 41	Np = 41	Np = 45	Np = 45
	Bp = 0.520, Pp = 0.982	Bp = 0.295, Pp = 0.958	Bp = 0.188, Pp = 0.939	Bp = 0.195, Pp = 0.926
0.7	-0.051***	-0.041**	-0.060***	-0.090***
	(0.020)	(0.017)	(0.022)	(0.027)
	Np = 42	Np = 42	Np = 46	Np = 46
	Bp = 0.579, Pp = 0.966	Bp = 0.338, Pp = 0.986	Bp = 0.173, Pp = 0.892	Bp = 0.163, Pp = 0.879
0.8	-0.051***	-0.041**	-0.060***	-0.090***
	(0.020)	(0.017)	(0.022)	(0.027)
	Np = 42	Np = 42	Np = 46	Np = 46
	Bp = 0.579, Pp = 0.966	Bp = 0.338, Pp = 0.986	Bp = 0.173, Pp = 0.892	Bp = 0.163, Pp = 0.879
0.9	-0.051***	-0.041**	-0.060***	-0.090***
	(0.020)	(0.017)	(0.022)	(0.027)
	Np = 42	Np = 42	Np = 46	Np = 46
	Bp = 0.579, Pp = 0.966	Bp = 0.338, Pp = 0.986	Bp = 0.173, Pp = 0.892	Bp = 0.163, Pp = 0.879

Note: The table reports coefficient estimates on the Homeowner dummy from IV regressions, corresponding to specification (5) in Table 4, estimated on samples of privatized and restituted houses matched under alternative maximum geographic distance and caliper settings. The default settings of maximum distance of 700m and caliper 0.7 are in bold. "Np" refers to the number of privatized houses in the matched sample (the full count of privatized houses in our data is 46). The balance of the matched samples of privatized and restituted houses is tested by paired t-tests of differences in matching variables, "Bp" reports the smallest p-value of these tests. "Pp" is the p-value of a t-test of difference in propensity scores between matched privatized and restituted houses. Standard errors clustered at the house level are in parentheses: $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

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