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Homeowner subsidies and suburban living: Empirical evidence from a subsidy repeal

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Homeowner Subsidies and Suburban Living: Empirical Evidence from a Subsidy Repeal

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Homeowner Subsidies and Suburban Living: Empirical Evidence from a Subsidy Repeal

Alexander Daminger

–August 10, 2021–

Abstract. This paper documents effects of a homeownership subsidy's full repeal on the urban-rural residential location choice. First, I document the distribution of population across space for German labor market regions, using official NUTS-3 level population statistics. These labor market regions usually consist of a city (the urban core) and adjacent counties (the urban hinterlands) connected by commuter flows. Second, using IV-estimations in Difference-in-Differences and Triple-Differences frameworks, I exploit the 2005 repeal of Germany's lump-sum direct homeownership subsidy "Eigenheimzulage" on changes in this distribution across space. The results indicate that repealing subsidies to homeownership reverses subsidy-induced population flows to the periphery and thus makes regions re-urbanize. Cities' population gains derive in large parts from families with children and young residents of "building age", that are no longer able to become homeowners outside the city gates without the subsidy's support.

Keywords: homeownership, housing subsidies, residential location choice, suburbanization
JEL Codes: H24, H30, H71, R23, R28

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1 Introduction

There are plenty of reasons why homeownership might be preferable to renting–and just as many against it. The advantages and disadvantages of homeownership are therefore subject of a large number of academic papers. But undeniably, many countries choose to support and actively promote owner-occupied housing. To do so, they can pick from a variety of policy instruments that can–quite broadly–be divided into two categories: First, there is the preferential treatment of homeownership through tax legislation, such as the mortgage interest tax deduction. Second, there are government policies and programs that support households in forming homeownership through, for example, equity loans, mortgage guarantees or direct subsidies.

This paper is interested in analyzing the effects of the latter, direct subsidies to homeownership, on the spatial distribution of population. Glaeser (2011) pointed out that subsidies to homeownership simultaneously act as subsidies to suburbanization if homeownership is formed more easily in rural than in urban areas. And Muth (1967) and Voith (1999) also argued that governmental programs, such as the federal income tax advantage for homeowners, may have played an important part in the US' experience of urban decentralization since the 1950s. This paper empirically tests the hypothesis of homeownership subsidies fostering suburbanization.

Germany also had a long-standing tradition in flanking the formation of homeownership through subsidy programs or preferential tax treatments. But in 2005, it unexpectedly repealed its most important homeownership subsidy program, the *Eigenheimzulage* without replacement, providing an opportunity to empirically exploit this quasi-experiment. Figure 1 plots the average number of children under the age of 16 in German cities (green dots) and counties (orange dots) over time. Children usually live with their parents rather than by themselves, so the number of children can convincingly serve as a proxy for the number of families.[1] The figure shows that, around the time of subsidy repeal in 2005, trends in the number of children diverge for cities and counties. Counties continue to lose children (and thus families) while cities see an *increase* in the number of children.

In several difference-in-differences (DD) and triple differences (TD) approaches, I identify this subsidy's removal as one key component in Germany's "renaissance of urban living" in the decade that followed. I show that the demographic decline in rural areas–and simultanously the thriving of cities–was partly driven by the absence of young people

[1]Official population statistics in Germany do not report figures for households or families.

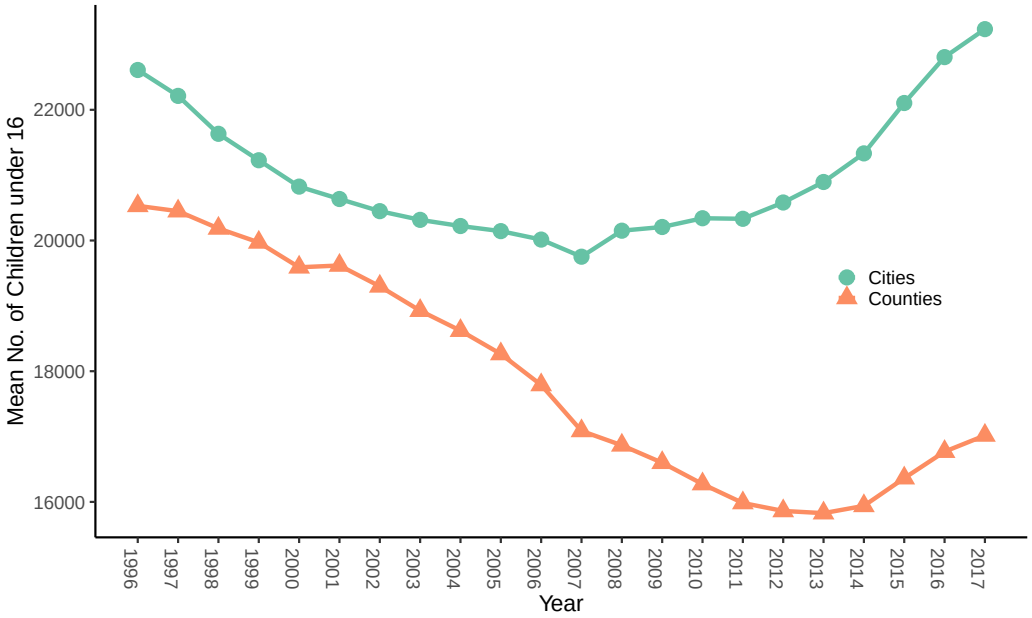


Figure 1: Average number of children under 16 in cities and counties over time

Note: This graph plots the average number of children in cities and counties over time. Cities are shown as green dots while counties are symbolized by orange triangels. Around the time of subsidy removal, these lines diverge. The number of children rises in cities while it is (further) shrinking in counties. Data: Federal and state statistical offices.

and families with children who, without the subsidy tailored to them, were no longer able to form homeownership outside the urban fringe and stayed in cities as renters. In contrast, the middle-aged, who had built up sufficient savings and were able to benefit from the subsidy before it was repealed, stayed put in their homes outside the city gates.

Although this lump-sum subsidy was paid regardless of properties' locations, cities and rural areas experienced different intensities of treatment: first, homeownership was formed most easily in rural areas, and this is also where the real subsidy rate, expressed as the share of the subsidy in the purchase cost of the property, was highest. In addition, for the longest part of the program's duration, the subsidy amount for new construction was twice that for existing properties, further increasing incentives to build in the hinterlands, where housing supply can react more elastically to increases in demand. And second, only certain strata of the population benefited from the subsidy (and were thus affected by its removal), opening up numerous opportunities to divide population into treatment and control groups.

Figure 2 plots the share of housing units in single and two-family houses in all housing units

Figure 2: Share of housing units in houses vs. homeownership rate

Note: This graph plots the 2011 share of housing units in detached and semi-detached houses against the 2011 share of owner-occupied housing units in all housing units. Cities are shown as green dots while counties are symbolized by orange triangels. The figure shows that homeowners predominately occupy single- and two family homes, and these are found in counties, not in cities. Data: 2011 German Census.

on the horizontal axis against the share of owner-occupied housing units in all housing units, i.e. the homeownership rate, on the vertical axis. Germany's 107 independent cites (*Kreisfreie Staedte*) are plotted as green dots, while its 294 counties (*Landkreise*) are represented by orange triangles. Two stylized facts can be inferred: First, there is a strong positive correlation between the the share of single and two-family homes and the homeownership rate.[2] And second, both the homeownership rate and the share of single and two-family homes are greater in counties than in cities.[3]

Presumably, homeownership subsidies lead a large proportion of recipients to build or buy an owner-occupied house outside the urban fringe, where housing supply tends to be more elastic than in the city (Baum-Snow and Han 2021; Cosman et al. 2018; Saiz 2010). Their change in tenure goes hand in hand with a move out of their previously rented

[2]This link has also been shown by Hilber (2005, 2007), who finds that a detached house is substantially more likely to be owner-occupied than an apartment in a multi-family building and by Ahlfeldt and Maennig (2015), who documents that close to 80% of one- and two-family houses are owner-occupied.

[3]And, one should add that, e.g., Linneman (1985) and Coulson and Fisher (2014) provide two–albeit different–theoretical mechanisms for disentangling the causality issue, suggesting that the building type causally affects optimal tenure choice.

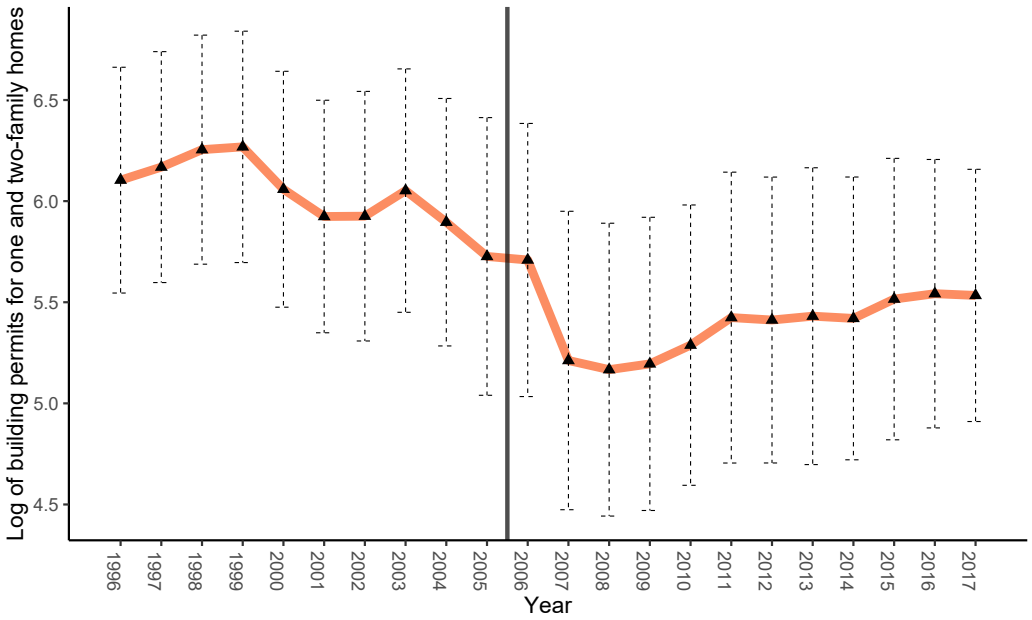


Figure 3: Slump in rural building permits, post subsidy repeal

Note: The graph shows the development of the number of building permits for one- and two-family houses in all German counties. Following the repeal of the subsidy, building permits fall sharply. Triangles depict the mean value, while error bars represent the standard deviation of the data at each point in time. Data: Federal and state statistical offices.

apartment–and rental apartments are mainly found in multifamily buildings and thus in cities. Simultaneously, repealing a homeownership subsidy removes households' incentives (and probably often also the financial capability) to change tenure from renting to owning and puts an end to the subsidized outflow of residents from cities to peripheries. Figure 3 has some suggestive evidence that this indeed might have been the case with Germany's subsidy repeal. It shows the development of building permits for single- and two-family houses in German counties. It is clearly visible that substantially fewer building permits for houses (and thus owner-occupied housing) were issued. Thus fewer houses were built in rural areas in close temporal correlation with the subsidy's repeal in 2005, suggesting that fewer people were able to build their own home outside the urban fringe without government's helping financial hand.

For the empirical analysis, I use the grouping of cities and counties into labor market regions. Typically, becoming a homeowner does not involve moving to a completely other city and thus, e.g., changing jobs. Rather, former city renters move into their own homes in the hinterlands surrounding the city to continue having easy access to jobs and city amenities. Germany's labor market regions mirror that fact by being defined on

the basis of their common labor market and commuter links between the city and the hinterlands. In each labor market region, I define all counties as the urban hinterlands (the treatment group) while the independent city (or in some rare cases: cities) forms the center (the control group). In my DD-analyses, I find that the repealing the subsidy impacted residential location choices predominantely in the age strata of people truly affected by the subsidy's repeal: Compared with the urban cores, significantly fewer people of "building age" and children (who are likely to be part of a family household) were living in the urban hinterlands post subsidy repeal.

This paper contributes to the strand of literature dealing with the causes and consequences of suburbanization or "sprawl": Brueckner (2000), Burchfield et al. (2006) or Baum-Snow (2007), among others, have identified a variety of different drivers of suburbanization. And one, in particular, is governmental policies promoting owner-occupied housing. Subsidization through the tax code by, e.g., mortgage interest tax deduction opportunities tends to be capitalized in house prices while simultanously rather increasing the intensive margin, i.e. subsidy recipients consuming more living space, than the extensive margin, i.e. steering them to forming homeownership in the first place (Carozzi et al. 2020; Davis 2019; Hilber and Turner 2014; Sommer and Sullivan 2018). This amplifying effect on house prices also seems to be the case with lump-sum cash homeownership subsidies as those in the German case (Krolage 2020). But not only prices for owner-occupied homes are affected. Daminger (2021) exploits how subsidy recipients must have previously been renters and finds that fostering homeownership through cash transfers lowers demand for rental housing and thus rents.

The issue of homeownership-induced suburbanization is studied by, e.g., Daminger and Dascher (2020), Glaeser (2011), Gyourko and Voith (1997), and Voith (1999), who shed light on the connection between homeownership, its subsidization and homeowners' residential location choice. And this is exactly where this paper fits in best. While Glaeser (2011) and Voith (1999) raised the link between homeownership subsidies and suburbanization early, their contributions lack a detailed and rigorous empirical analysis of the causal relationship. Daminger and Dascher (2020) analyze population shifts *within cities* and propose a causal link between the removal of a homeownership subsidy and an increase in city centers' populations. This paper picks up there and analyzes population shifts *within regions* (and thus between cities and their hinterlands) in response to a homeowner subsidies' repeal.

But since the policy measure under study explicitly promoted homeownership, my study

also contributes to the large literature on the consequences of homeownership: Numerous authors discuss the link between homeownership and (i) investment in social capital (e.g., DiPasquale and Glaeser (1999) or Hilber (2010)), (ii) investments in public goods (e.g., Hilber and Mayer (2009) on public schools), (iii) the effects on labor markets and employment (e.g., Blanchflower and Oswald (2013) or Ringo (2021) on unemployment rates or Harding and Rosenthal (2017) on self-employment) or (iv) voting behavior and the political economy of land use regulations (e.g., Ahlfeldt and Maennig (2015), Fischel (2001), Hilber and Robert-Nicoud (2013), and Ortalo-Magné and Prat (2014)).

This paper has five sections. Section 2 introduces the institutional background. Section 3 describes the empirical data and explains the spatial setup using Germany's labor market regions. Section 4 turns to the empirical analysis, which identifies the subsidy repeal's effects on the spatial distribution of populations within labor market regions. Section 5 concludes and provides some policy implications.

2 Institutional Background

Five phases in subsidizing homeownership can be distinguished in relation to Germany post World War II: In a first phase (1949–1995), investments in owner-occupied housing were tax-deductible. Phase 2 (1996–2005) consisted of a direct, lump-sum subsidy for purchasing or constructing owner-occupied housing (*Eigenheimzulage* or EZ for short). The EZ was repealed at the end of 2005 without replacement. In the following twelve years (2006–2017), the third phase, there was no distinct federal policy to promote homeownership. In 2018, a new support program (*Baukindergeld* or BK for short) was introduced, which pays out subsidies to households with children for the construction and purchase of owner-occupied housing. This fourth phase of subsidies to homeownership ended mid 2021 with the repeal of the BK. At present, in phase 5, Germany again has no governmental program explicitly subsidizing homeownership.

This paper addresses the 2005 repeal of the EZ and thus analyzes the transition from phase 2 to phase 3. This transition has features that make it particularly viable for empirical analysis. First, the subsidy accounted for a substantial portion of the public budget and was thus not negligible. The public sector disbursed a subsidy volume of more than €10 billion/year until 2005, making the EZ the single largest item in the federal subsidy budget. Over the entire period, the program totaled subsidies of €111.4 billion, financed by federal, state and local governments, and supported more than 4.5

million people in becoming homeowners.

Second, the announcement of the repeal could not be foreseen by any individual or municipality, and the repeal itself was closely linked in time, making strategic exploitation unlikely: on November 11, 2005, the governing parties announced for the first time that the EZ would be repealed at the end of the year, leaving only 1.5 months for interested applicants to conclude the purchase contract, file necessary building documents, and apply for the subsidy.

And third, although the subsidy was nominally location-independent, applicants outside cities had higher real subsidy rates. Thus, the elimination was bound to hit prospective owner-occupiers in the periphery harder than those in cities, where real estate and land prices were too high for the subsidy to make a real contribution in financing. Additionally, only those of "building-age" could benefit from the subsidy before it was repealed while those too young at the moment of repeal missed the opportunity to move into subsidized homeownership.

Table 1 provides an overview of the details of the subsidy. Both the purchase and the construction of houses and apartments for owner-occupancy were subsidized. For new buildings, the basic subsidy amount per year was 5% of the property's construction costs (including land acquisition costs - maximum €2,556). The purchase of existing real estate was subsidized with an annual basic subsidy amount of 2.5% of the purchase costs (maximum €1,278). Although the basic subsidy for new construction was higher than that for the purchase of existing property, the child allowance in both cases amounted to €767 per child per year.[4] The total annual subsidy (basic subsidy and child allowance) was paid out over a period of 8 consecutive years.

The subsidy was discontinued at the end of 2005, but applicants who began construction and buyers who signed the notarized purchase agreement before January 1, 2006, were still entitled to the EZ for the entire subsidy period of eight years. In the case of construction, the subsidy period began in the year of completion, and in the case of purchase, it began in the year of purchase; but note that the subsidy was only paid out on condition that the property was actually occupied by the owner.[5]

[4]The different treatment of new and existing houses/condos was abandoned by a change in the law in 2004: For the remaining two years of the subsidy, the annual basic subsidy amount was 1% of the purchase or construction cost (maximum €1,250). The child allowance was also raised slightly (to €800).

[5]Since building permits in Germany are valid for at least three years, it is also possible that construction work only began (and was completed) years after the building application was submitted, but that

Table 1: Details on the subsidy scheme

	1996–1999	2000–2003	2004–2005
Beneficiary			
Recipient		— Income tax liable individuals —	
Maximum 2-year taxable income	€122,710 (singles) €245,420 (couples)	€ 81,807 (singles) €163,614 (couples)	€ 70,000 (singles) €140,000 (couples)
Threshold increase per child	—	€ 30,678	€ 30,000
Object			
Subsidized Property		— Owner-occupied property (house or condo) —	
Subsidy			
Funding start		— Year of aquisition —	
Funding period		— 7 subsequent years —	
Child allowance	€767 per child	€767 per child	€800 per child
Yearly subsidy amount (baseline)			
New Construction (q_1)	max(5.0% of q_1, €2,556)	max(5.0% of q_1, €2,556)	max(1.0% of q_1, €1,250)
Existing Property (q_2)	max(2.5% of q_2, €1,278)	max(2.5% of q_2, €1,278)	max(1.0% of q_2, €1,250)

Note: This table represents the schematic structure of the subsidy. The subsidy can be divided into three time periods (second to fourth columns): (i) 1996–1999, (ii) 2000–2003, and (iii) 2004–2005. The first change in 2000 covered only the income thresholds: these were generally reduced, but they could now be increased by the presence of children. The second change in 2004 was more comprehensive: not only were the general income thresholds further reduced but the distinction between the purchase of existing property and new construction was eliminated. From then on, both types of owner-occupied housing were subsidized equally. Over the entire period, the subsidy was paid out only upon moving into the owner-occupied property and then for a total period of eight years. Source: German Home Owners' Allowance Act (*Eigenheimzulagegesetz [EigZulG]*) with its amendments.

As stated earlier, the subsidy was granted irrespective of location, such that nominal subsidy rates in cities were just as high as in the hinterlands. But of course, real estate and especially residential land prices are much higher in cities than in the surrounding areas.[6] Take the example of a family with two children who was eligible for receiving the EZ and built its own home in 2003. In a city, the cost of land and construction might have been € 400,000, while a comparable property could have been built in a nearby county for half the cost. The family received–no matter where it built–€ 2,556 per year (basic subsidy) + 2 × € 767 (child allowance), i.e. € 32,720, over the entire subsidy period.[7] However, the share of the subsidy in the financing of the home–the real subsidy rate–was only just over 8% in the city while it was twice as high in the hinterlands. So not only was it easier to build in the urban hinterlands (since there was simply more open space available for new construction) but also the real benefit of the subsidy was

this building was nevertheless subsidized for the full period of eight years upon completion because the building application was submitted before the EZ was repealed. According to a report by the German government, the last (but only minor) payments for the repealed subsidy were made in 2017.

[6] See Braun and Lee (2021) for an assessment of detailed residential land prices in Germany.

[7] And it is easy to calculate that, for all properties more expensive than € 51,120 (i.e. in virtually all cases), the subsidy amount was the same.

higher outside the urban fringe.

3 Data and Methods

Although the EZ was a federal subsidy, it was not administered centrally. Rather, local tax offices were responsible for its administration. I do not have microdata on subsidy recipients that would allow me to examine household characteristics and location decisions.[8] And yet, using aggregate population data, I can examine those segments of the population that were particularly affected by the subsidy's repeal: Young residents of "building age" and children.

Using labor market regions, defined by the Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR), enables me to examine suburbanization trends in the wake of the policy change in a narrowly defined area. The change from renting to owner-occupancy is usually not accompanied by a complete move to a new city (and thus a change of job and the like). Rather, renters decide to settle permanently in their current place of residence and move into owner-occupancy to the hinterlands of the same city to continue to have easy transportation to their workplace or city amenities.

The BBSR constructs labor market regions on the basis of the share of commuters between cities (where most of workplaces are located) and counties, imposing five constraints on their construction: Labor market regions (i) use NUTS-3 level boundaries of cities and counties and do not cross state boundaries, (ii) provide jobs for more than 65% of the working population living in them, (iii) have more than 65% of their jobs occupied by citizens living in Germany, (iv) do not overlap and (v) have a maximum within-region one-way commute to the workplace of 45 minutes (Eckey et al. 2006; Kosfeld and Werner 2012). In principle, there are 258 labor market regions in Germany. I clean this data set from labor market regions that consist of only counties or only cities, or for which not all years of population data are available. My final data set has 72 labor market regions, depicted in Figure 4.

For the empirical analysis of the subsidy's repeal on suburbanization, I use official population statistics from the federal and state statistical offices. Table 2 has some descriptives on this data. In detail, my panel data covering 1996–2017 (i.e. starting

[8] According to the Federal Ministry of Finance, no nationwide consolidated data set actually exists. This lack of data may also explain why there are hardly any studies on the EZ.

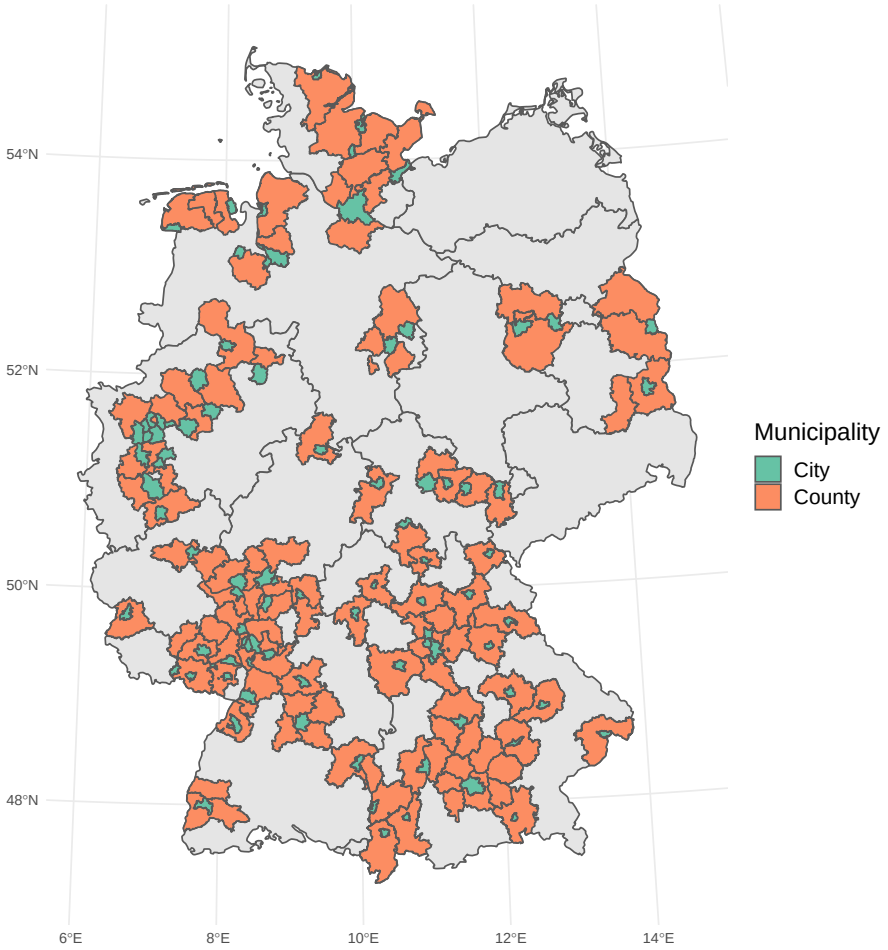


Figure 4: Map of Germany's labor market regions

Note: The figure shows my data set of 72 labor market regions, consisting of (at least) one city (green) and adjacent counties (orange). Data: Federal Agency for Carthography and Geodesy.

with subsidy introduction (1996), enveloping subsidy repeal (end of 2005) and ending prior to the introduction of EZ's successor (2018)) consists of annual population counts subdivided into age groups for each city (n=86) and for each adjacent county (n=110) of my labor market regions for ten years prior to twelve years after the EZ's removal.

For the analysis of their spatial distribution, I choose age groups based on a study by Färber (2003), who analyzed early microdata for the first five years of the subsidy (1996–2000).[9] She found that nearly 70% of subsidy recipients were between 30 and

[9]There is also an official government report analyzing these early years data (BBR 2002). Unfortunately, I am not aware of any study or data covering the second half (2001–2005), or the entire subsidy period.

Table 2: Descriptive statistics of population data

		N	Mean	SD	Min	Max
Cities	Population	1,892	200,811	268,777	33,944	1,830,584
	Building-Age (30–50y)	1,892	60,998	86,252	7,431	581,716
	Children (0–16y)	1,892	17,794	24,282	2,168	179,130
Counties	Population	2,420	205,940	122,143	55,624	662,712
	Building-Age (30–50y)	2,420	60,967	36,517	12,930	204,531
	Children (0–16y)	2,420	19,999	12,295	4,625	73,467

Data: Federal and state statistical offices

50 years old at the time of application. Individuals in this age group, who (i) were of family formation age and therefore often need more living space and at the same time (ii) had already accumulated sufficient equity to purchase a property, were most adversely affected by the repeal of the subsidy.

In addition, Rohrbach (2003) notes that at least one child was living in over 60 percent of EZ-receiving households and that, in 80 percent of the cases, those children were under 16 years of age. If parents no longer move into their own home in the urban hinterlands after the repeal of the EZ, their underage children will also remain in the city, shrinking the size of this age cohort in the years after the repeal.[10]

4 Empirical Framework and Results

I motivate the empirical analysis with the following simple propositions: Assume that there are only two housing types: Rental housing in the city and both new and existing one- and two-family housing (owner-occupancy) in the urban hinterlands (recall this stylized fact from Figure 2). The repeal of the homeownership subsidy, which implicitly promoted housing in the hinterlands, resulted in fewer residents moving from rental into owner-occupied housing. Consequently, we observe reurbanization, i.e. a population advantage of the city over the hinterland, in the period following the repeal.[11]

[10] Of course it does not have to follow that the "successors" in age groups of those having benefited from the subsidy must also be the ones that suffer from its removal. But I believe there are convincing arguments that this is indeed the case: For example, the age range in which people normally move into their own homes is relatively narrow.

[11] One could also formalize this, as did Daminger and Dascher (2020). They use a multiple-qualities filtering model adapted for the housing market (Sweeney 1974) and rank housing qualities by tenure.

To identify the causal effect of the subsidy repeal on the spatial distribution of the population, I present two approaches in this section: In the first approach, I use a Difference-in-Differences (DD) framework to show that the subsidy repeal caused a shrinkage of the affected age cohort in rural areas. In the second approach, comparing constant age cohorts using a Triple Differences (TD) framework, I show that those who were of "building-age" before the repeal of the subsidy live in rural areas fifteen years later while those who were too young to have benefited from the subsidy at the time of its repeal do not.

4.1 Urban vs. Rural Living

Identification The DD method allows me to identify a treatment effect (on, e.g., the number of children) by differentiating across space (cities vs. their hinterlands) and time (before and after the subsidy's repeal). The conditional expectation of the log of population count (in various age subgroups) y inhabiting municipality (city/county) i in labor market region j at year t is dependent on all covariates on the right side, in short x_{ij}^t:

$$E(\mathrm{y}_{ij}^t|\mathrm{x}_{ij}^t) = \alpha + \mu_j + \beta_1 \,\mathrm{PERI}_{ij} + \beta_2 \,\mathrm{POST}^t + \beta_3 \,\mathrm{PERI}_{ij} \times \mathrm{POST}^t, \tag{1}$$

μ_j is a region fixed effect controlling for unobserved time-invariant factors that affect regions (cities and their hinterland) individually. PERI is a region periphery dummy turning 1 if municipality i is a county and thus belongs to the hinterlands and zero if i is a city. POST is a treatment period dummy turning 1 if year t dates to after 2005, the year of subsidy removal, and zero otherwise.

I briefly describe the interpretation of the coefficients and later discuss the actual estimated coefficients. β_1 indicates the difference in log population in counties compared to cities before the repeal of the EZ (difference in space). β_2, meanwhile, indicates the extra in log population after repealing the EZ compared to before (difference in time). The coefficient most important for interpretation, β_3, indicates how the difference

The repeal of a homeownership subsidy, which implicitly incentivized living in existing and newly built single- and two-family homes, leads to a higher demand in the rental housing market and a decline in demand in the owner-occupancy market through filtering processes. The strong link between tenure and residential location suggests that the repeal of this type of homeownership subsidy leads to population growth in central locations and population decline in peripheral locations.

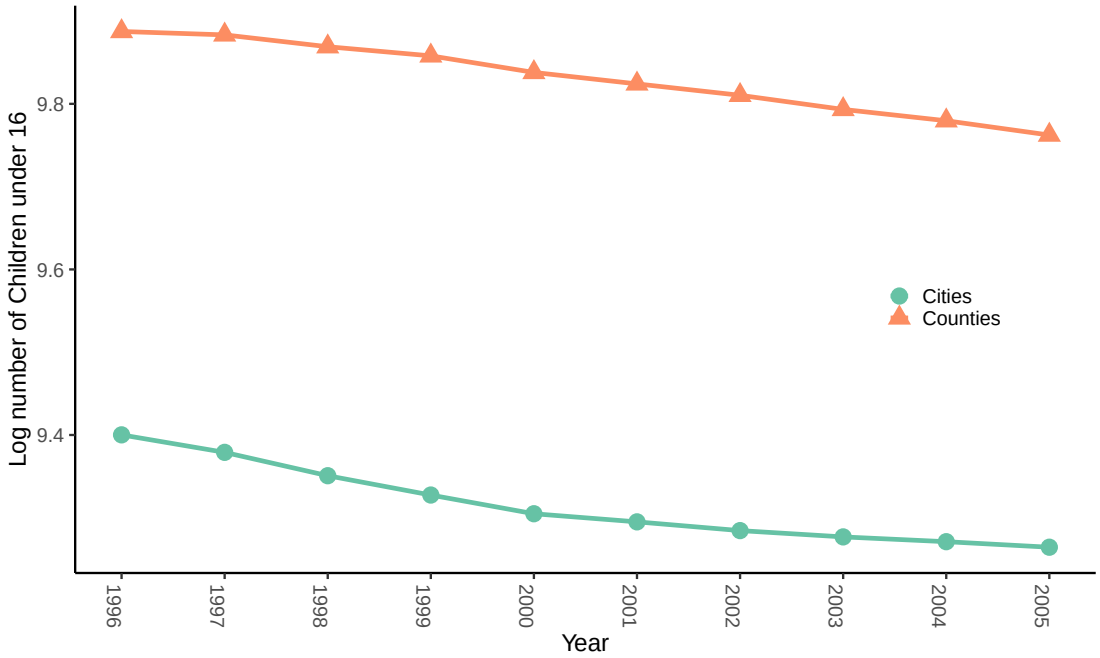


Figure 5: Parallel trends in the pre-treatment period

Note: This graph plots the log number of children in cities and counties in the pre-treatment period. Cities are shown in green while counties are shown in orange. Clearly, both lines do follow a parallel trend before the subsidy repeal. Data: Federal and state statistical offices.

between the log population of counties and cities changes in the wake of subsidy repeal (difference-in-differences). This DD-coefficient can be equated with the effect of subsidy removal on treated units, i.e. counties, over and above all other trends that might have influenced peoples' residential location choices.

Parallel trends In any Difference-in-Differences setup, the interaction term can only be interpreted causally if the common pre-trends assumption is not violated. This means that, in the absence of treatment, treatment and control group shall not trend differently (Lechner 2011). In my setup, I identify the number of children (as a proxy for families) as the strata of population strongest affected by subsidy removal. The parallel trends assumption thus demands that, in the period before the subsidy's repeal, the number of children in cities and urban hinterlands evolves similiarly.

Figure 5 allows a visual inspection of the trends in the number of children in cities and the urban hinterlands in the pre-treatment period. There is no evidence of a violation of the parallel trends assumption. To further elaborate the comparability in the number

Table 3: Testing the parallel trends assumption

	Log number of children under 16		
	(1)	(2)	(3)
Intercept	9.38***	9.35***	9.33***
	(0.10)	(0.10)	(0.10)
Placebo	−0.09***	−0.07***	−0.06***
	(0.01)	(0.01)	(0.01)
Peri	0.50***	0.51***	0.52***
	(0.08)	(0.08)	(0.08)
Placebo × Peri	0.02	0.00	−0.01
	(0.01)	(0.01)	(0.01)
Placebo Intervention Year	1999	2001	2003
Adj. R^2	0.11	0.11	0.11
Num. obs.	1960	1960	1960
N Clusters	72	72	72

Note: OLS regression with the log of children under 16 as the response variable. Placebo interventions are in years 1999 (column 1), 2001 (column 2), and 2003 (column 3). Observations are from 1996–2005. $^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$. Data: Population data are from federal and state statistical offices

of children in cities and counties in the pre-treatment period, I additionally perform placebo interventions with a regression as Equation 1 and a restricted sample with years 1996–2005. Table 3 has the results with a placebo intervention in 1999 (column 1), 2001 (column 2), and 2003 (column 3). The estimated coefficient on the DD interaction is statistically not significant from zero, suggesting that cities and urban hinterlands did not exhibit differential trends in the pre-treatment period.

Results Table 4 has OLS and 2SLS results for the estimation of Equation 1 for children (up to age 16) in columns 1, 4, and 7, for building age population (aged between 30 and 50) in columns 2, 5, and 8, and for the total residential population in columns 3, 6, and 9.[12] I expect from the subsidy's design that its removal had the largest impact on the number of children (i.e. families) and the size of the population of building age.

[12] Since the dependent variable is of count nature, maximum likelihood estimation (Poisson) might also be appropriate. I also conducted an ML estimation, which led to the same conclusions as the OLS results.

Table 4: Reurbanization of young residents post subsidy repeal

	OLS						2SLS		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Ln Children	Ln "Building-age"	Ln Pop	Ln Children	Ln "Building-age"	Ln Pop	Ln Children	Ln "Building-age"	Ln Pop
DD coefficients									
Peri	0.43***	0.30**	0.29**	0.39***	0.26*	0.25*	0.45***	0.34**	0.32**
	(0.09)	(0.10)	(0.09)	(0.10)	(0.11)	(0.11)	(0.11)	(0.11)	(0.10)
Post	−0.06***	−0.10***	0.00	−0.00	−0.01	0.04	−0.26***	−0.25**	−0.20**
	(0.02)	(0.01)	(0.01)	(0.04)	(0.04)	(0.04)	(0.07)	(0.08)	(0.07)
Peri × Post	−0.11***	−0.03*	−0.00	−0.13***	−0.04*	−0.03	−0.22***	−0.13**	−0.11**
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.03)	(0.04)	(0.03)
Controls									
Ln Household Income				−0.26	−0.31	0.00	1.85**	1.41	1.76**
				(0.30)	(0.31)	(0.29)	(0.62)	(0.69)	(0.61)
Female employment rate				−2.52*	−2.33	−2.36	−2.70	−2.29	−2.32
				(1.20)	(1.19)	(1.17)	(1.79)	(1.74)	(1.70)
Weak instruments (Ln avg. household income)							57.61***	57.61***	57.61***
Weak instruments (Female employm. rate)							73.62***	73.62***	73.62***
Wu-Hausman							13.33***	10.47***	11.12***
Overidentifying							294.19***	310.47***	293.29***
Labor Market Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Labor Market Region FE × Post	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.68	0.65	0.65	0.72	0.69	0.68	0.68	0.65	0.65
Num. obs.	4312	4312	4312	4152	4152	4152	3474	3474	3474
N Clusters	72	72	72	72	72	72	72	72	72

Note: OLS regressions (col 1–6) with the log of population in age strata as the response variable. Building-age residents are aged between 30 and 50 years; children are aged between 0 and 16 years. 2SLS regressions (col 7–9) with Ln Household Income and Female employment rate instrumented by sectoral employment shares in the hospitality, financial and public sector, the unemployment rate, and business tax revenue (see Appendix B for description). Clustered standard errors (at region level) in parentheses. $^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$. Data: Population data and data on household income and sectoral shares are from federal and state statistical offices. Data on the female employment rate, the unemployment rate, and municipalities' business tax revenues are from the INKAR database.

I start by discussing the OLS results of the plain DD-framework (columns 1–3) as outlined in Equation 1: For the log of the number of children as the response variable, the estimated DD-coefficient $\widehat{\beta_3}$, indicating the effect of subsidy removal on the urban hinterlands, is 0.11 in column 1 and statistically highly significant. For the log of the number of "building-age" population in column 2, this estimated coefficient remains negative and statistically significant. It is only for the total population in column (3), that both, $\widehat{\beta_2}$ and $\widehat{\beta_3}$, render statistically insignificant, with the point estimate actually being zero, suggesting no significant change in total resident population post subsidy repeal in either, city or periphery.

This plain DD-specification might suffer from omitted variable bias, as there are surely time-varying changes on the municipality level steering residents' location choices that I have not adequately controlled for. Therefore, in columns 4–9, I add Region $\times$ Post fixed effects to my specification and control for changes in the average household income and in womens' participation in the labor market. My choice of these two additional time-varying covariates is motivated by the results of Dauth et al. (2018) and Brenke (2015), who find that, in Germany's large cities (i) the urban wage premium and (ii) the female employment rate increased strongly. On the one hand, higher wages and thus household incomes increase the propensity of forming homeownership–and thus moving out–in the first place (Barakova et al. 2003; Di and Liu 2007; Goodman and Mayer 2018; Haurin et al. 1987). On the other hand, the–predominantly non-rural–presence of childcare facilities enables mothers to re-enter the labor force and might thus steer them (and their families) to cities to have short commutes and more time to spend with their children (Farré et al. 2020; Morrissey 2017; Neuberger et al. 2020).

In order not to confound my results by these effects, I control for the female employment rate and the average household income at the municipality level in addition to time-invariant effects at the region level in the pre- and post-treatment periods. I report OLS results of this specification in columns 4–6: Still, the estimated coefficient on the DD-coefficient $\widehat{\beta_3}$ is negative and statistically significant for the population strata of children under 16 (column 4) and the "building-age" population (column 5), while it renders statistically insignificant for the total residental population (column 6).

Both my additional control variables might suffer from endogeneity; hence the distribution of population across space might reversely influence, e.g., employment opportunities and thus household incomes as well as the female employment rate. Columns 7–9 thus report Two-Stage least squares (2SLS) results with the female employment rate and the

average household income instrumented by sectoral employment shares in the hospitality, financial, and public sector as well as municipalities' unemployment rates and business tax revenues. The diagnostics show that I chose strong instruments for both instrumented variables, and a test for overidentifying restrictions rejects the null that the model is overidentified. Further, the significant endogeneity test (Wu-Hausman test) provides evidence for variables being endogenous and thus OLS estimation not being equally consistent.

The 2SLS results suggest that it was indeed children (and their parents) that suffered most from subsidy repeal: After repeal, roughly 38% ($\widehat{\beta_2} + \widehat{\beta_3}$) fewer children, 32% fewer residents in "building age", and 27% lower total population lived in the urban hinterlands. As expected by its design, the subsidy played a major role in the residential location choice among young families.

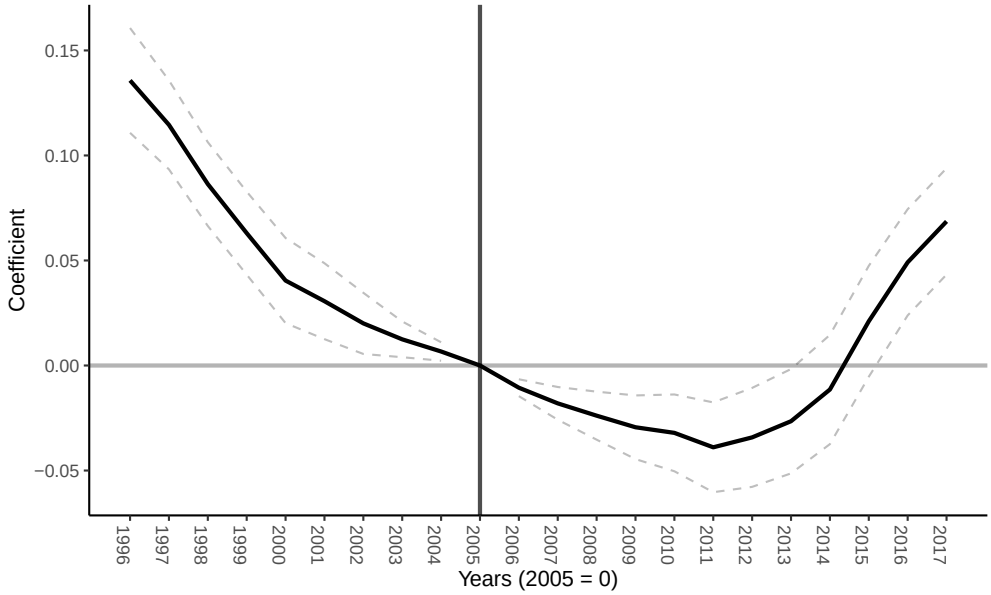
Next, I provide insight into the dynamics of population growth over time to show the precise coincidence of the EZ repeal with changes in population growth. I modify Equation 1 such that the 2005 repeal of the subsidy does not split my study period into two periods (pre- and post-treatment) but instead reveals the dynamics of population developments in cities and their neighboring counties using year fixed effects.

Let the conditional expectation of the log of children under age 16 y, inhabiting municipality i in labor market region j at year t depend on all variables on the right side, in short x_{ij}^t:

$$E\left(\mathrm{y}_{ij}^t|\mathrm{x}_{ij}^t\right) = \alpha + \mu_i + \beta_1 \,\mathrm{PERI}_{ij} + \sum_{t=2}^{T} \delta^t \,\mathrm{YEAR}^t + \sum_{t=2}^{T} \lambda_i^t \,\mathrm{PERI}_{ij} \times \mathrm{YEAR}^t \qquad (2)$$

Adding a full set of year dummy-variables in this type of regression model would result in multicollinearity (dummy-variable trap). Therefore, one left-out year dummy serves as the reference, and I choose to leave out the dummy for 2005, the last year of the EZ being in effect. All changes in y indicated by the estimated coefficients $\widehat{\delta^t}$ and $\widehat{\lambda_i^t}$ are thus relative to 2005.

Figure 6 shows estimated coefficients of the Year dummies in the top panel (a) while bottom panel (b) shows the estimated coefficients of Peri × Year dummies. Panel 6a can be interpreted as the population trend of cities (centers) while 6b represents the extra in population of the urban hinterlands (peripheries) compared to cites over time. I interpret



(a) Year dummies ($\widehat{\delta^t}$)

(b) Peri × Year dummies ($\widehat{\lambda_i^t}$)

Figure 6: Central and peripheral population growth dynamics

Note: This figure plots estimated coefficients along with 95% confidence intervals of the estimated coefficients $\widehat{\delta^t}$ and $\widehat{\lambda_i^t}$ from equation 2. Standard errors are clustered at the region level. With the subsidy still in place, the hinterland's lead over the city grows (figure 6b). After its repeal, this lead reverses into a lag.

this extra of the hinterlands over cities as the EZ effect, analogous to the DD approach from earlier. During the presence of the homeownership subsidy, the hinterlands' number of children increased *more* than that of the urban population with a peak in this extra around 2000/2001. Thereafter, this extra persists but becomes smaller. With the repeal of the homeownership subsidy in 2005, this dynamic reverses and the hinterlands' number of children grows *weaker* than the urban population.

Interesting is why the lead of the peripheries over the centers becomes smaller well before EZ's repeal. One reason could simply be that many homeowners-to-be took advantage of the first years of the EZ to switch to owner-occupancy, with the flow declining thereafter. And also recall the changes in the subsidy's rules regarding income limits, presented in Section 2. A pull-forward effect prior to the 2000 change is likely, with a reduction in income limits of this magnitude (by nearly 1/3) in sight. And lastly, it should not be neglected that the serious changes in the subsidy amount in 2004, which also occurred due to consolidation constraints of public budgets, were already being discussed years earlier. In sum, households probably pulled forward their homeownership decision as a result of this discussion. Thus, the temporal dynamics of the evolution of this population growth lead can still be convincingly linked to the EZ's temporal dynamics, because only after its repeal did the sign of the lead turn negative, reversing it into a lag.

4.2 Old vs. Young

Identification In my second approach, rather than comparing different individuals in age cohorts at two points in time, I try to follow the same individuals in age cohorts over time and exploit the effects of individuals' differential treatment by age. I restrict my data sample to 1996–2002 (before subsidy repeal) and 2011–2017 (after subsidy repeal). In the period before subsidy repeal, I set the age cohort of 30–44 year olds ("olds") who were able to benefit from the subsidy due to their "building age", against the age cohort of 15–29 year olds ("youngs"), who were too young to own a home at the time of and before subsidy repeal. Over the omitted period, the "young" become the "old" and the "old" become the "very old". Consequently, for the period after subsidy repeal, I set the 45–59 year olds ("very old") against the 30–45 year olds (now "old", formerly "young").[13] I expect the initial old to have built and started residing in their own homes in the urban

[13] Of course, with my aggregate data, I in fact *do not* observe individuals. I cannot account for "moving out of my sample", i.e. that individuals forming an age cohort at one point are not the same individuals forming this (now older) age cohort later. It nevertheless seems highly implausible that the aggregate numbers consist of completely different individuals.

hinterland in time before the subsidy was repealed. In contrast, the initial young could no longer benefit from the subsidy and remain in place.

Let dummy YOUNG be 1 (zero) if the age cohort in municipality i and labor market region j is between 15- and 29-years-old (30–44) in 1996–2002 and between 30- and 44-years-old (45–59) in 2011–2017. In the following triple differences model, the conditional expectation of the logarithm of population y_{ij} depends on all covariates on the right-hand side of the equation, x_{ij} for short:

$$\begin{aligned} E(\mathrm{y}_{ij}^t|\mathrm{x}_{ij}^t) = \alpha + \mu_i + \beta_1 \,\mathrm{POST}^t + \beta_2 \,\mathrm{YOUNG}_{ij}^t + \beta_3 \,\mathrm{PERI}_{ij} \\ + \gamma_1 \,\mathrm{POST}^t \times \mathrm{YOUNG}_{ij}^t + \gamma_2 \,\mathrm{POST}^t \times \mathrm{PERI}_{ij} + \gamma_3 \,\mathrm{YOUNG}_{ij}^t \times \mathrm{PERI}_{ij} \\ + \delta \,\mathrm{POST}^t \times \mathrm{YOUNG}_{ij}^t \times \mathrm{PERI}_{ij} \,. \end{aligned} \tag{3}$$

Coefficient δ indicates the extent to which the young suburbanized *less* (or more, if the estimated coefficient is positive) than the old over the left-out fifteen-year period. This effect, which I interpret as the causal effect of subsidy removal on the residential choice of the young and old, is unbiased by effects that affect both age groups and that I do not explicitly control for, e.g., specific observable or unobservable growing urban amenities.

Results Columns 1 and 2 of Table 5 have OLS results without and with Region × Post fixed effects (in addition to Region fixed effects) and with the female employment rate and the logarithm of the average household income as covariates. Column 3 has, again, 2SLS estimates with the female employment rate and the logarithm of average household income instrumented by sectoral employment shares in the hospitality, financial, and public sector, the unemployment rate and the business tax revenue.

Figure 7 captures regression estimates in terms of "population gradients" using estimated coefficients from column 1. The gradients for the old (the control group) are shown on the left, while gradients for the young (the treatment group) are shown on the right. Solid blue lines in each panel depict the population gradient for the period pre-subsidy repeal while solid red lines depict it for the period post-repeal. The initial old who could have benefitted from the subsidy have indeed suburbanized. In cities, the incidence of this age cohort decreases by 9 log points while it increases by 2 log points in the urban hinterlands.

Table 5: Old vs. Young Residents

	OLS		2SLS
	(1)	(2)	(3)
TD coefficients			
Post	-0.09^{***}	0.03	-0.42^{*}
	(0.01)	(0.09)	(0.15)
Young	-0.28^{***}	-0.28^{***}	-0.30^{***}
	(0.01)	(0.01)	(0.01)
Peri	0.30^{**}	0.24^{*}	0.33^{**}
	(0.09)	(0.11)	(0.11)
Post × Young	0.15^{***}	0.15^{***}	0.17^{***}
	(0.02)	(0.02)	(0.02)
Post × Peri	0.11^{***}	0.10^{**}	-0.06
	(0.01)	(0.04)	(0.07)
Young × Peri	-0.09^{***}	-0.09^{***}	-0.11^{***}
	(0.01)	(0.01)	(0.01)
Post × Young × Peri	-0.11^{***}	-0.11^{***}	-0.09^{***}
	(0.01)	(0.02)	(0.02)
Controls			
Ln Household Income		-0.22	2.20^{*}
		(0.42)	(0.95)
Female Employment Rate		-2.68^{*}	-2.75
		(1.21)	(1.96)
Weak Instruments (Ln Household Income)			46.10^{***}
Weak Instruments (Female employm. rate)			48.31^{***}
Wu-Hausman			16.04^{***}
Overidentifying			414.36^{***}
Region FE	Yes	Yes	Yes
Region FE × Post	No	Yes	Yes
Adj. R^2	0.66	0.69	0.65
Num. obs.	5488	5200	3860
N Clusters	72	72	72

Note: OLS and 2SLS regressions with the log of population count as the response variable. Long panel with years 1996–2002 (before repeal) and 2011–2017 (post repeal). Young = 1 in years before (post) repeal, in age stratum 15–29 (30–44) and zero in years before (post) repeal, in age stratum 30–44 (45–59). 2SLS regression with female employment rate and Ln Household Income instrumented by sectoral employment shares in the hospitality, financial, and public sector, the unemployment rate, and the business tax revenue (see Appendix B for description). Clustered standard errors (at region level) in parentheses. $^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$.
Data: Population data and data on household income and sectoral shares are from federal and state statistical offices. Data on the female employment rate, the unemployment rate, and municipalities' business tax revenue are from the INKAR database.

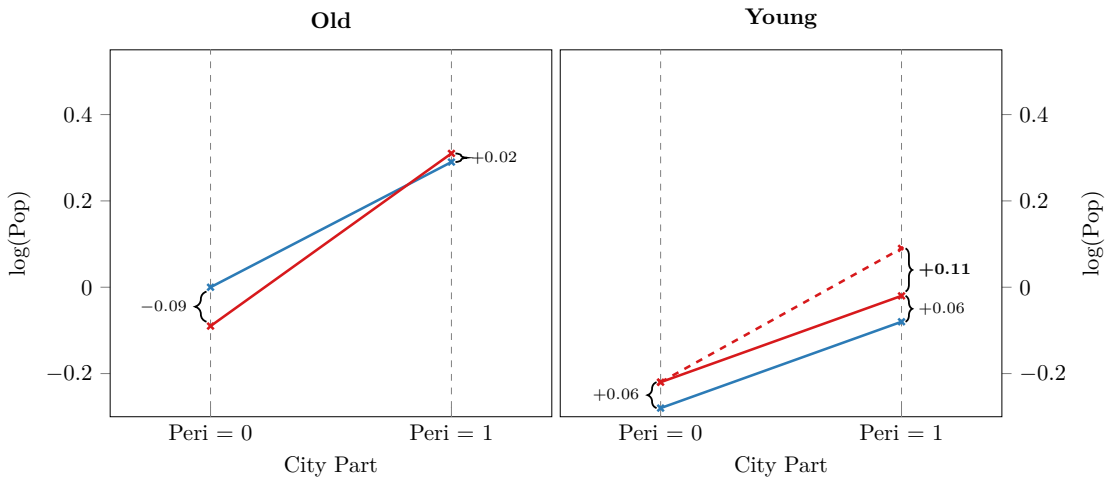


Figure 7: Population Gradients of Old and Young

Note: This figure shows the results from Table 5 using "population gradients" of the old and young. Blue solid lines show these gradients for the period before the subsidy was repealed; red solid lines show the gradients for post repeal. The logarithm of the number of "old" population (control group, left panel) decreased by 9 log points in cities while it increased by 2 log point in the urban hinterlands. For the old, the difference between these two differences is 11 log points. The logarithm of the population count of "young" population (treatment group, right panel) increased symmetrically in both cities and urban hinterlands by 6 log points. For the young, the difference between these two differences is in fact zero. The red dashed line in the right panel shows the counterfactual situation if the gradient of the treatment group (the "young") had evolved the same as the control group (the "old"), i.e., if the subsidy had not been repealed: the slope of the "young"'s population gradient would increaseeven stronger and the log number of young population in the periphery would be 11 log points higher than it actually is (difference-in-differences). Data: Author's calculations using NUTS-3 population data from federal and state statistical offices.

The young, on the other hand, who no longer benefited from the subsidy, grew evenly, by 6 log points in both urban and rural areas. The red dashed line in the right panel now shows how the population gradient of the young would have developed if the subsidy had not been repealed, i.e. if the young still had benefitted from the subsidy and had followed the same trend as the old: they would have suburbanized strongly, by 11 log points more than they actually did. The repeal of the subsidy prevented the young from moving to the urban hinterlands.

5 Conclusion

Germany's "new love with urban living" is not just a story of changing residential preferences, increasing urban wage premiums, stronger immigration, or higher female participation rates due to improved childcare options in cities. Rather, and often unnoticed, German homeownership policies played an important role in families' residential

location decisions.

Owner-occupied housing in Germany is predominantly found in single- and two-family homes, and these are easiest built in the urban hinterland rather than in the city. The repeal of the largest homeownership subsidy program in 2005 deprived potential home builders–typically young families–of the incentive and financial means to build their own home. They stayed living in the city as renters and did not suburbanize.

Using multiple approaches with varying difference-in-difference frameworks, this paper establishes a causal link between the repeal of the homeownership subsidy and Germany's reurbanization. The central result is that children (and their parents) are less likely to live in the urban hinterland after the repeal. Moreover, I find that the age cohort that was still able to benefit from the subsidy before it was repealed now resides in the suburbs. Those who were in their teens before the subsidy was repealed did not create homeownership without it and stayed put at their initial place of residence.

These findings complement policy advice on issues of homeownership and suburbanization: First, if a policymaker's goal is fostering reurbanization, then repealing homeownership subsidies seems to be a promising tool to steer residential choice in favor of cities. Second, if living in cities leads to smaller commutes and living spaces–and thus fewer greenhouse gas emissions–then repealing homeownership subsidies might also be an important tool in the fight against climate change.

However, as Daminger (2021) shows, homeownership subsidies also appear to function as a "price valve" for the urban rental market. Thus, third, the repeal-induced stop of population flows to the periphery, triggering a positive demand shock in rental housing markets, will likely lead to an increase in cities' rents.

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Appendices

A Robustness

A.1 Other categorizations of regions

In addition to my analysis with labor market regions, I also conducted the analysis with so-called spatial planning regions and self-constructed "synthetic regions". Spatial planning regions are formed by the Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR) using German NUTS-3 municipalities (counties, independent cities as well as Hamburg and Berlin). They also describe cities (the economic center) and its surrounding hinterlands as in the case of labor market regions, but on much coarser scale. Results do not change qualitatively when using spatial planning regions (n = 55).

As a second robustness check, I constructed "synthetic regions" using NUTS-3 municipalities. Guided by the Standard Urban Model and using NUTS-3 level shapefiles, I first selected all German independent cities (107). Second, I identified all counties sharing an administrative boundary with an independent city using geographical information system (GIS) methods. Defining all of a independent city's neighboring counties as its urban hinterland, I created a total of 80 regions consisting of a core (an independent city) and a periphery (one or multiple neighboring counties). I exclude from the analysis all independent cities whose synthetic urban hinterland includes another independent city, such that each region has one and only one city and at least one neighboring county. In this approach, I create 60 synthetic regions that share common borders but for which I cannot ensure that they are indeed connected through commuter flows. Also with this approach, results are similar to the ones obtained by using labor market regions.

B Data description

Female Employment Rate The variable FEMALE EMPLOYMENT RATE is the share of female employees subject to compulsory social insurance in all employees. Employees subject to social insurances are manual and non-manual workers and persons in vocational training who are compulsorily insured under statutory pension, health and/or

unemployment insurance schemes, i.e. excluding civil servants, self-employed persons, family workers, and marginally employed persons. The female employment rate in city i in year t is calculated as the number of female employees subject to compulsory social insurance at place of work i at t divided by the number of employees in i at t. Source: INKAR database (http://www.inkar.de)

Household Income The variable HOUSEHOLD INCOME is the average disposable household income. Households' disposable income is calculated by adding to primary income the social benefits and other current transfers in kind that households mainly receive from the general government and deducting taxes on income and wealth, social contributions and other current transfers payable by households. The disposable income of private households thus corresponds to the income that ultimately accrues to private households and that they can use for consumption and saving purposes. Source: Federal and state statistical offices (http://www.statistikportal.de/)

Share Hospitality Sector The variable SHARE HOSPITALITY SECTOR is the share of working population working in trade, transport, hospitality, and information & communication industries in city i in year t. This industry includes the following sections: "Sale, maintenance and repair of motor vehicles and motorcycles", "Transport and storage", "Hotels and restaurants", and "Information and Communication". Source: Federal and state statistical offices (http://www.regionalstatistik.de)

Share Financial Sector The variable SHARE FINANCIAL SECTOR is the share of working population working in financial, insurance and corporate service, and land and housing industries in city i in year t. This industry includes the following sections: "Financial and insurance activities", "Real estate activities', "Professional, scientific and technical activities", and "Other business activities". Source: Federal and state statistical offices (http://www.regionalstatistik.de)

Share Public Sector The variable SHARE PUBLIC SECTOR is the share of working population working in public and other service, education, and health industries in city i in year t. This industry includes the following sections: "Public administration, defense and compulsory social security", "Education', "Health and social work", "Arts, entertainment and recreation", "Other services not elsewhere classified", and "Households with domestic staff". Source: Federal and state statistical offices (http://www.regionalstatistik.de)

Unemployment Rate The variable UNEMPLOYMENT RATE is the share of unemployed as a percentage of the civilian labor force. These represent the labor supply (employed +

Table 6: Descriptives on municipalities (mean over time)

	N	Mean	SD	Min	Max
Population	196	203,690	200,413	34,918	1,747,648
Building-Age (30-50y)	196	60,981	63,275	9,587	555,872
Children (0-16y)	196	19,031	18,477	2,614	156,955
Average Household Income	196	18,600	2,479	14,207	31,054
Business Tax Revenue p.c.	196	422	270	133	1,917
Unemployment rate	196	0.078	0.033	0.027	0.184
Female Employment Rate	196	0.456	0.045	0.286	0.561
Share Employment in the Hospitality Sector	196	0.263	0.041	0.152	0.456
Share Employment in the Financial Sector	196	0.148	0.046	0.068	0.340
Share Employment in the Public Sector	196	0.311	0.069	0.157	0.511

Source: POPULATION, BUILDING-AGE, CHILDREN, HOUSEHOLD INCOME & SECTORAL SHARES: Federal and state statistical offices. BUSINESS TAX REVENUE, UNEMPLOYMENT RATE & FEMALE EMPLOYMENT RATE: KOSTAT database.

unemployed). They are estimated on the basis of the census and the microcensus. The unemployment rate in municipality i at time t is calculated as the numer of unemployed in i at t divided by all civilian labor force in i at t. Source: INKAR database (http://www.inkar.de)

Business Tax Revenues The variable BUSINESS TAX REVENUES is the business tax revenue in € per inhabitant. In addition to income tax revenues, business tax revenues are particularly important for municipal task planning. Business tax revenues depend primarily on the degree of industrialization and the production structure, but also on the development of the tertiary sector. Municipalities can influence trade tax revenue by setting assessment rates. The variable business tax revenues in municipality i at time t is calculated as the sum of business tax revenues in i at t divided by all residents in i at t. Source: INKAR database (http://www.inkar.de)

Table 7: Sample of Labor Market Regions

No.	Region ID	Munic. ID	Munic. name	Munic. type
1	4	1001	Flensburg, kreisfreie Stadt	City
2	4	1059	Schleswig-Flensburg, Landkreis	County
3	5	1003	Lübeck, kreisfreie Stadt	City
4	5	1055	Ostholstein, Landkreis	County
5	6	1002	Kiel, kreisfreie Stadt	City
6	6	1004	Neumünster, kreisfreie Stadt	City
7	6	1057	Plön, Landkreis	County
8	6	1058	Rendsburg-Eckernförde, Landkreis	County
9	8	2000	Hamburg, kreisfreie Stadt	City
10	8	1056	Pinneberg, Landkreis	County
11	8	1060	Segeberg, Landkreis	County
12	8	1062	Stormarn, Landkreis	County
13	8	3353	Harburg, Landkreis	County
14	9	3101	Braunschweig, kreisfreie Stadt	City
15	9	3157	Peine, Landkreis	County
16	9	3158	Wolfenbüttel, Landkreis	County
17	11	3103	Wolfsburg, kreisfreie Stadt	City
18	11	3151	Gifhorn, Landkreis	County
19	31	3402	Emden, kreisfreie Stadt	City
20	31	3452	Aurich, Landkreis	County
21	33	3403	Oldenburg (Oldenburg), kreisfreie Stadt	City
22	33	3458	Oldenburg, Landkreis	County
23	34	3404	Osnabrück, kreisfreie Stadt	City
24	34	3459	Osnabrück, Landkreis	County
25	35	3405	Wilhelmshaven, kreisfreie Stadt	City
26	35	3455	Friesland, Landkreis	County
27	35	3462	Wittmund, Landkreis	County
28	42	3401	Delmenhorst, kreisfreie Stadt	City
29	42	4011	Bremen, kreisfreie Stadt	City
30	42	3356	Osterholz, Landkreis	County
31	43	4012	Bremerhaven, kreisfreie Stadt	City
32	43	3352	Cuxhaven, Landkreis	County
33	45	5111	Düsseldorf, kreisfreie Stadt	City
34	45	5158	Mettmann, Landkreis	County
35	45	5162	Rhein-Kreis Neuss	County
36	46	5112	Duisburg, kreisfreie Stadt	City
37	46	5119	Oberhausen, kreisfreie Stadt	City
38	46	5170	Wesel, Landkreis	County
39	57	5315	Köln, kreisfreie Stadt	City

Sample of Labor Market Regions (continued)

No.	Region ID	Munic. ID	Munic. name	Munic. type
40	57	5362	Rhein-Erft-Kreis	County
41	57	5378	Rheinisch-Bergischer Kreis	County
42	59	5314	Bonn, kreisfreie Stadt	City
43	59	5382	Rhein-Sieg-Kreis	County
44	63	5512	Bottrop, kreisfreie Stadt	City
45	63	5513	Gelsenkirchen, kreisfreie Stadt	City
46	63	5916	Herne, kreisfreie Stadt	City
47	63	5562	Recklinghausen, Landkreis	County
48	64	5515	Münster, kreisfreie Stadt	City
49	64	5558	Coesfeld, Landkreis	County
50	64	5570	Warendorf, Landkreis	County
51	67	5711	Bielefeld, kreisfreie Stadt	City
52	67	5758	Herford, Landkreis	County
53	73	5913	Dortmund, kreisfreie Stadt	City
54	73	5915	Hamm, kreisfreie Stadt	City
55	73	5978	Unna, Landkreis	County
56	81	6611	Kassel, kreisfreie Stadt	City
57	81	6633	Kassel, Landkreis	County
58	91	6414	Wiesbaden, kreisfreie Stadt	City
59	91	6439	Rheingau-Taunus-Kreis	County
60	92	6412	Frankfurt am Main, kreisfreie Stadt	City
61	92	6413	Offenbach am Main, kreisfreie Stadt	City
62	92	6433	Groß-Gerau, Landkreis	County
63	92	6434	Hochtaunuskreis	County
64	92	6436	Main-Taunus-Kreis	County
65	92	6438	Offenbach, Landkreis	County
66	92	6440	Wetteraukreis	County
67	94	6411	Darmstadt, kreisfreie Stadt	City
68	94	6432	Darmstadt-Dieburg, Landkreis	County
69	100	7111	Koblenz, kreisfreie Stadt	City
70	100	7137	Mayen-Koblenz, Landkreis	County
71	100	7141	Rhein-Lahn-Kreis	County
72	105	7211	Trier, kreisfreie Stadt	City
73	105	7235	Trier-Saarburg, Landkreis	County
74	109	7312	Kaiserslautern, kreisfreie Stadt	City
75	109	7333	Donnersbergkreis	County
76	109	7335	Kaiserslautern, Landkreis	County
77	109	7336	Kusel, Landkreis	County
78	110	7313	Landau in der Pfalz, kreisfreie Stadt	City
79	110	7337	Südliche Weinstraße, Landkreis	County

Sample of Labor Market Regions (continued)

No.	Region ID	Munic. ID	Munic. name	Munic. type
80	111	7315	Mainz, kreisfreie Stadt	City
81	111	7339	Mainz-Bingen, Landkreis	County
82	112	7319	Worms, kreisfreie Stadt	City
83	112	7331	Alzey-Worms, Landkreis	County
84	113	7317	Pirmasens, kreisfreie Stadt	City
85	113	7320	Zweibrücken, kreisfreie Stadt	City
86	113	7340	Südwestpfalz, Landkreis	County
87	114	7311	Frankenthal (Pfalz), kreisfreie Stadt	City
88	114	7314	Ludwigshafen am Rhein, kreisfreie Stadt	City
89	114	7316	Neustadt an der Weinstraße, kreisfreie Stadt	City
90	114	7318	Speyer, kreisfreie Stadt	City
91	114	7332	Bad Dürkheim, Landkreis	County
92	114	7338	Rhein-Pfalz-Kreis	County
93	120	8111	Stuttgart, kreisfreie Stadt	City
94	120	8115	Böblingen, Landkreis	County
95	120	8116	Esslingen, Landkreis	County
96	120	8118	Ludwigsburg, Landkreis	County
97	120	8119	Rems-Murr-Kreis	County
98	122	8121	Heilbronn, kreisfreie Stadt	City
99	122	8125	Heilbronn, Landkreis	County
100	127	8211	Baden-Baden, kreisfreie Stadt	City
101	127	8216	Rastatt, Landkreis	County
102	128	8212	Karlsruhe, kreisfreie Stadt	City
103	128	8215	Karlsruhe, Landkreis	County
104	129	8221	Heidelberg, kreisfreie Stadt	City
105	129	8226	Rhein-Neckar-Kreis	County
106	130	8222	Mannheim, kreisfreie Stadt	City
107	130	6431	Bergstraße, Landkreis	County
108	135	8311	Freiburg im Breisgau, kreisfreie Stadt	City
109	135	8315	Breisgau-Hochschwarzwald, Landkreis	County
110	135	8316	Emmendingen, Landkreis	County
111	145	8421	Ulm, kreisfreie Stadt	City
112	145	8425	Alb-Donau-Kreis	County
113	145	9775	Neu-Ulm, Landkreis	County
114	154	9163	Rosenheim, kreisfreie Stadt	City
115	154	9187	Rosenheim, Landkreis	County
116	159	9162	München, kreisfreie Stadt	City
117	159	9174	Dachau, Landkreis	County
118	159	9175	Ebersberg, Landkreis	County

Sample of Labor Market Regions (continued)

No.	Region ID	Munic. ID	Munic. name	Munic. type
119	159	9177	Erding, Landkreis	County
120	159	9178	Freising, Landkreis	County
121	159	9179	Fürstenfeldbruck, Landkreis	County
122	159	9184	München, Landkreis	County
123	159	9188	Starnberg, Landkreis	County
124	160	9161	Ingolstadt, kreisfreie Stadt	City
125	160	9176	Eichstätt, Landkreis	County
126	160	9185	Neuburg-Schrobenhausen, Landkreis	County
127	160	9186	Pfaffenhofen an der Ilm, Landkreis	County
128	162	9261	Landshut, kreisfreie Stadt	City
129	162	9274	Landshut, Landkreis	County
130	165	9262	Passau, kreisfreie Stadt	City
131	165	9275	Passau, Landkreis	County
132	169	9263	Straubing, kreisfreie Stadt	City
133	169	9278	Straubing-Bogen, Landkreis	County
134	171	9362	Regensburg, kreisfreie Stadt	City
135	171	9375	Regensburg, Landkreis	County
136	173	9361	Amberg, kreisfreie Stadt	City
137	173	9371	Amberg-Sulzbach, Landkreis	County
138	175	9363	Weiden in der Oberpfalz, kreisfreie Stadt	City
139	175	9374	Neustadt an der Waldnaab, Landkreis	County
140	177	9464	Hof, kreisfreie Stadt	City
141	177	9475	Hof, Landkreis	County
142	178	9462	Bayreuth, kreisfreie Stadt	City
143	178	9472	Bayreuth, Landkreis	County
144	179	9461	Bamberg, kreisfreie Stadt	City
145	179	9471	Bamberg, Landkreis	County
146	182	9463	Coburg, kreisfreie Stadt	City
147	182	9473	Coburg, Landkreis	County
148	184	9562	Erlangen, kreisfreie Stadt	City
149	184	9474	Forchheim, Landkreis	County
150	184	9572	Erlangen-Höchstadt, Landkreis	County
151	185	9563	Fürth, kreisfreie Stadt	City
152	185	9564	Nürnberg, kreisfreie Stadt	City
153	185	9565	Schwabach, kreisfreie Stadt	City
154	185	9573	Fürth, Landkreis	County
155	185	9574	Nürnberger Land, Landkreis	County
156	185	9576	Roth, Landkreis	County
157	187	9561	Ansbach, kreisfreie Stadt	City

Sample of Labor Market Regions (continued)

No.	Region ID	Munic. ID	Munic. name	Munic. type
158	187	9571	Ansbach, Landkreis	County
159	190	9663	Würzburg, kreisfreie Stadt	City
160	190	9679	Würzburg, Landkreis	County
161	191	9662	Schweinfurt, kreisfreie Stadt	City
162	191	9678	Schweinfurt, Landkreis	County
163	196	9661	Aschaffenburg, kreisfreie Stadt	City
164	196	9671	Aschaffenburg, Landkreis	County
165	196	9676	Miltenberg, Landkreis	County
166	200	9761	Augsburg, kreisfreie Stadt	City
167	200	9771	Aichach-Friedberg, Landkreis	County
168	200	9772	Augsburg, Landkreis	County
169	201	9764	Memmingen, kreisfreie Stadt	City
170	201	9778	Unterallgäu, Landkreis	County
171	202	9762	Kaufbeuren, kreisfreie Stadt	City
172	202	9777	Ostallgäu, Landkreis	County
173	203	9763	Kempten (Allgäu), kreisfreie Stadt	City
174	203	9780	Oberallgäu, Landkreis	County
175	206	12051	Brandenburg an der Havel, kreisfreie Stadt	City
176	206	12054	Potsdam, kreisfreie Stadt	City
177	206	12063	Havelland, Landkreis	County
178	206	12069	Potsdam-Mittelmark, Landkreis	County
179	207	12052	Cottbus, kreisfreie Stadt	City
180	207	12066	Oberspreewald-Lausitz, Landkreis	County
181	207	12071	Spree-Neiße, Landkreis	County
182	208	12053	Frankfurt (Oder), kreisfreie Stadt	City
183	208	12064	Märkisch-Oderland, Landkreis	County
184	208	12067	Oder-Spree, Landkreis	County
185	242	16051	Erfurt, kreisfreie Stadt	City
186	242	16068	Sömmerda, Landkreis	County
187	243	16052	Gera, kreisfreie Stadt	City
188	243	16076	Greiz, Landkreis	County
189	244	16053	Jena, kreisfreie Stadt	City
190	244	16074	Saale-Holzland-Kreis	County
191	245	16054	Suhl, kreisfreie Stadt	City
192	245	16069	Hildburghausen, Landkreis	County
193	246	16055	Weimar, kreisfreie Stadt	City
194	246	16071	Weimarer Land, Landkreis	County
195	247	16056	Eisenach, kreisfreie Stadt	City

Sample of Labor Market Regions (continued)

No.	Region ID	Munic. ID	Munic. name	Munic. type
196	247	16063	Wartburgkreis	County

Note: This table has all labor market regions consisting of at least one city (the core) and at least one county (the hinterlands), as used in the analysis in the body of the paper.