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Abstract

This paper examines the effects of real estate transfer taxes (RETT) on property prices using a rich micro dataset of roughly 17 million German properties for the period from 2005 to 2019. We exploit a 2006 constitutional reform that allows states to set their own RETT rates, leading to frequent increases in states' tax rates in the subsequent years. Our monthly event study estimates indicate a price response that strongly exceeds the change in the tax burden for single transactions. Twelve months after a reform, a one percentage point increase in the tax rate reduces property prices by on average 3%. Effects are stronger for apartments and apartment buildings than for single-family houses. Moreover, negative price effects are predominantly found in growing housing market regions. Our results can be rationalized by a theoretical model that predicts larger price responses in sellers' markets and for properties with a high transaction frequency.

JEL-Codes: H220, H710, R320, R380.

Keywords: real estate transfer taxes, property taxes, housing market.

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1 Introduction

In many countries, taxes on real estate transfers are an important source of public sector revenue. However, they are often criticized for preventing real estate transactions and for making housing unaffordable, in particular for the middle class.[1] This paper studies how changes in real estate transfer taxes affect house prices. We focus on *permanent* tax changes, which are understudied in the literature. Most existing contributions focus on transitory tax changes or discontinuities in the tax schedule. Understanding effects of permanent increases in transfer taxes is important, not least because growing international mobility of both capital and people may increase pressure to raise more revenue from land and real estate. If that happens, a key question is who bears the tax burden. Is the tax capitalized into house prices so that those who own the house when the reform happens effectively pay the tax? Or do the buyers, who actually remit the tax, bear the burden? To provide answers to these questions, we develop a simple housing market model and test the model's predictions using a large micro dataset of property listings in Germany.

In the first part of the paper, we consider a very stylized overlapping generations model where the price effects of transfer taxes depend on (i) the distribution of bargaining power between the seller and the buyer as well as (ii) the likelihood that the buyer will resell the house in the future. To the best of our knowledge, the second channel has not been studied formally in previous studies. In the second part of the paper, we exploit a reform of the German federal fiscal system in 2006 that gave the German states the right to set the rate of the real estate transfer tax (RETT) autonomously. This allows us to study the price effects of RETT rate changes empirically. Before the reform, there was a nationwide uniform tax rate of 3.5%. After the reform, most states increased their tax rates, some of them multiple times. The timing of these tax increases varies across states. Today, the highest tax rates are equal to 6.5%. In our empirical analysis, we use the variation in RETT rate hikes across German states and over time and employ an event study design to investigate the impact of the RETT on property prices for different property types. To this end, we use a unique dataset covering roughly 17 million properties offered for sale over the period from 2005 to 2019. The data was collected by analyzing real

[1] With 45%, Germany has the lowest homeownership rate in the Eurozone and the second lowest rate among OECD countries. Kaas et al. (2020) estimate that lowering real estate transfer taxes in Germany to the average level of the tax in the US would lead to an increase in the homeownership rate by 6–14 percentage points.

estate advertisements from 140 different sources, including online property portals such as ImmobilienScout24.de, as well as regional and trans-regional newspapers. Our dataset includes a large number of property characteristics, such as the asking price, the first and the last day the property was listed, floor size, the construction year, as well as several amenity features.

Our theoretical model predicts that the price effects of a RETT rate change can be larger than the associated change in the tax burden.[2] Such an overshifting of the tax burden to the sellers can occur if the bargaining power of the seller is high and the (expected) holding period of the property is not too long. Our empirical results are in line with these predictions. In our pooled sample that includes all property types, a one percentage point increase in the RETT rate is found to reduce property prices by roughly 3% within a year after the tax reform, indicating a strong overshifting of the tax burden. Price effects are about two times larger for apartments (and apartments buildings), which are characterized by shorter average holding periods, than they are for single-family houses, which are typically held for a longer time.[3] Also, we find notably stronger price effects in growing housing market regions, while the price effects in shrinking housing market regions are statistically insignificant. We interpret this finding as evidence that — as our theoretical model predicts — the price effect of a RETT rate change is indeed positively related to the bargaining power of the sellers. Growing housing market regions are characterized by high demand for properties, relative to the available supply, arguably resulting in higher bargaining power on the side of the sellers, while shrinking housing market regions are characterized by high supply relative to demand, leading to higher bargaining power for buyers. Our results are robust to several modifications to our empirical specification. Moreover, we find that key assumptions for the identification of causal effects — that is, the common trend assumption and the absence of spillovers from the treatment to the control group — appear to be valid.

In contrast to the present paper, a large part of the existing literature on the effect of property transaction taxes on housing prices either focuses on temporary

[2]This finding refers to the tax liability for a single transaction. Since the tax increase will also apply to future transactions, the true burden implied by the tax increase is likely to be larger, as we will discuss further below. This point is also made by Petkova and Weichenrieder (2017).

[3]An alternative explanation for the large price effect is that buyers are crowded out of the market through downpayment constraints as emphasized by Best and Kleven (2018). As taxes are usually not mortgageable, an increase in the tax burden limits which houses downpayment-constrained households are able to afford.

tax changes or uses discontinuities in property tax schedules (Besley et al., 2014; Kopczuk and Munroe, 2015; Slemrod et al., 2017; Best and Kleven, 2018). Besley et al. (2014) use the 2008-2009 UK stamp duty tax holiday and find that only 60% of the tax relief was passed on to property prices. Due to the temporary nature of the tax reduction, it is not surprising that their estimated price effect is notably smaller than ours, as permanent tax changes also affect the tax burden on all future transactions. Bunching estimates based on notches in the tax schedule, on the other hand, infer the price effects of property transfer taxes from the distribution of property prices in close proximity to the tax notch, thus estimating local effects. Interestingly, the estimates reported in this strand of the literature vary notably. Slemrod et al. (2017) exploit a notched transfer tax in Washington D.C. and find that the burden of the transfer tax is equally split between buyers and sellers. In contrast, Kopczuk and Munroe (2015) use a discontinuity in the so-called 'mansion tax' in New York and New Jersey that applies to residential transactions of US-$ 1 million and more and report that the tax-induced decline in property prices is more than two times larger than the tax liability. Best and Kleven (2018) exploit notches in the UK stamp duty tax and even find a decline in property prices that exceeds the tax paid by four to five times.

The price effect of a permanent tax change is studied by Dachis et al. (2012), who exploit the introduction of a land transfer tax in Toronto in 2008. Their estimates suggest that the introduction of the tax led to a reduction of property prices that is roughly equal to the tax for a single transaction.

There are also studies analyzing the price effects of the German RETT. However, these studies use housing market data aggregated at the state level. Petkova and Weichenrieder (2017) use annual property price indices and transaction volumes to evaluate the effects of RETT rate hikes on the German housing market. For houses and vacant lots, the authors find that the number of transactions declines, while prices are not significantly affected. For apartments, however, the authors report negative price effects, but no effect on the number of transactions. In a similar vein, Fritzsche and Vandrei (2019) find negative effects of RETT rate hikes on monthly transaction volumes for family homes. Their results also suggest that RETT rate hikes are anticipated by market participants. Focusing on commercial property, Baudisch and Dresselhaus (2018) document a reduction in the number of transactions and prices following a RETT rate hike. A problem with these state-level analyses is that they fail to control for regional differences in housing market conditions and property characteristics, which may result in biased estimates. Also, property price indices typically reflect the value of some standardized properties rather than actual property values. These standardized properties are often not representative of the actual property stock, especially at the sub-national level.

Some of the studies discussed above also use theoretical models to analyze the importance of different channels through which transfer taxes may affect property prices. Most of them employ bargaining models similar to ours (Besley et al., 2014; Kopczuk and Munroe, 2015; Slemrod et al., 2017).[4] A novel feature of our model is that it highlights the importance of the likelihood that a property will be resold in the future for the magnitude of the price effect. As we will see later on, this channel has a notable impact on the RETT's price effects.

The remainder of the paper is structured as follows. The next section describes the institutional background of the RETT in Germany. In section 3, we present a simple housing market model that guides our empirical analysis and facilitates the interpretation of our results. Section 4 presents the data and descriptive statistics. In section 5, we describe our empirical approach. Results are presented in section 6. Section 7 concludes.

2 Institutional Background

The RETT is an important source of revenue for the German states. This is not primarily because of its share in overall revenue. With a revenue of 14.1 billion euros in 2018, which corresponds to 4.5% of state level tax revenues, its quantitative weight is limited. Its importance is rather due to fact that it is the only tax with significant revenue where the states can set the tax rate autonomously.[5] The RETT is charged on the purchase price of residential and non-residential property as well as vacant lots and is paid by the buyer.

[4] A different approach is taken by Best and Kleven (2018), who consider a model with downpayment constraints to rationalize large prices responses.

[5] In Germany, tax autonomy is higher at the local level. Local governments can set the property tax rate and the rate of the local business tax. The rates of the most important revenue sources, the income tax and the value added tax, are set at the federal level. Through the second chamber, the states participate in decisions regarding income and value added tax rates, and they receive a share of the revenue.

Table 1: Real estate transfer tax rate changes

State	Initial Tax Rate	Date of Increase	New Tax Rate	First Legal Draft
Baden-Württemberg	3.5%	11/05/2011	5.0%	09/13/2011
Bavaria	3.5%	-	-	-
Berlin	3.5%	01/01/2007	4.5%	11/07/2006
		04/01/2012	5.0%	01/18/2012
		01/01/2014	6.0%	10/10/2013
Brandenburg	3.5%	01/01/2011	5.0%	09/13/2010
		07/01/2015	6.5%	03/04/2015
Bremen	3.5%	01/01/2011	4.5%	06/22/2010
		01/01/2014	5.0%	07/09/2013
Hamburg	3.5%	01/01/2009	4.5%	10/14/2008
Hesse	3.5%	01/01/2013	5.0%	09/25/2012
		08/01/2014	6.0%	05/13/2014
Lower Saxony	3.5%	01/01/2011	4.5%	08/31/2010
		01/01/2014	5.0%	09/17/2013
Mecklenburg-Western Pomerania	3.5%	07/01/2012	5.0%	02/14/2012
North Rhine-Westphalia	3.5%	10/01/2011	5.0%	05/10/2011
		01/01/2015	6.5%	10/28/2014
Rhineland-Palatinate	3.5%	03/01/2012	5.0%	11/23/2011
Saarland	3.5%	01/01/2011	4.0%	10/19/2010
		01/01/2012	4.5%	10/18/2011
		01/01/2013	5.5%	10/08/2012
		01/01/2015	6.5%	10/07/2014
Saxony	3.5%	-	-	-
Saxony-Anhalt	3.5%	03/02/2010	4.5%	09/30/2009
		03/01/2012	5.0%	09/28/2011
Schleswig-Holstein	3.5%	01/01/2012	5.0%	08/23/2010
		01/01/2014	6.5%	07/26/2013
Thuringia	3.5%	04/07/2011	5.0%	01/06/2011
		01/01/2017	6.5%	09/23/2015

Notes: This table shows the timing and the scope of state-level RETT rate increases.
Date format: MM/DD/YYYY.

Before 2006, the RETT rate was uniform across all states. The rate was equal to 2% prior to 1997 and 3.5% between 1997 and 2006. In 2006, a constitutional reform permitted the states to set their RETT rates autonomously. With the exception of Bavaria and Saxony, all states have increased their tax rates since, often multiple times. Until today, RETT rates have been raised 27 times in total. So far, no state has ever reduced its tax rate. Table 1 provides an overview of all RETT rate changes by state, along with the date of the tax increase, the new tax rate, as well as the publishing date of the first legal draft of the bill implementing the tax rate hike. The median time between a RETT rate hike and the first legal draft of the corresponding bill is 3.2 months. We take this time gap between the announcement of the RETT rate change and its implementation into account when choosing a reference period in our empirical analysis (cf. section 5).

As shown by Büttner and Krause (2018), the German fiscal equalization scheme sets strong financial incentives for states to raise their RETT rates. Moreover, the German public debt ceiling ('debt brake') requires state governments to achieve structurally balanced budgets from 2020 onwards, which may explain why the need for budget consolidation is the most frequent official justification for RETT increases (Fritzsche and Vandrei, 2019).

3 A Simple Model of a Housing Market with Transfer Taxes

To guide our empirical analysis, we consider a highly stylized model of a housing market with overlapping generations. There are two types of agents, the young (Y) and the old (O). All agents live for two periods; they are young in the first period and old in the second. The number of households in each generation is normalized to unity. There is a stock of two units of housing in the economy. For simplicity we abstract from depreciation of housing capital and construction.

The utility for the young (old) of owning property while young (old) is given by U^Y(U^O). Property ownership may or may not imply that a household actually occupies the property. There is a perfectly competitive rental market which makes sure that all households live somewhere. For the purposes of our analysis we do not need to model this market explicitly. We consider a housing market with frictions. At the beginning of each period, a fraction $0 < q < 1$ of the young enters the housing market.[6] Only old households consider selling their property. Each young household in the market is matched with an old household.

If no trade takes place, the old agent keeps the property while old and passes it on to the next generation, which generates a utility for the old household denoted by U^O.[7] The reservation utility of the young households is equal to zero. If a

[6] A standard way of modeling frictions would be to assume that a share of $1-q$ young households is liquidity constrained. A limitation of our model is that we do not endogenize q, which implies that changes in transfer taxes in our model do not influence the number of transactions. We make this assumption because our empirical analysis focuses on effects of tax changes on prices, not on the number of transactions. The main objective of our theoretical analysis is to highlight specific factors which are likely to affect the impact of tax changes on prices.

[7] This may or may not include the utility of the old from passing on a property to the next generation. Note that in equilibrium, at the beginning of each period before transactions take place,

transaction takes place, the buyer pays a transfer tax equal to T percent of the property price.

It is straightforward to determine the equilibrium property price. When the young negotiate, they take into account that they will sell the property with probability q when they are old. With probability $1-q$ they will keep and use the property while old, so that the present value of the surplus from buying the property is given by

$$U^Y + \frac{q}{(1+\rho)}p_{t+1} + (1-q)\frac{U^O}{(1+\rho)} - p_t(1+T) \tag{1}$$

where t is the period index and ρ is the discount rate. The surplus of the old agent from selling is simply given by $p_t - U^O$.
The equilibrium property price in period t is thus given by maximizing the Nash maximand

$$\beta \ln\left(U^Y + \frac{q}{(1+\rho)}p_{t+1} + (1-q)\frac{U^O}{(1+\rho)} - p_t(1+T)\right) + (1-\beta)\ln(p_t - U^O) \tag{2}$$

over p_t, which yields

$$p_t^*(1+T) = \beta U^O(1+T) + (1-\beta)\left(U^Y + \frac{q}{(1+\rho)}p_{t+1} + (1-q)\frac{U^O}{(1+\rho)}\right). \tag{3}$$

where β refers to the bargaining power of the buyer. Our analysis focuses on the property price effects of changes in the transfer tax rate T which are perceived as permanent. It is therefore sufficient to consider the tax effect on prices in the steady state, where prices are the same in each period in this stationary model. The steady state property price is given by

$$p^* = \left(1+T-\frac{(1-\beta)q}{(1+\rho)}\right)^{-1}\left[\beta U^O(1+T) + (1-\beta)\left(U^Y + (1-q)\frac{U^O}{(1+\rho)}\right)\right]. \tag{4}$$

Denote the semi-elasticity of the property price with respect to the tax rate by $\varepsilon \equiv \frac{dp^*}{dT}\frac{1}{p^*}$. Consider first the two polar cases $\beta = 1$ (buyer has all the bargaining power) and $\beta = 0$ (seller has all the bargaining power). If the buyer has all the bargaining power it follows directly from (4) that $\varepsilon = 0$. Since the seller is always

only the old households own houses, which is why only they can sell houses. After transactions have taken place, the old households still own $2-q$ units of housing. At the end of period two, the old households die and the houses owned by the old are inherited by the next generation of old households.

reduced to her reservation utility and the property price is the net of tax price, changes in T are always fully borne by the buyer and the property price does not change. In the opposite polar case, where the seller has all the bargaining power ($\beta = 0$), we get

$$\varepsilon = -\frac{1}{1 + T - \frac{q}{(1+\rho)}}. \tag{5}$$

Equation (5) yields various important insights. First, if q converges to zero, which implies that buyers do not expect further transactions during their lifetime, a one percentage point increase in the transfer tax ($dT = 0.01$) reduces the price by approximately 1%. But if q is positive, the decline in the price will be larger than 1% because the tax increase is also expected to be a burden on future transactions. We may then observe that a one percentage point increase in the real estate transfer tax reduces property prices by more than 1%. Unsurprisingly, the impact of future transactions is stronger, the lower the discount rate.

Consider finally the general case $0 < \beta < 1$, where:

$$\varepsilon = \left[1 + T - \frac{(1-\beta)q}{(1+\rho)}\right]^{-1} \left[\frac{\beta U^O}{p^*} - 1\right] < 0 \tag{6}$$

As we show in Appendix A.1, equation (6) defines ε as a function of β and q, that is $\varepsilon = \varepsilon(\beta, q)$, with $\frac{\delta\varepsilon}{\delta\beta} > 0$ and $\frac{\delta\varepsilon}{\delta q} < 0$. For our empirical analysis, this implies that we would expect to see (i) a smaller price reduction in response to a tax increase in case the bargaining power of the buyers is higher and (ii) a larger price reduction in case the traded property is expected to be traded more frequently in the future.[8]

4 Data and Descriptive Statistics

In our empirical analysis we use a novel and large dataset on the German real estate market provided by F+B, a commercial real estate consultancy firm. The dataset covers roughly 17 million properties that were offered for sale in Germany during the period from January 2005 until December 2019. The dataset was created by analyzing real estate advertisements from 140 different sources, including online

[8] Of course, the expected number of future transactions will itself be a function of the transfer tax. In the simple model considered here, the number of future transactions is exogenous because our empirical analysis focuses on price effects, not the quantity of property transactions.

property portals, regional and trans-regional newspapers, as well as real estate agencies, using web-scraping techniques. The raw data was thoroughly cleaned to make sure that properties that were listed in more than one source at the same time only appear once in the final dataset. For all properties included in the final dataset, we know the first and the last day the property was listed. Moreover, the final dataset includes the complete list of sources in which the property was advertised.

The dataset contains three price variables: the offering price of the property on the day it was first listed, the offering price on the last day the property was listed, and a proxy for the actual selling price of the property, which is equal to the offering price on the last day of the listing minus an estimated deduction. F+B estimates this deduction based on matching a subsample of the advert data to actual transaction data. In our analysis, we primarily focus on the final offering price and use the estimated selling price in a robustness check. Moreover, the dataset covers a wide range of property characteristics, such as floor space, the number of rooms, the construction year, as well as binary indicators for equipment and locational features, and the postal code of the property. The data is available for three different property types: apartments, single-family houses, and apartment buildings. In our empirical analysis, we study the price effects of a change in the RETT both for a pooled sample and separately for each property type.

Over the last decades, there was a very heterogeneous development of property prices in Germany. Some large German cities, such as Berlin, Frankfurt, Hamburg, and Munich, as well as areas in their vicinity, have experienced a rapid increase in property prices, considerably driven by a substantial growth in population size. At the same time, there are some predominantly rural areas in Germany that suffer from a population drain, leading to declining property prices. To mitigate concerns that our results might be affected by some outliers that have experienced extreme migration patterns during our sample period, we winsorize our sample according to municipal population growth between 2005 and 2017.[9] More precisely, we drop all municipalities with a population growth rate that is smaller than the population-weighted 5% quantile or larger than the population-weighted 95% quantile of the

[9] Administrative data on municipal population size was only available until 2017 at the time of writing the paper.

population growth rate.[10]

Table 2 shows descriptive statistics for the full sample and the winsorized sample separately for each property type. The figures suggest that the average realizations of important property characteristics are fairly stable across both samples. For apartments (single family houses/apartment buildings), the average final asking price per square meter is EUR 2,135 (EUR 1,729/EUR 1,161) in the full sample compared to EUR 2,067 (EUR 1,767/EUR 1,205) in the winsorized sample. The average apartment in both samples has a floor size of around 96 square meters, three rooms, and was built in 1980. For single-family houses, the average floor size is around 152 to 153 square meters and the average number of rooms is five. Our final sample comprises roughly 7.6 million apartments, 8.6 million single-family houses, and 830,000 apartment buildings.

Table 2: Real estate data: Full vs. winsorized sample

	Apartments		Single-family Houses		Apartment Buildings	
	Full sample	Winsorized	Full sample	Winsorized	Full sample	Winsorized
First price	2,146	2,078	1,739	1,778	1,169	1,213
Last price	2,135	2,067	1,729	1,767	1,161	1,205
Floor size	96.5	96.6	151.9	152.6	329.3	328.8
Rooms	3.1	3.1	5.0	5.0	8.5	8.5
Constr. year	1980	1980	1980	1981	1953	1955
Kitchen	0.35	0.35	0.21	0.22	0.18	0.19
Parking spot	0.63	0.63	0.59	0.60	0.64	0.65
Garden	0.25	0.25	0.36	0.37	0.34	0.35
Balcony	0.42	0.42	0.32	0.32	0.33	0.34
Basement	0.40	0.41	0.39	0.40	0.40	0.41
Obs. (max.)	8,687,213	7,618,910	10,157,288	8,644,239	980,249	829,039

Notes: The table shows the average realizations of different property characteristics for different property types separately for the full sample and a sample that is winsorized based on municipal population growth rates. Floor space is measured in square meters. Asking prices refer to the price per square meter. Note that the construction year is missing for some properties, which is why the number of observations for this variable is smaller than it is for the others.

Table 3 shows the sample means separately for three different time periods: 2005-2009, 2010-2014, and 2015-2019. A glance at the price variables suggests that property prices have increased notably over the past years. I.e., between 2015 and 2019, the average price per square meter for an apartment (single-family house)

[10]Dropping properties offered for sale in areas that experienced particularly large increases and declines in population growth, rather than directly winsorizing based on property prices, ensures that the selection of our sample is not endogenous, that is, related to price changes induced by a decrease in RETT rates.

was roughly EUR 780 (EUR 490) higher than it was between 2010 and 2014. This corresponds to a price increase of about 42% (30%).

Table 3: Real estate data: Summary statistics by time period

	Apartments			Single-family Houses			Apartment Buildings		
	2005-09	2010-14	2015-19	2005-09	2010-14	2015-19	2005-09	2010-14	2015-19
First price	1701	1857	2635	1614	1636	2123	1013	1056	1446
Last price	1683	1849	2629	1598	1628	2116	998	1049	1439
Floor size	93.2	94.3	102.4	150.7	152.6	154.5	387.1	312.4	328.0
Rooms	3.1	3.1	3.2	4.8	5.1	5.1	7.5	8.5	8.9
Constr. year	1979	1978	1982	1982	1979	1981	1955	1953	1956
Kitchen	0.32	0.40	0.31	0.17	0.22	0.26	0.12	0.17	0.23
Parking spot	0.62	0.63	0.65	0.58	0.61	0.60	0.58	0.65	0.67
Garden	0.25	0.22	0.27	0.33	0.32	0.46	0.31	0.28	0.42
Balcony	0.47	0.37	0.44	0.31	0.24	0.42	0.34	0.24	0.44
Basement	0.28	0.47	0.46	0.35	0.41	0.43	0.31	0.40	0.45
Obs. (max.)	2,286,182	2,879,276	2,453,452	2,959,107	3,070,274	2,614,858	109,095	370,830	349,114

Notes: The table shows the average realizations of different property characteristics for different property types and across different time periods. Floor space is measured in square meters. Asking prices refer to the price per square meter. Note that the construction year is missing for some properties, which is why the number of observations for this variable is smaller than it is for the others.

A closer inspection of our data reveals that a large fraction of the properties included in our dataset was advertised on the online property portal ImmobilienScout24.de, which is by far the largest online property portal in Germany. To check whether properties listed on ImmobilienScout24.de differ from those advertised in other outlets, we compare the characteristics of properties listed on ImmobilienScout24.de to the characteristics of properties that were solely listed in other outlets. The descriptive statistics in Table 4 of Appendix A.2 indicate that properties listed on ImmobilienScout24.de do not appear to be representative of the German property market. On average, properties listed on ImmobilienScout24.de are more expensive than properties solely listed in other outlets. Also, the characteristics of properties advertised on ImmobilienScout24.de differ from the characteristics of properties listed in other sources. For instance, apartments advertised on ImmobilienScout24.de appear to be smaller, but are more likely equipped with a kitchen, a parking spot, a garden, a balcony, and a basement. This underlines our dataset's higher degree of representativity compared to web-scraped Immobilienscout24.de data used by other studies on the German real estate market.

Finally, Table 5 of Appendix A.2 presents descriptive statistics for properties in shrinking and growing housing market regions. In the course of our empirical analysis, we analyze the price effects of RETT rate changes separately for these two regions in order to study the importance of the distribution of bargaining power across buyers and sellers. Asking prices per square meter are considerably higher in growing housing market regions. Moreover, properties in growing housing market regions are younger on average than those in shrinking housing market regions and are more likely equipped with a kitchen, a parking spot, a balcony, and a basement.

5 Empirical Strategy

We employ an event study design to assess the impact of changes in RETT rates on residential property prices. All of our regressions are based on some form of the following equation:

$$ln(p)_{i,c,t} = \sum_{j=-12}^{23} \beta_j \Delta\tau_{c,t-j} + \mu_c + \varsigma_{c,t} + \epsilon_{i,c,t} \tag{7}$$

Index i refers to the property, c to the postal code area the property is located in, and t to the month it was offered for sale. The dependent variable is the log of the offering price per square meter. As event study indicator, we use $\Delta\tau$ which depicts the size of the tax rate change. The event window runs from 12 months prior to the tax change to 24 months after the tax change.[11] End points are adjusted in line with Schmidheiny and Siegloch (2019). We include postal code area fixed effects μ_c to account for time-invariant local characteristics that influence property prices. $\varsigma_{c,t}$ is a time-fixed effect for months and years which we interact with a set of four different dummy variables indicating the degree of urbanization. Indicators for the degree of urbanization (*Siedlungsstrukturelle Kreistypen*) are provided by the Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR). Through these interaction terms, we account for the fact that property prices have experienced a stronger increase in urban areas over the last years (Baldenius et al., 2019). Standard errors are clustered at the postal code level.

Deviating from the standard event study setting, we choose $t-4$ as the reference period relative to which the change in property prices is measured. We do so for two reasons. First, the price of a property offered for sale shortly before

[11] The final month of the event window is indicated by the number 23 as the month of the tax change is coded as 0.

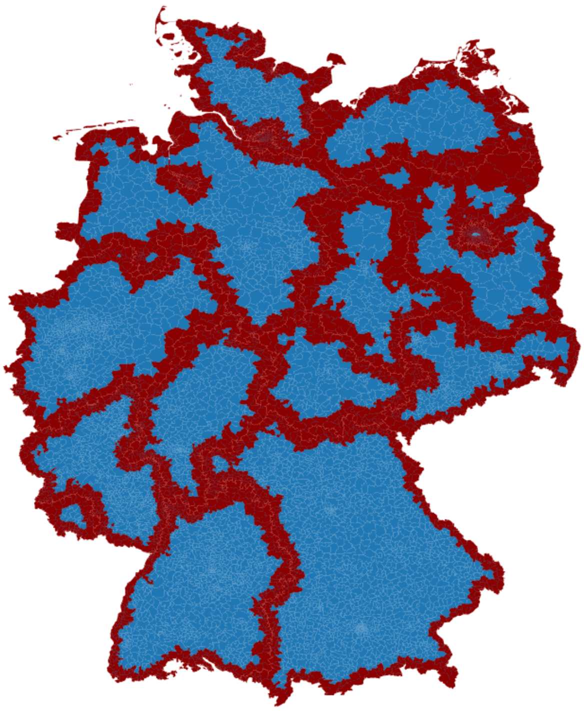
a tax reform might already reflect the upcoming tax rate change. As it may take several months to complete a property transaction, setting an earlier reference period ensures that prices are compared to a time period in which the preceding tax rate still applies. Second, the median time between the first legal draft of the bill through which a tax rate hike was implemented and the day the reform became effective amounts to 3.2 months (Table 1). The 4-month window hence ensures that the pre-treatment development of property prices is not affected by announcement effects.

In our baseline specification, we estimate Equation 7 for our pooled sample including all property types (section 6.1). We then check for heterogeneous price effects in order to test the theoretical predictions of our model. First, we estimate Equation 7 separately for apartments, single-family houses, and apartment buildings (section 6.2). This allows us to test the importance of transaction frequencies for the price effects since the average holding period varies across property types as we will discuss below. Second, we estimate Equation 7 separately for growing and shrinking housing market regions (section 6.3). Housing market regions are defined by the BBSR taking into account regional population growth, migration patterns, the development of the number of employed and unemployed persons, income growth, and the fiscal situation of local governments. We expect the bargaining power of sellers (buyers) to be higher in growing (shrinking) housing market regions, implying larger (smaller) expected price effects in growing (shrinking) housing market regions.

We conduct various robustness checks (section 6.4). First, we employ the change in the log net-of-tax rate as event study indicators as in Fuest et al. (2018). The coefficient estimates of these indicators measure the elasticity of property prices with respect to the net-of-tax rate $\eta = (\frac{\Delta p}{p})/(\frac{\Delta(1-\tau)}{1-\tau})$. Second, we include several property characteristics that may affect property prices per square meter to our empirical model. We include the floor space, the number of rooms, dummy variables for construction year groups, as well as dummy variables indicating whether the property comes with a kitchen, a parking spot, a garden, a balcony, or a basement (see Tables 2 to 5). Third, we include regional control variables that are related to the state's fiscal position and local property market developments. These variables include state debt per capita, the log of per-capita GDP, and the unemployment rate. The latter two variables are measured at the county-level. Note that all regional variables are only available at an annual frequency. The data are provided by the German Federal and the German States' Statistical Offices. Fourth, we make use of the full sample and use F+B's proxy variable for the actual selling price as our left-hand side variable.

Finally, we address the concern that effects in border regions may be partially driven by spillover effects. An increase in a state's tax rate may shift demand to border regions in neighboring states, which might result in higher prices in the control group. Such a spillover effect from the treatment to the control group would represent a violation of the SUTVA assumptions for the identification of a causal treatment effect (Imbens and Rubin, 2015) and could lead to an overestimation of price effects. We test for the presence of spillover effects in two different ways. First, we estimate a specification without observations in the vicinity of a border. More precisely, we exclude postal code areas that either directly adjoin a state border, or for which the postal code's centroid is located at a distance of up to 10 kilometers to the border. Figure 1 indicates which postal codes areas are excluded in this specification. Second, we restrict the sample to border regions and define the event as a RETT tax increase taking place in the neighboring state.

Figure 1: Postal codes in the vicinity of state borders



Notes: This figure shows all German postal code areas, distinguished by their distance to state borders. Red areas indicate postal codes that either directly adjoin a state border or whose centroid is located at a distance of up to 10 kilometers to a border.

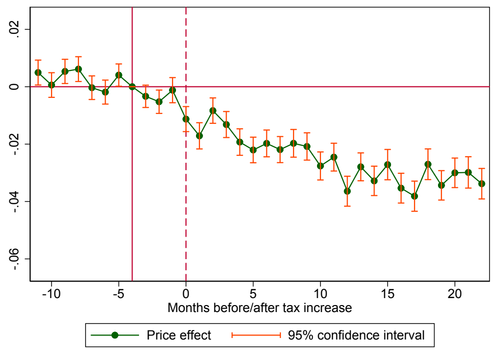
6 Results: The Effect of RETT Rate Hikes on Property Prices

6.1 Price Effects for the Pooled Sample

Figure 2 displays the results for the baseline specification in which we employ the change in the RETT rate $\Delta\tau$ as event study indicator. We estimate our empirical model based on a pooled sample including apartments, houses, and apartment buildings. The solid vertical line at $t = -4$ indicates our reference period (i.e., the median time gap between the presentation of the first legal draft of the bill implementing the tax rate hike in the state parliament and the month the reform became effective, cf. section 5). The dashed vertical line at $t = 0$ indicates the month of the tax rate change taking effect. Our results show that prices start to drop immediately after the tax rate hike becomes effective. There is a gradual decline in prices until the price response reaches a minimum at around -0.03 after one year. This indicates that an increase in the RETT rate by one percentage point reduces prices by up to 3%, implying that the reduction in the property price exceeds the increase in the tax burden for a single transaction.

While our results stand in contrast to previous findings for Germany, the observed overshifting is consistent with Best and Kleven (2018), Kopczuk and Munroe (2015) and Davidoff and Leigh (2013), who also find a reduction in real estate prices that exceeds the increase in the tax burden by far. In the following sub-sections, we investigate two factors that may contribute to this overshifting as highlighted in our theoretical model: the role of transaction frequencies and the distribution of bargaining power between buyers and sellers.

Figure 2: Joint estimation for apartments, houses, and apartment buildings



Notes: The figure plots monthly event study estimates and corresponding 95% confidence bands for a pooled sample including apartments, single-family houses, and apartment buildings. The dependent variable is a property's log price per square meter, and event study indicators correspond to the change in the tax rate $\Delta\tau$. Specifications include postal code and month-year $\times$ urbanization level fixed effects. Standard errors are clustered at the postal code level. N=17,092,188.

6.2 Price Effects by Property Types

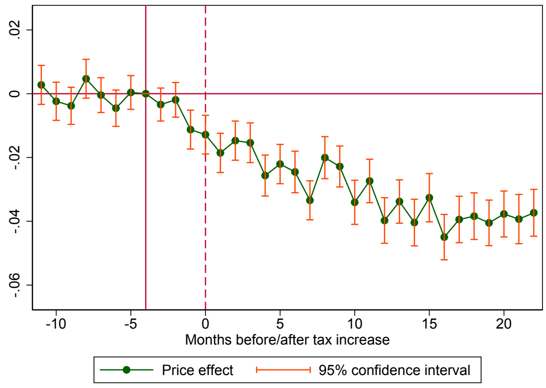
Our theoretical model predicts that the price effect of a RETT rate change is larger when a property is expected to be traded more frequently in the future (see section 3). While we neither observe the transaction frequency in our data directly nor whether the buyer has an investment motive or intends to use the property as an owner-occupier, there are well-documented differences in holding periods across property types. As reported by Deutsche Bundesbank (2018), apartments have a higher transaction frequency than single-family houses. One explanation for this is that single-family houses are mainly bought by families who plan to live in the property for many years (and may even have a bequest motive), while apartments (and apartment buildings) are more frequently bought by investors who often resell the property at some point in time. We therefore estimate the event study specification separately for apartments, single-family houses, and apartment buildings in order to empirically test the theoretical prediction of our model.

Results are presented in Figure 3. In line with the prediction of our model, we find the largest price effects for apartments and – with larger standard errors – apartment buildings. For these property types, the price response reaches a minimum of roughly -0.04. While apartment prices decline gradually until stabilizing roughly 12 months after the reference period, the price response is more immediate for apartment buildings. Our estimates suggest that an increase in the RETT rate by one percentage point reduces the prices of apartments and apartment buildings by up to 4%. In contrast, with a minimum coefficient of roughly -0.02, the price response is smaller for single-family houses for whom an increase in the tax rate by one percentage point leads to a price reduction of 2%.

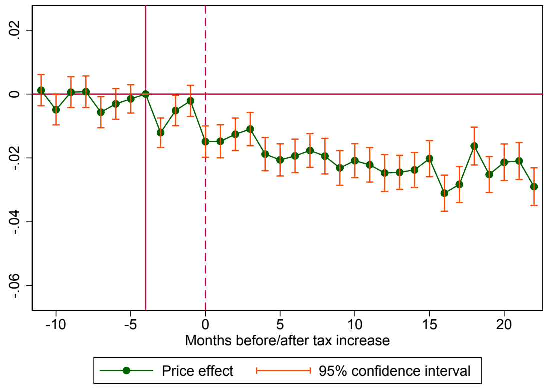
The price decrease thus exceeds the increase in the tax burden not only for the pooled sample, but also for all three property types. Interestingly, prices start to react already prior to the reform right after the draft law presentation. This is in line with our expectations and reflects the importance of anticipation effects. If a property is offered for sale shortly before the RETT rate change becomes effective, it is unlikely that the transaction will be completed before the implementation date, implying that the higher RETT rate will apply. Therefore, we already observe a decrease in property prices before the implementation of the reform.

Figure 3: Effects of changes in the RETT rate $\Delta\tau$ across property types

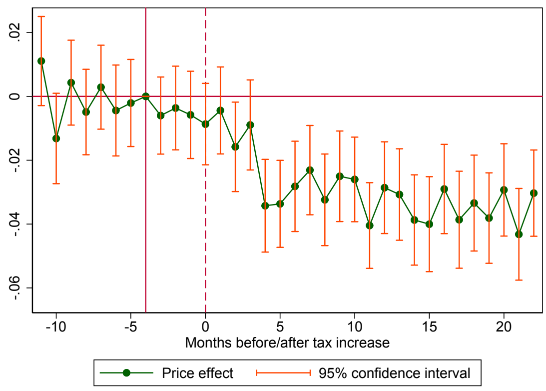
(a) Apartments



(b) Single-family houses



(c) Apartment buildings



Notes: The figure plots monthly event study estimates and corresponding 95% confidence bands. The dependent variable is a property's log price per square meter, and event study indicators correspond to the change in the tax rate $\Delta\tau$. Specifications include postal code and month-year $\times$ urbanization level fixed effects. Standard errors are clustered at the postal code level. a) N=7,618,910 (apartments). b) N=8,644,239 (single-family houses). c) N=829,039 (apartment buildings).

6.3 Price Effects by Housing Market Regions

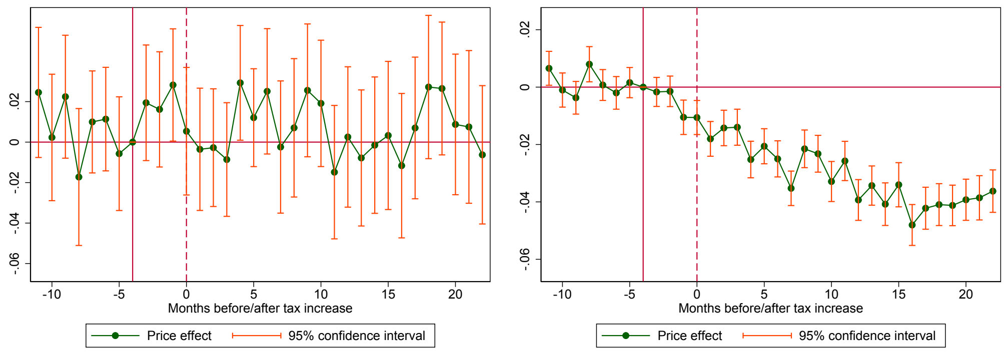
Besides the transaction frequency, our theoretical model predicts that the distribution of bargaining power between sellers and buyers is a key determinant of the magnitude of the price response. Since bargaining power is not directly observable, we use a proxy instead. We focus on different housing market regions which differ in their demographic and socio-economic structures and, hence, very likely also in the way how bargaining power is distributed between buyers and sellers. The BBSR classifies housing market regions as 'strongly growing', 'growing', 'with no clear trend', 'shrinking', or 'strongly shrinking', depending on the realizations of the following indicators: a) average yearly population growth (in %), b) average yearly total migration balance (per 1,000 inhabitants), c) average yearly change in the working age population (i.e., persons between 20–64 years; in %), d) average yearly change in the number of employees subject to social insurance contributions (in %), e) average yearly change in the unemployment rate (in percentage points), and f) average yearly change in local business tax revenue per inhabitant (in %).[12] In particular, growing (shrinking) housing market regions are characterized by relatively high demand for (supply of) apartments and houses. We interpret this as going along with a higher bargaining power for sellers (buyers)(Bundesinstitut für Bau-, Stadt- und Raumforschung, 2015).

We pool 'strongly growing' and 'growing' as well as 'strongly shrinking' and 'shrinking' housing market regions, respectively, and estimate our event study specification separately for these two groups. Results are shown in Figures 4 to 6. In line with the predictions derived from our theoretical model, we observe mostly insignificant coefficients for shrinking housing market regions where the bargaining power of the seller is expected to be low, while price responses in growing housing market regions closely resemble those presented in Figure 3. In other words, we only observe the seller to bear the burden of the RETT in those markets where her bargaining power is expected to be high. As before, price responses are stronger for apartments and apartment buildings as compared to single-family houses.

[12] Most of these indicators are measured over the period 2011–16 which is only a sub-period of our sample period. However, a comparison with previous years reveals that there are relatively little changes in the classifications over time.

Figure 4: Effects of changes in the RETT rate $\Delta\tau$ across housing market regions: Apartments

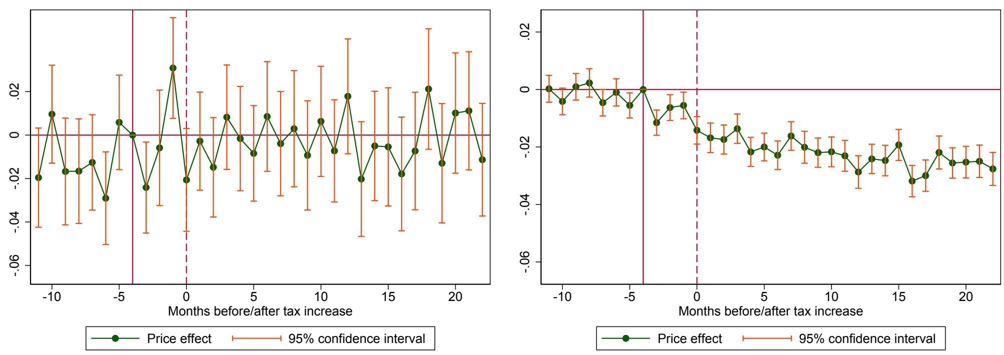
(a) Shrinking Housing Market Regions (b) Growing Housing Market Regions



Notes: The figure plots monthly event study estimates and corresponding 95% confidence bands for apartments across housing market regions. The dependent variable is a property's log price per square meter, and event study indicators correspond to the change in the tax rate $\Delta\tau$. Specifications include postal code and month-year $\times$ urbanization level fixed effects. Standard errors are clustered at the postal code level. Panel (a): N=437,730. Panel (b): N=6,692,988.

Figure 5: Effects of changes in the RETT rate $\Delta\tau$ across housing market regions: Single-family houses

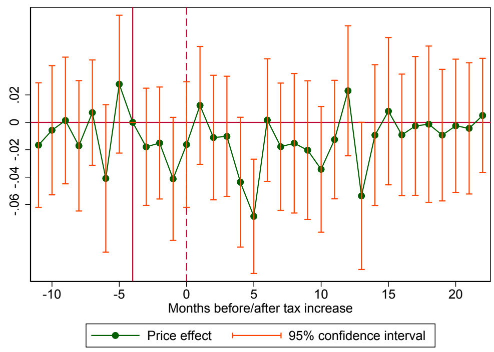
(a) Shrinking Housing Market Regions (b) Growing Housing Market Regions



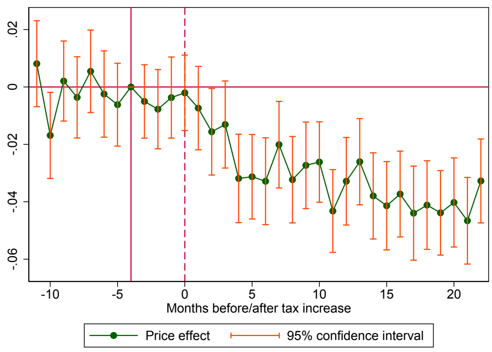
Notes: The figure plots monthly event study estimates and corresponding 95% confidence bands for single-family houses across housing market regions. The dependent variable is a property's log price per square meter, and event study indicators correspond to the change in the tax rate $\Delta\tau$. Specifications include postal code and month-year $\times$ urbanization level fixed effects. Standard errors are clustered at the postal code level. Panel (a): N=708,186. Panel (b): N=7,221,060.

Figure 6: Effects of changes in the RETT rate $\Delta\tau$ across housing market regions: Apartment buildings

(a) Shrinking Housing Market Regions



(b) Growing Housing Market Regions



Notes: The figure plots monthly event study estimates and corresponding 95% confidence bands for apartment buildings across housing market regions. The dependent variable is a property's log price per square meter, and event study indicators correspond to the change in the tax rate $\Delta\tau$. Specifications include postal code and month-year $\times$ urbanization level fixed effects. Standard errors are clustered at the postal code level. Panel (a): N=97,402. Panel (b): N=660,315.

6.4 Robustness Checks

To check the robustness of our results, we modify our empirical specification in several additional ways. Results are displayed in Appendix A.3. As a first robustness check, we replace the change in the RETT rate by the log net-of-tax rate. A glance at Figure 7 reveals that our results remain qualitatively unchanged. For apartments and apartment buildings, the estimated price elasticity with respect to the log net-of-tax rate reaches a maximum of 4, while the estimated elasticity for houses is roughly 2.

Second, we add property-specific control variables to Equation 7. Specifically, we control for the floor space in square meters, the number of rooms, construction year categories, as well as various amenities (see Table 2). Controlling for property characteristics ensures that our findings are indeed due to changes in offering prices and not driven by composition effects. This concern would be relevant if a change in the RETT has an effect on the pool of properties that are offered for sale. As shown in Figure 8, the coefficients' magnitudes slightly decreases, while the differential price responses across property types persist.

In a third robustness check, we add control variables to our empirical model that cover local housing market conditions (per-capita GDP, the unemployment rate) and the state's fiscal space (state debt per capita). The results are illustrated in Figure 9. Again, we find somewhat smaller price responses compared to our baseline specification, but results remain qualitatively unchanged.

Fourth, we make use of the full sample and employ F+B's proxy variable for actual transaction prices as a dependent variable. Results are virtually identical to the baseline results presented in Figure 3 (and available upon request). This latter finding is re-assuring as it suggests that the last offer price is a close proxy for the actual transaction price and differences between the two do not change around RETT rate hikes.

In a final robustness check, we investigate to what extent our results may be driven by spillover effects. The existence of spillover effects would constitute a violation of the SUTVA assumptions for causal inference and may result in biased estimates of the price effects (Imbens and Rubin, 2015). We test for the existence of spillover effects in two different ways. Our first approach is to exclude properties located in postal code areas in the vicinity of a state border, as described in section 5. The reason is that there may be spillover effects of RETT changes into regions that are located close to the border of a state that has implemented the RETT change. Suppose there is a region located in state A bordering state B. If state B increases the RETT, but state A does not, we may observe an increase in the demand for properties located in that region because of its proximity to state B. Figure 10 shows the results. While the estimated price effects for single-family houses and apartment buildings are virtually identical to the ones obtained in our baseline estimation, the magnitude of coefficient estimates slightly increases for apartments. This alleviates the concern that the rather large effect measured in the baseline specification is attributable to spillover effects into border regions of tax-increasing states.

Our second approach is a more direct test for spillover effects. We estimate an event study specification for border regions with the event being a RETT rate hike in the neighboring state, provided that there is no change in the RETT rate during the event window in the state the postal code area is located in. That is, we exclusively focus on those postal code areas close to state borders that were excluded in the first approach. Moreover, we vary the maximum distance to the border and estimate specifications with maximum distances of either 10 or 20 kilometers to the border. Significant treatment effects would indicate that RETT rate changes in the neighboring state affect property prices in close proximity to the tax-increasing state. We do not find any evidence for spill-over effects as all event study coefficients are insignificant (results available upon request).

7 Conclusion

This paper exploits a constitutional reform that was passed in Germany in 2006 to study the effect of changes in the real estate transfer tax (RETT) on property prices. The reform gave the German states the right to set the rate of the RETT autonomously. Over the following years, 14 out of the 16 states used this right and increased the RETT rate, often various times. Up to date, there have been 27 tax hikes. Before the reform, there was a uniform RETT rate of 3.5% that applied to all German states. Today, the highest RETT rate amounts to 6.5%.

We combine the information on RETT rate changes at the state level with a large micro dataset covering roughly 17 million properties offered for sale during the period from January 2005 until December 2019. The dataset was created by collecting information from property listings using web-scraping techniques. This information was collected from 140 different sources, including online property portals, regional and trans-regional newspapers, as well as property brokers. Based on this dataset, we analyze the effect of an increase in the RETT rate on property prices using an event study design. We conduct our analysis both for our pooled sample and separately for apartments, single-family houses, and apartment buildings.

We propose a stylized theoretical model of the housing market that guides our empirical analysis. One of the main insights of the model is that an increase in the RETT rate may result in a decline in property prices that exceeds the tax increase. Our model predicts that the semi-elasticity of the house price with respect to the RETT may be larger than one if the bargaining power of the seller is high and if a property is expected to be traded frequently in the future.

Our empirical findings lend support to our theoretical model and have important policy implications. We find that a one percentage point increase in the RETT reduces prices of apartments and apartment buildings by roughly 4% and single-family house prices by 2% in the 12 months after the reform. These results confirm a positive association between the magnitude of the price effect and the expected transaction frequency of a property as average holding periods are higher for single-family houses than for apartments and apartment buildings. We further show that negative price effects are predominantly found in growing housing market regions where one can expect a high bargaining power of sellers. Our results are robust to several modifications to our empirical specifications. Overall, the tax burden of the real estate transactions tax mainly falls on the sellers, especially in growing housing market regions. In terms of policy implications, our results suggest that making greater use of these taxes does not make housing less affordable for first time buyers because it is capitalized in property prices. Accordingly, tax cuts may give rise to windfall profits for property sellers.

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Appendix

A.1 Theoretical Model: General Case

In this appendix we show that $\frac{\delta\varepsilon}{\delta\beta} > 0$ and $\frac{\delta\varepsilon}{\delta q} < 0$, as claimed in the main text.

From equation (6) we can derive

$$\begin{aligned}\frac{\delta\varepsilon}{\delta\beta} = &- \left[1 + T - \frac{(1-\beta)q}{(1+\rho)}\right]^{-2} \frac{q}{(1+\rho)} \left[\frac{\beta U^O}{p^*} - 1\right] \\ &+ \left[1 + T - \frac{(1-\beta)q}{(1+\rho)}\right]^{-1} \frac{U^O}{p^{*2}} \left[p^* - \beta\frac{\delta p^*}{\delta\beta}\right]\end{aligned} \tag{A.1}$$

Note that the first term on the right hand side of equation (A.1) is positive because $\frac{\beta U^O}{p^*} - 1 < 0$. The second term on the right hand side of equation (A.1) is also positive because the price declines with increasing bargaining power of the buyers, i.e.

$$\frac{\delta p^*}{\delta\beta} = - \left[1 + T - \frac{(1-\beta)q}{(1+\rho)}\right]^{-1} \left[\frac{p^* q}{(1+\rho)} - U^O(1+T) + U^Y + (1-q)\frac{U^O}{(1+\rho)}\right] < 0 \tag{A.2}$$

From equation (6) we can also derive

$$\begin{aligned}\frac{\delta\varepsilon}{\delta q} = &\left[1 + T - \frac{(1-\beta)q}{(1+\rho)}\right]^{-2} \frac{(1-\beta)}{(1+\rho)} \left[\frac{\beta U^O}{p^*} - 1\right] \\ &- \left[1 + T - \frac{(1-\beta)q}{(1+\rho)}\right]^{-1} \frac{\beta U^O}{p^{*2}} \frac{\delta p^*}{\delta q}\end{aligned} \tag{A.3}$$

The first term on the right hand side of equation (A.3) is negative because $\frac{\beta U^O}{p^*} - 1 < 0$. The second term is also negative because

$$\frac{\delta p^*}{\delta q} = \left[1 + T - \frac{(1-\beta)q}{(1+\rho)}\right]^{-1} \frac{(1-\beta)}{(1+\rho)}(p^* - U^O) > 0. \tag{A.4}$$

q.e.d.

A.2 Additional descriptive statistics

Table 4: Real estate data: Summary statistics by data source

	Apartments		Single-family Houses		Apartment Buildings	
	IS24	Other sources	IS24	Other sources	IS24	Other sources
First price	2162	2012	1840	1731	1280	1177
Last price	2149	2003	1828	1721	1269	1171
Floor size	94.7	98.1	149.6	154.8	311.5	339.0
Rooms	3.2	3.0	5.3	4.8	10.4	7.4
Constr. year	1979	1980	1983	1978	1955	1955
Kitchen	0.38	0.33	0.15	0.27	0.11	0.23
Parking spot	0.67	0.60	0.62	0.58	0.68	0.63
Garden	0.28	0.22	0.32	0.40	0.31	0.36
Balcony	0.48	0.38	0.29	0.35	0.31	0.35
Basement	0.50	0.33	0.46	0.35	0.51	0.35
Obs. (max.)	3,420,820	4,198,090	3,812,550	4,831,689	306,565	522,474

Notes: The table shows the average realizations of different property characteristics for different property types separately for properties listed on immobilienscout24.de (IS24) vs. properties listed in other sources. Floor space is measured in square meters. Asking prices refer to the price per square meter.

Table 5: Real estate data: Summary statistics by housing market region

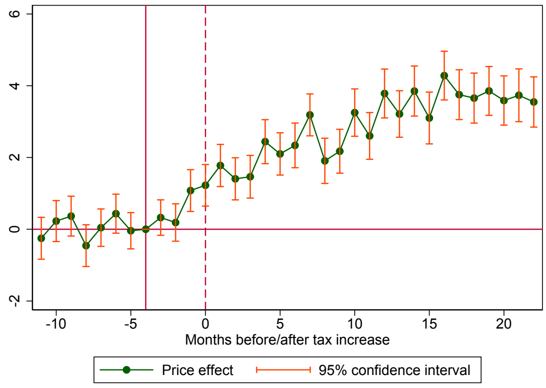
	Apartments		Single-family Houses		Apartment Buildings	
	Shrinking	Growing	Shrinking	Growing	Shrinking	Growing
First price	1231	2171	1221	1867	703	1326
Last price	1222	2160	1212	1856	697	1318
Floor size	102.4	96.0	151.3	152.9	341.7	324.4
Rooms	3.3	3.1	5.0	5.0	8.6	8.5
Constr. year	1971	1980	1972	1982	1941	1958
Kitchen	0.24	0.36	0.16	0.23	0.13	0.20
Parking spot	0.59	0.64	0.55	0.61	0.58	0.66
Garden	0.24	0.25	0.34	0.37	0.31	0.36
Balcony	0.37	0.42	0.30	0.33	0.29	0.35
Basement	0.40	0.41	0.36	0.40	0.38	0.41
Obs. (max.)	437,730	6,692,988	708,186	7,221,060	97,402	660,315

Notes: The table shows the average realizations of different property characteristics for different property types separately for properties listed in shrinking vs. growing housing market regions. Floor space is measured in square meters. Asking prices refer to the price per square meter.

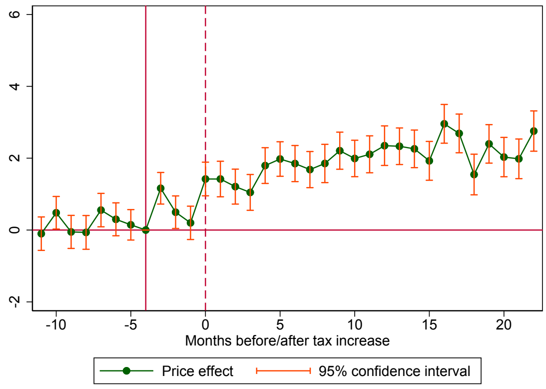
A.3 Robustness checks

Figure 7: Robustness check: Effects of changes in the log net-of-tax rate

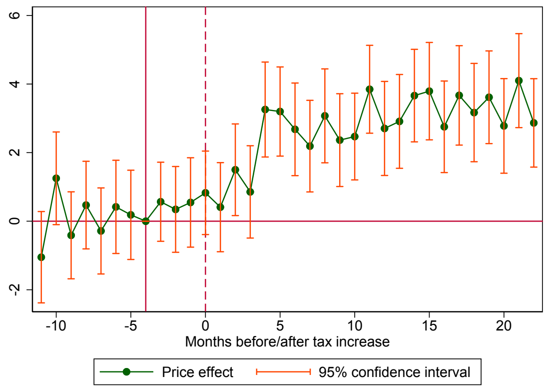
(a) Apartments



(b) Single-family houses



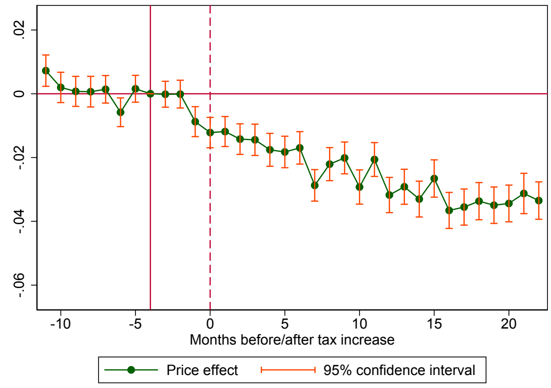
(c) Apartment buildings



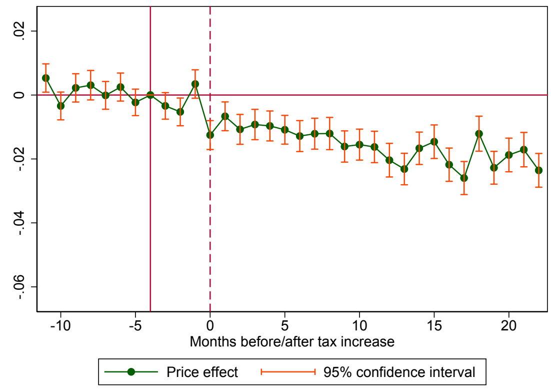
Notes: The figure plots monthly event study estimates and corresponding 95% confidence bands. The dependent variable is a property's log price per square meter, and event study indicators correspond to the change in the log net-of-tax rate. Specifications include postal code and month-year × urbanization level fixed effects. Standard errors are clustered at the postal code level. a) N=7,618,910 (apartments). b) N=8,644,239 (single-family houses). c) N=829,039 (apartment buildings).

Figure 8: Robustness check: Property-specific control variables

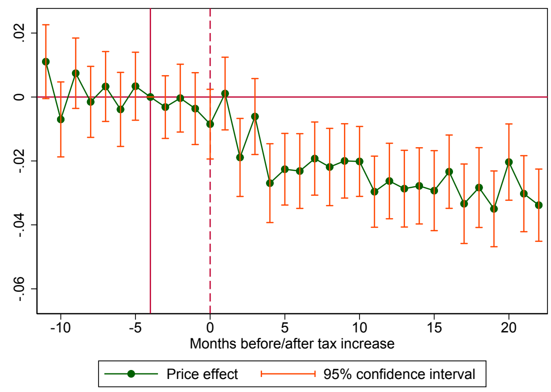
(a) Apartments



(b) Single-family houses



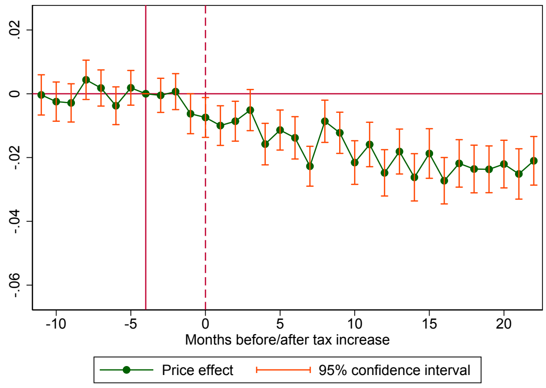
(c) Apartment buildings



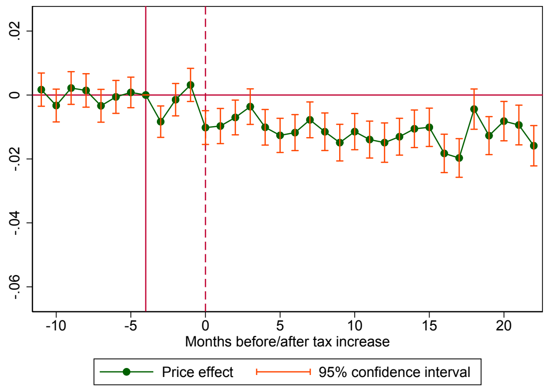
Notes: The figure plots monthly event study estimates and corresponding 95% confidence bands. The dependent variable is a property's log price per square meter, and event study indicators correspond to the change in the tax rate $\Delta\tau$. Specifications include postal code and month-year $\times$ urbanization level fixed effects. Standard errors are clustered at the postal code level. Specifications control for area in square meter, the number of rooms, the construction year, as well as whether the property has a basement, a parking spot, a garden, and a kitchen. a) N=7,618,910 (apartments). b) N=8,644,239 (single-family houses). c) N=829,039 (apartment buildings).

Figure 9: Robustness check: Regional control variables

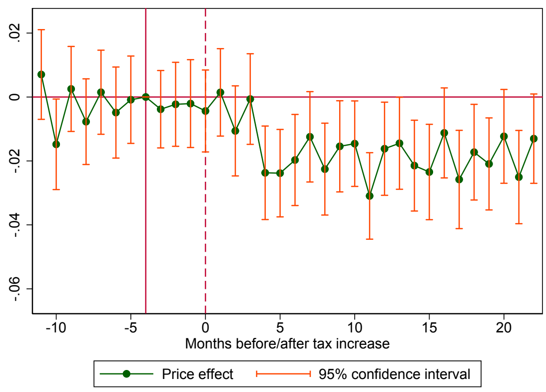
(a) Apartments



(b) Single-family houses



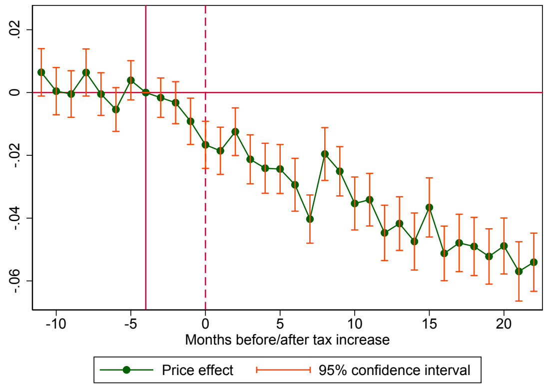
(c) Apartment buildings



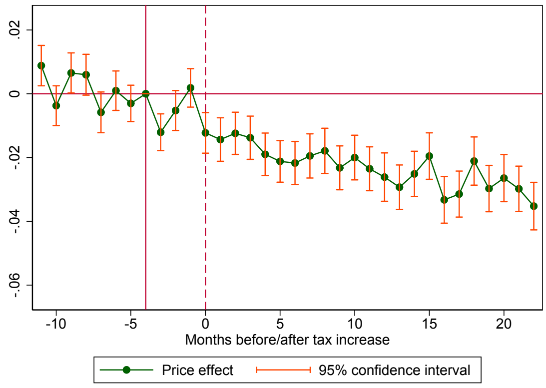
Notes: The figure plots monthly event study estimates and corresponding 95% confidence bands. The dependent variable is a property's log price per square meter, and event study indicators correspond to the change in the tax rate $\Delta\tau$. Specifications include postal code and month-year $\times$ urbanization level fixed effects. Standard errors are clustered at the postal code level. Specifications control for annual county-level GDP, the unemployment rate, and state debt per capita. a) N=7,618,910 (apartments). b) N=8,644,239 (single-family houses). c) N=829,039 (apartment buildings).

Figure 10: Robustness check: Without postal codes within 10 km of the border

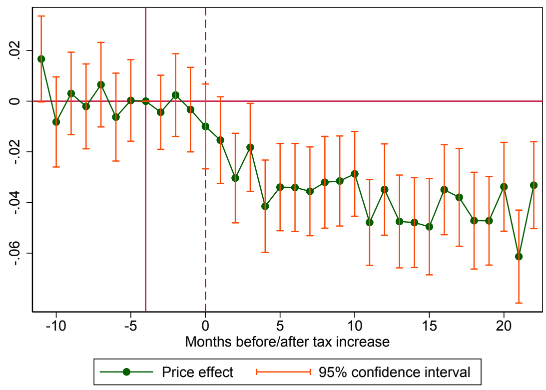
(a) Apartments



(b) Single-family houses



(c) Apartment buildings



Notes: The figure plots monthly event study estimates and corresponding 95% confidence bands. The dependent variable is a property's log price per square meter, and event study indicators correspond to the change in the tax rate $\Delta\tau$. Specifications include postal code and month-year $\times$ urbanization level fixed effects. Standard errors are clustered at the postal code level. Specifications exclude postal codes that either directly adjoin a border or whose centroid is located at a distance of up to 10 kilometers to the border. a) N=4,931,489 (apartments). b) N=5,522,226 (single-family houses). c) N=546,984 (apartment buildings).