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**Conference Paper**

## The German Real Estate Transfer Tax: Evidence for Single-Family Home Transactions

Beiträge zur Jahrestagung des Vereins für Socialpolitik 2017: Alternative Geld- und Finanzarchitekturen - Session: Taxation III, No. C19-V1

**Provided in Cooperation with:**

Verein für Socialpolitik / German Economic Association

*Suggested Citation:* Fritzsche, Carolin; Vandrei, Lars (2017) : The German Real Estate Transfer Tax: Evidence for Single-Family Home Transactions, Beiträge zur Jahrestagung des Vereins für Socialpolitik 2017: Alternative Geld- und Finanzarchitekturen - Session: Taxation III, No. C19-V1, ZBW - Deutsche Zentralbibliothek für Wirtschaftswissenschaften, Leibniz-Informationszentrum Wirtschaft, Kiel, Hamburg

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# The German Real Estate Transfer Tax: Evidence for Single-Family Home Transactions\*

## Abstract

This paper uses recent data for single-family home purchases to study the effects of the German real estate transfer tax. We aim to separate the tax's short-term anticipatory effects from its long-term effects on real estate transactions. The data indicate that an increase in the transfer tax is negatively correlated with the number of transactions that take place in the market for single-family homes. We estimate that a one percentage point higher transfer tax produces enormous anticipation effects and yields approximately 6% fewer transactions over the long run.

JEL-Codes: H20, H71, R30

Keywords: real estate transfer tax, housing markets, property taxation, anticipation effects

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This version: February 14, 2017

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\* We are grateful to Marcel Thum, Thiess Büttner, and participants at the Homes-uP International Meeting, the Urban Studies Seminar at the University of Glasgow, the European Real Estate Society Annual Conference, and the 15<sup>th</sup> Finanzwissenschaftliches Seminar in Berlin for very helpful comments and discussions. We would like to thank the staff at the Property Valuation Committees in Berlin, Brandenburg, Bremen, Rhineland-Palatinate, Saarland and Saxony-Anhalt for access to the data and their support of this project. Financial support from the Leibniz-Gemeinschaft is gratefully acknowledged. All errors are our own.

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## 1. Introduction

The impact of real estate transfer taxes<sup>1</sup> on the residential housing market is a controversial subject in both political debates and scholarly research. On the one hand, some authors consider the positive effects of transfer taxes that result from less volatility and speculation in the real estate market (see Catte et al. 2004). However, these findings are empirically ambiguous (see Crowe et al. 2011 and Aregger et al. 2013) and must be placed in the context of potentially larger economic distortions. On the other hand, higher transaction costs might discourage sales and purchases and may lead to a less active market and thus to welfare losses for both buyers and sellers (European Commission 2015, Deutscher Bundestag 2016, Buettner 2017, Petkova and Weichenrieder 2016). High real estate transfer taxes might also decrease worker mobility, thus adding imperfections into the labor market when owners remain in their home although it might be more efficient to move to a different place (Andrews et al. 2011). Exploiting a unique new dataset, this paper aims to show that real estate transfer taxes have a substantial negative long-term effect on real estate transactions.

Our data on single-family home transactions provide a powerful method for assessing the adverse effects of the real estate transfer tax by investigating tax increases in different German states for the 2005–2015 period. We include dummy variables before and after the tax increase that capture when transactions are pushed ahead of the tax increase. By excluding from our sample this bunching around the tax increase, we can measure the tax increase's long-term effects on transactions. To our knowledge, this long-term effect has not been isolated and measured in previous econometric analyses. The results of our study indicate that an increase in the transfer tax is negatively correlated with the number of transactions that occur on the market for single-family homes. We find significant evidence that transfer tax increases lead to massive bunching of transactions just before an increase and a nearly equally large drop in transactions immediately following a tax increase. In addition, market activities decrease by 6% over the long run following the increase.

Despite its economic relevance, there is only a small body of literature that focuses on the effects of real estate transfer taxes on the real estate market.<sup>2</sup> One of the first studies addressing the effects of an in-

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<sup>1</sup> The literature uses several different terms for real estate transfer taxes, i.e., land transfer taxes, property transfer taxes, housing transfer taxes, or real property transfer taxes. To simplify, we henceforth refer to all of those as real estate transfer taxes.

<sup>2</sup> The effects of higher transaction costs in general (including those due to higher real estate transfer taxes) are a recurring theme in the literature. For example, van Ommeren and van Leuvensteijn (2005) examine the effects of transaction costs on residential mobility in the Netherlands. However, it is useful to focus on one specific type of transaction cost as we do here. When summarizing transaction costs empirical examinations are hampered because different costs are often due at different points in time and the incidence of the cost falls upon different market

crease in the transfer tax was undertaken by Benjamin et al. (1993) and involved sales of land in Philadelphia. The authors find that the sales prices of properties inside of Philadelphia decreased relative to properties outside of the metropolitan area as a result of higher tax rates. In a more recent study, the impact of Toronto's transfer tax, which was imposed on single-family home sales in early 2008, has been studied by Dachis et al. (2012). These authors estimate that the 1.1% tax led to a 15% decline in transaction volumes. Kopczuk and Munroe (2013) examine the effects on house prices of the 1% real estate transfer tax on residential transactions over \$1 million in New York and New Jersey. The authors explore bunching at the tax notch on a theoretical basis by means of an equilibrium bargaining model and conclude that market participants are incentivized not to pursue a transaction close to the threshold. Empirically, Kopczuk and Munroe (2013) find evidence of significant bunching just below the price notch. Quite similarly, Slemrod et al. (2016) analyze different policy reforms of real estate transfer taxes in Washington D.C. and find evidence of manipulative sorting around the price notch but not around the time notch. With regard to studies of European real estate transfer taxes, there are only studies considering the effects of transfer taxes in the U.K. Best and Kleven (2013) study the impact of a tax holiday between 2008 and 2009 and show that there is bunching just below the price notches, in addition to distortions involving the volume and timing of transactions. The same unanticipated stamp duty tax holiday was also studied by Besley et al. (2014), who find it led to significant decreases in sales prices and an increase in transactions.

Whereas previous studies measure short-term transaction bunching, there are no empirical studies to our knowledge on the long-term adverse effects of real estate transfer taxes. This paper is most closely related to Dachis et al. (2012), as we are also concerned with the effects of a higher real estate transfer tax on the number of transactions in the market for single-family homes. Our analysis, however, is distinguished from previous studies because we do not focus on transactions in North American metropolitan areas but on transactions in both urban and rural areas in Germany. We thus conduct the first analysis for a continental European housing market in which bank lending practices are more conservative, homeownership rates are lower, housing supply tends to be more rigid and tenant-landlord regulation is comparatively strict (Andrews et al. 2011).

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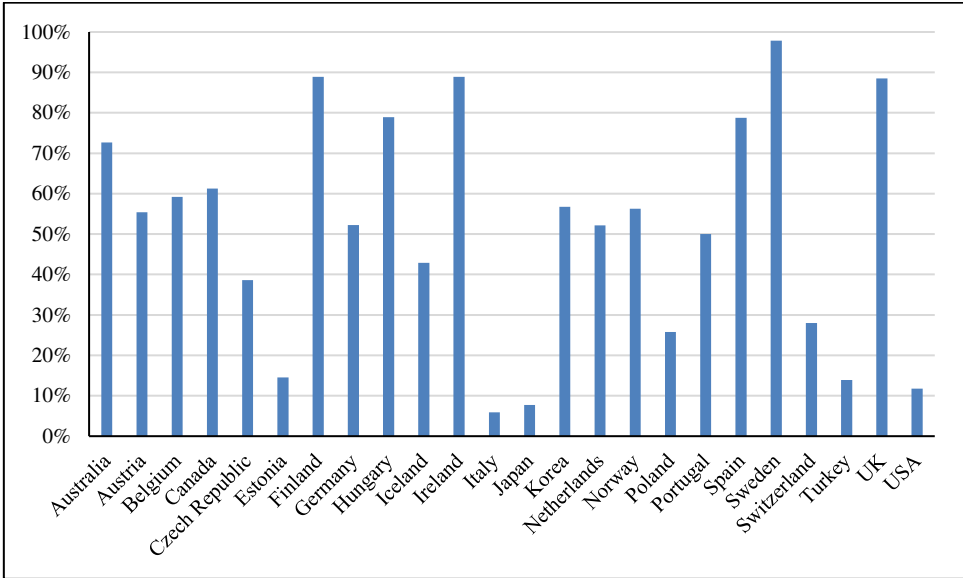
participants. Further, the definition of transaction costs varies greatly in previous studies, which further muddles the results, particularly in terms of comparisons. To distinguish our study from this strand of the literature, we discuss only those studies that directly measure the effects of a change in the real estate transfer tax in this section.

## 2. Institutional Background in Germany

To highlight the economic relevance of real estate transfer taxes and to provide supporting information for our empirical strategy, we now present the relevant institutional background facts on real estate transfer taxes in Germany.

Real estate transfer taxes are commonplace and an important source of government revenues in many OECD countries (Andrews et al. 2011).<sup>3</sup> Nonetheless, tax rates reveal significant variation across different countries; for example, at 10%, Belgium imposes one of the highest tax rates on real estate transactions in Europe (although some exceptions apply) (European Commission 2015). In some countries, such as the U.K. and Portugal, progressive rate structures are utilized. Notably, almost half of the EU member states have transfer tax rates below 5%, and Germany fits right in the middle with a current median rate of approximately 5%. As a consequence, the share of real estate transfer taxes out of total transaction costs<sup>4</sup> varies substantially among countries (see Figure 1). With regard to Germany, the real estate transfer tax amounted to nearly 52% of the average transaction cost in 2011.<sup>5</sup>

FIGURE 1. AVERAGE SHARE OF REAL ESTATE TRANSFER TAXES ON TRANSACTIONS COSTS OF PROPERTY TRANSACTIONS IN OECD COUNTRIES, 2011



Notes: The figure shows the average share of real estate transfer taxes on total transaction costs of property transactions in OECD countries in 2011 where data are available. Transaction costs include notary and legal fees, real estate agent (broker’s) fees and real estate transfer taxes. Data: Andrews et al. (2011).

<sup>3</sup> In 2012, the tax revenue from real estate transfer taxes was equal to 0.8% of GDP in the European Union (European Commission 2015).

<sup>4</sup> Following Andrews et al. (2011), transaction costs include notary and legal fees, real estate agent (broker’s) fees and real estate transfer taxes.

<sup>5</sup> For more details on transaction costs in Germany, see Figure 9 and the explanations in the appendix.

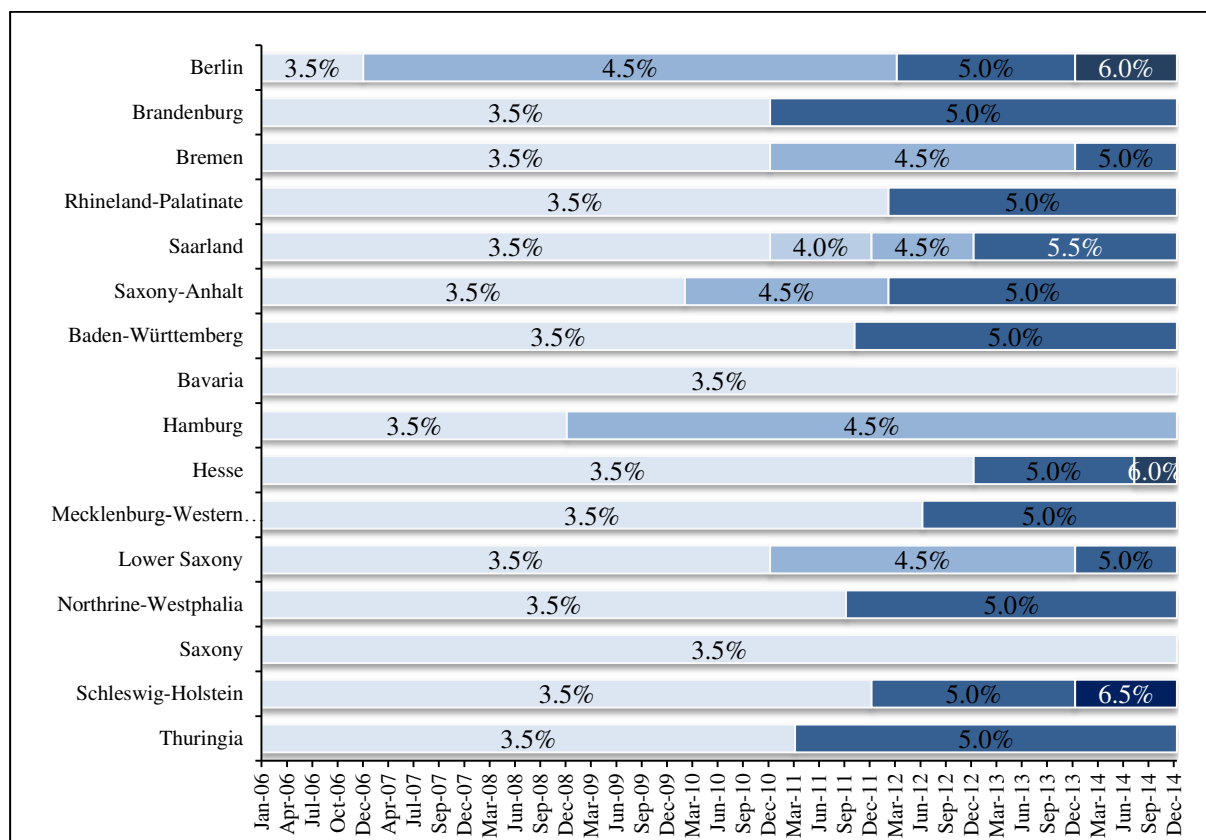
Generally, real estate transfer tax regimes differ greatly among countries with regard to the tax base, tax schedule, exemptions and the tax incidence (for a comparison of housing taxation systems in different countries, see Oxley and Haffner 2010). In Germany, after the buyer and seller agree upon a price and the buyer ensures appropriate funding, a notary must draft the official contract for the purchase of the property. Next, a date for the certification must be set, which can take place as quickly as a couple of days later and as long as several weeks later. After executing the contract, the attesting notary requests the registration in the land register. The original certificate of the contract remains with the notary; copies are sent to the buyer and the seller, the land registry, the relevant property valuation committee and, where appointed, the real estate agent. An additional copy is transmitted to the responsible tax office of the district in which the transaction is taking place. The tax office draws the real estate transfer tax assessment on the buyer, the party formally responsible for paying the tax. Everything that must be spent to purchase a property is subject to the transfer tax, including the purchase price, encumbrances on the property, usage rights, abatement costs and broker fees. The term ‘property’ also includes fractional shares of the property, land rights (such as leaseholds) and condominiums. Next to the land itself, everything that is inherently a part of the property is taxable, such as a house built on the land (including newly built houses). Although most countries apply progressive tax rates, German states impose a flat tax on real-estate transactions. Further, there are only a few exemptions from taxation in Germany: Notably, transactions valued at less than € 2,500, inheritances and transfers within families are exempt from the transfer tax.

The German real estate transfer tax system has historically been subject to substantial revisions: In 1983, the tax rate was standardized at 2% for all German states.<sup>6</sup> This rate was raised to 3.5% in 1997. However, following a 2006 constitutional reform of the German federation aimed at strengthening state competencies, German states can set their real estate transfer tax rates themselves (similar to US states), and almost all German states (with the exception of Bavaria and Saxony) have increased their rates since that time. In particular, rightwing governments were less active in increasing the real estate transfer tax rates than leftwing and center governments (Krause and Potrafke 2016). Figure 2 provides an overview of the effective dates of each increase. As of the present date, no German state has decreased the tax rate. As of 2016, the real estate transfer tax rate ranges between 3.5% and 6.5% (see Figure 11 in the appendix), resulting in an increase of the average tax rate across all German states since 2007 of approximately 51%.

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<sup>6</sup> The German states constitute the second layer of government beneath the federal level.

FIGURE 2: REAL ESTATE TRANSFER TAX RATES IN GERMAN STATES FROM 2006 TO 2014



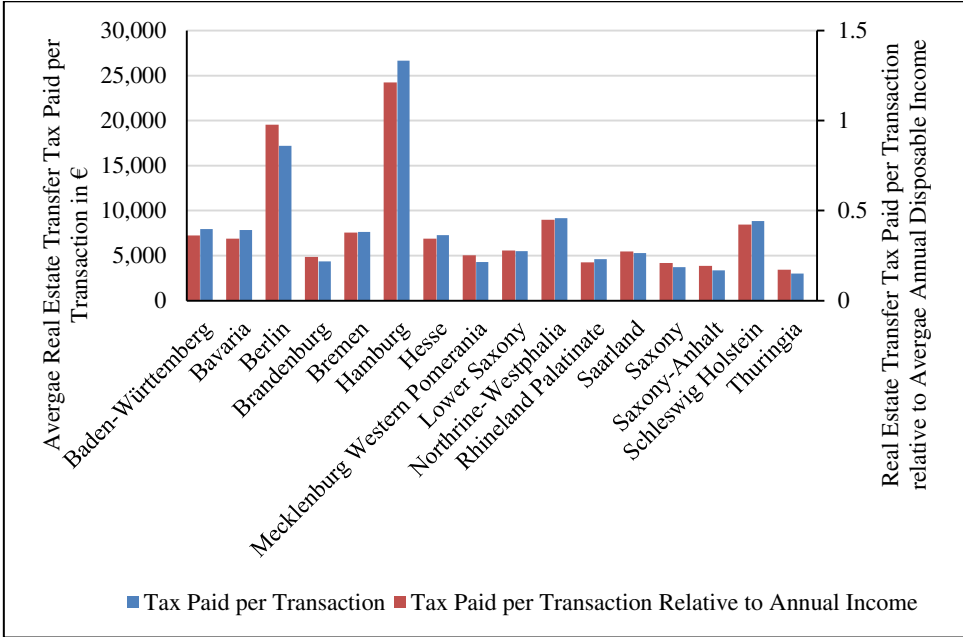
Notes: The figure presents the levels of the real estate transfer tax in the German states from January 2006 to December 2014. Changes in the tax typically take place at the beginning of a month, although the first increase in Saxony-Anhalt took place on the 2<sup>nd</sup> of March in 2010. Data: Official announcements of German state governments.

Typically, increased taxation rates are justified by the consolidation of budgets due to high public debt and the ‘debt brake’ anchored in Germany’s Basic Law that will become effective in 2020 (RWI 2012, IW Köln 2015). Tax changes primarily come into effect in January – presumably for practical reasons and not because real estate transactions are particularly high in this month.<sup>7</sup> Therefore, it is assumed that a change in the tax rate occurs independently of the number of real estate transactions.

<sup>7</sup> In fact, our analysis shows that the number of single-family home transactions is particularly low in January (see section 3).

Although the tax rates do not seem to be particularly high, the real estate transfer tax results in a relatively high tax amount to be paid because of the substantial taxable base (i.e., the property). Therefore, even small changes in the tax rate may cause buyers to accelerate a planned transaction to fall under a lower tax rate. Figure 3 shows the average transfer tax paid per transaction and its share of average annual per capita disposable income in 2012 for each German state.

FIGURE 3. AVERAGE REAL ESTATE TRANSFER TAX PAID PER TRANSACTION AND REAL ESTATE TRANSFER TAX PAID PER TRANSACTION RELATIVE TO AVERAGE ANNUAL DISPOSABLE INCOME, 2012



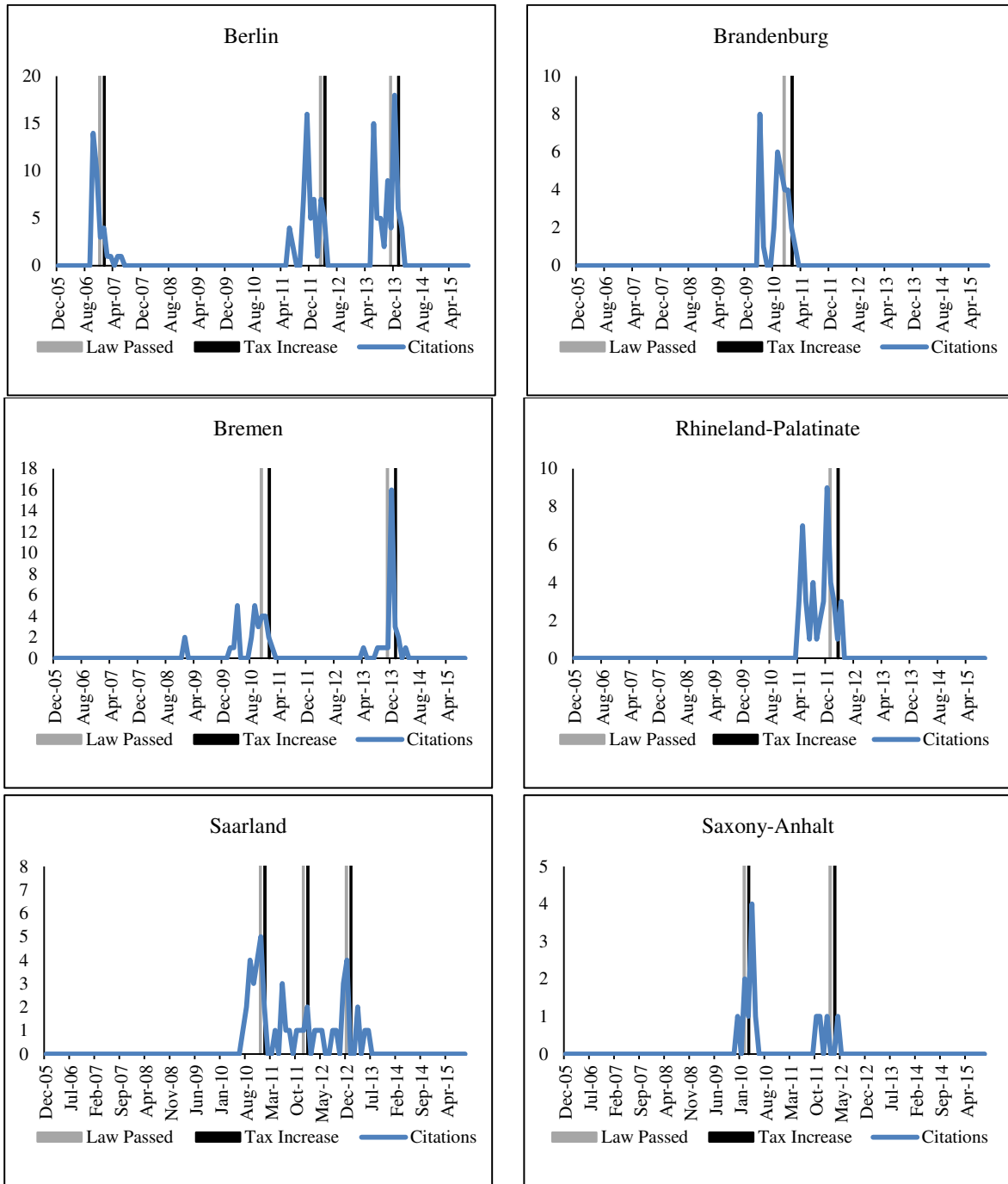
Notes: The figure shows the average real estate transfer tax paid per transaction in 2012 (left hand side, blue columns) and the real estate transfer tax paid per transaction relative to average annual disposable income in Germany in 2012 (right hand side, red columns). Data: Bundesministerium der Finanzen (2015a), Bundesinstitut für Bau-, Stadt- und Raumforschung (2015) and Arbeitskreis der Gutachterausschüsse und Oberen Gutachterausschüsse der Bundesrepublik Deutschland (2014).

Changes to the real estate transfer tax rates are typically announced several months in advance, as they must be passed by the state parliament. Figure 4 charts the media coverage on the topic and the respective tax increases for the states included in our empirical analysis. Media citations are particularly high when tax changes are announced or discussed by the state parliaments. With regard to the actual date of the tax increase, media coverage is less active. The data indicate that it can be assumed that the timing of the tax changes in most cases is largely anticipated.<sup>8</sup> In the next section, we illustrate a theoretical framework to investigate this anticipation effect.

<sup>8</sup> The only exceptions here seem to be Saarland and Saxony-Anhalt where media coverage has been relatively low. In Saarland, a stepwise increase of the real estate transfer tax on a yearly basis was announced in 2009, which might explain this issue.



FIGURE 4. MEDIA CITATIONS OF REAL ESTATE TRANSFER TAX INCREASES IN VARIOUS GERMAN STATES



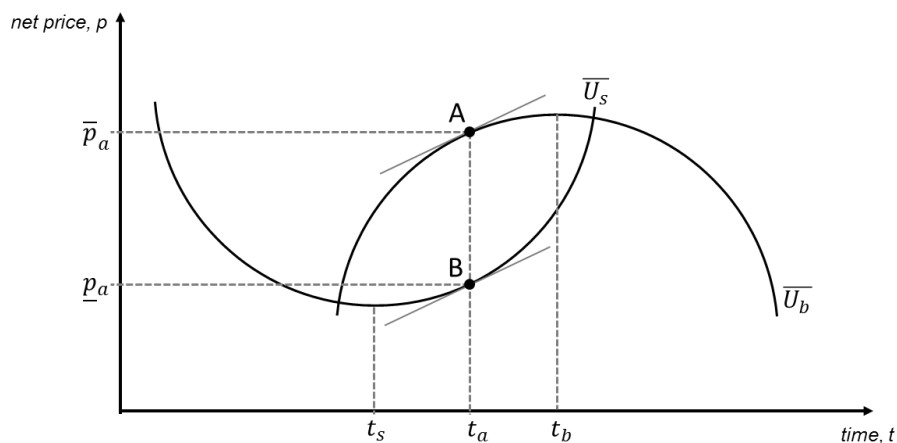
Notes: The figure provides the media citations of ‘*Grunderwerbsteuer Erhöhung*’ (‘Real Estate Transfer Tax increase’) plus the respective state name. Media coverage has been particularly intense at the end of the legal year, as many newspapers present special issues that cover major tax changes in the upcoming year. If there have been simultaneous tax increases in different states, media coverage has generally been higher. Further, media speculation on further tax increases can be observed after elections, in particular. Media citations are from The Financial Times, Frankfurter Allgemeine Zeitung, Frankfurter Allgemeine Sonntagszeitung, Handelsblatt, Die Welt, Die Welt am Sonntag, Die Zeit, Süddeutsche, Spiegel Online, Wirtschaftswoche, Focus, Focus-Money, Immobilien Zeitung, Immobilienwirtschaft, dapd Nachrichtenagentur, news aktuell, vdi Nachrichten, Börse Online, Euro am Sonntag, die tageszeitung, Der Tagesspiegel, Berliner Morgenpost, Berliner Zeitung, Berliner Kurier, Frankfurter Rundschau, Westfalen-Blatt, Rhein-Zeitung, General-Anzeiger, Sonntag Aktuell, Münchner Abendzeitung, Stuttgarter Zeitung, Stuttgarter Nachrichten, Kölner Stadtanzeiger, Kölnische Rundschau, Nürnberger Nachrichten, Saarbrücker Zeitung, Meininger Tageblatt, Aachener Nachrichten, Märkische Allgemeine, Schweriner Volkszeitung, Mitteldeutsche Zeitung, Potsdamer Neuste Nachrichten, Leipziger Volkszeitung, Lampertheimer Zeitung, and Darmstädter Echo. Data: <http://www.genios.de>.

### 3. Conceptual Framework

In this section, we refer to the theoretical framework proposed by Slemrod et al. (2016) to distinguish among the various economic effects of increases in the real estate transfer tax. Slemrod et al. (2016) address both a price and a time discontinuity (or notch) for when new taxes take effect. As there is no price notch in Germany, we limit our analysis to the time notch (see Slemrod et al. 2016, pp. 14 ff.).

Potential buyers and sellers in the housing market are matched exogenously. Both the buyer's and the seller's valuation of a house are determined by exogenous outside options. Both parties have preferences regarding the transaction date. Moving the transaction away from the preferred sale or buy date reduces the utility of either party based on convex cost functions. Thus, utility is a combination of the transaction price and the transaction date, where the preferred transaction date yields the highest utility for a given price. Figure 5 depicts the price/date combinations (indifference curves) for both seller and buyer that yield the lowest acceptable utility levels in a scenario without transfer taxes. The seller would gain higher utility from higher prices at a given transaction date. Thus, higher indifference curves represent higher utility levels for the seller, whereas lower indifference curves represent higher utility levels for the buyer.

FIGURE 5: BARGAINING SOLUTION IN A SCENARIO WITHOUT TAXES



*Notes:* The figure depicts the bargaining solution of a matched buyer and seller pair.  $t_s$  ( $t_b$ ) is the seller's (buyer's) preferred transaction date. The indifference curves,  $\overline{U}_s$  and  $\overline{U}_b$ , show the seller's reservation price and the buyer's willingness to pay as functions of the transaction date. The distance [AB] depicts the highest possible bargaining surplus. Thus, the transaction will take place on  $t_a$ .  $\underline{p}_a$  and  $\overline{p}_a$  represent the lower and upper bounds for the transaction price.

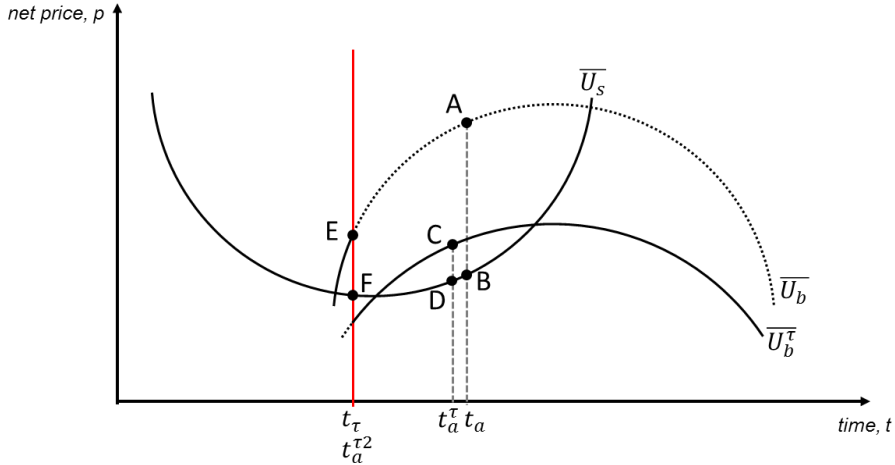
Buyer and seller engage in a Nash bargaining situation well in advance of the actual transaction, and the transaction date is uniquely defined by the Pareto-optimality condition. In the interior solution, the indifference curves are tangent, thus maximizing the bargaining surplus. Subsequently, the price is determined based on the individual bargaining power of both parties.

Figure 6 illustrates a scenario with the introduction of real estate transfer taxes. The red line reports the date that the new tax takes effect. The dotted line marks the highest price that the buyer is willing to pay at each transaction date. Since the transaction tax is imposed on the buyer, it measures his gross willingness to pay. Consequently, the buyer's net willingness to pay is lowered by the amount of the appropriate tax liability.

Because the tax is assessed on the basis of the sales price, with a lower price, the buyer thus profits not only from paying less to the seller but also from having to pay a lower tax amount. To a certain extent, the buyer profits more from a lower price than the seller suffers. In the bargaining solution, the party might pick a lower transaction price, while compensating the seller by moving the transaction date slightly toward his preference. The same argumentation holds for postponing the transaction if the buyer prefers to transact before the seller.

However, if the time period between the effective date of the new tax and the bargaining solution with taxes is sufficiently short, the amount of taxes saved compensates for the rather strong deviation in the time preferences. As a result, transactions become bunched just before the effective date of the new tax (the notch), which is followed by a steep drop in transaction numbers for the period after the notch.

FIGURE 6: BARGAINING SOLUTION IN A SCENARIO WITH A NEW TAX – ANTICIPATION EFFECT WITH RESPECT TO THE EFFECTIVE DATE

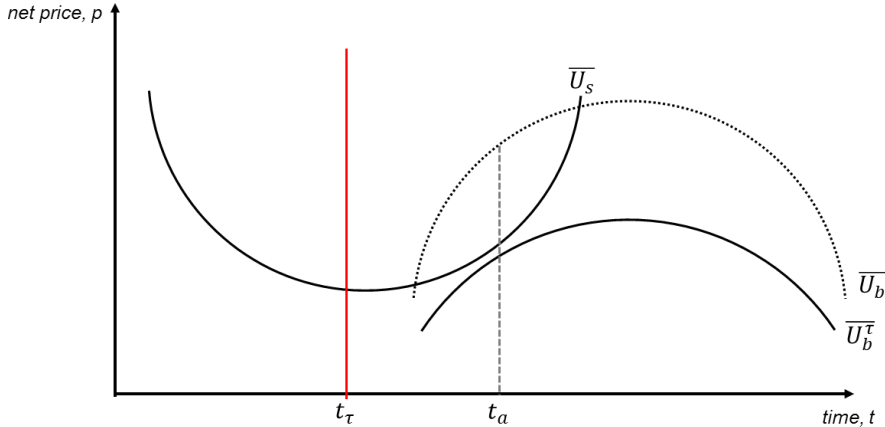


Notes: The new real estate transfer tax rate is introduced at  $t_\tau$ . Here, the buyer's indifference curve shows a discontinuity. Because he must pay a higher price after the effective date of the new tax rate, his net willingness to pay drops on that date. The bargaining surplus absent taxes ( $[AB]$ ) can no longer be obtained. The highest possible outcome with the new tax in place is located at  $t_a^\tau$  with a bargaining surplus of  $[CD]$ .<sup>9</sup> However, in the depicted scenario, buyer and seller will choose to transact marginally before the effective date of the new tax. In  $t_a^{\tau 2}$ , they achieve a bargaining surplus of  $[EF] > [CD]$ .

<sup>9</sup> More precisely,  $[CD]$  represents the bargaining surplus if the seller holds all bargaining power. If the buyer holds all bargaining power, the surplus would be  $(1 + \tau)[CD]$  because of the lower tax liability.

A second effect is that transactions might not take place at all due to transfer taxes, which is the case if the bargaining surplus in a situation without taxes is smaller than the tax liability at all times. The reason for this effect is either that the price spread in the willingness to pay and the reservation price is fairly small, the transaction date preferences are wide apart (see Figure 7), or a combination of the two. If so, a transfer tax might lead to a negative maximal bargaining surplus. Thus, in such a case, not transacting at all results in the highest utility for both parties.

FIGURE 7: BARGAINING SOLUTION IN A SCENARIO WITH A NEW TAX – THE LONG-TERM EFFECT



Notes: The figure depicts a scenario in which no transaction takes place due to the real estate transfer tax. The buyer’s willingness to pay does not exceed the seller’s reservation price at any given time. Thus, no surplus can be generated by transacting.

For an announced but not yet implemented transfer tax increase, we expect temporal substitutions. To maximize the bargaining surplus, accelerating transactions is profitable if the tax saved compensates for the utility loss resulting from the time deviation. All transactions that would have taken place sufficiently close after the tax increase are moved to a transaction date marginally before the tax increase.

**Hypothesis 1:** More transactions take place just before the tax increase (bunching).

On the other hand, those transactions that are brought forward do not take place after implementation of the higher real estate transfer tax.

**Hypothesis 2:** Fewer transactions take place immediately after the tax increase (lagging).

With real estate transfer taxes in place, the sale of a property yields less utility as lower prices can be obtained. Concurrently, buying a property also yields less utility as higher prices must be paid. Therefore, the number of transactions should drop after the tax increase.

**Hypothesis 3:** The higher the real estate transfer tax, the fewer transactions take place (liquidity).

#### 4. Data

In this section, we empirically investigate the conceptual framework we described above. Unfortunately, figures on real estate transactions in Germany are scarce. However, we can rely on a unique dataset provided by the Property Valuation Committees of Berlin, Brandenburg, Bremen, Rhineland-Palatinate, Saarland and Saxony-Anhalt. Our data cover only transactions involving single-family homes for several reasons.<sup>10</sup> First, these dwellings have a high rate of owner-occupation and are used for private housing (see Table 7 in the appendix); therefore, our sample consists almost exclusively of private transactions. Commercial transactions might bias our results as commercial buyers can set the real estate transfer tax off against the tax liability. The data cover the number of single-family home transactions since 2005 on a monthly basis for each German state. Our sample spans the period from January 2005 to December 2014<sup>11</sup> for almost all states, which allows us to include all tax increases that took effect during the sample period.<sup>12</sup> We included two years prior to the actual possibility that states might change the tax rate; by examining transactions in which no tax increases could have taken place, we can control for seasonal and common factors that might affect transactions on a range of relatively similar properties.

The sample is restricted to observations that are considered ‘suitable’ by the Property Valuation Committees, i.e., the sales price and the property size must lie within specific thresholds.<sup>13</sup> As a result, the impact of outliers is minimized. Overall, 12 tax increases are covered by our sample (see also Figure 2). Altogether, these restrictions produce a sample size of 655 observations, which are summarized in Table 1. In addition to data on the level of the real estate transfer tax, we aggregate economic and fiscal controls that may drive the number of transactions of single-family homes. The dataset also contains information regarding the introduction or abolition of public funding instruments on the housing market (see Table 9 in the appendix).

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<sup>10</sup> For more details on the market-share and average price of single-family homes in the states included in the sample, see Table 8 in the appendix.

<sup>11</sup> As a result, our time frame includes the recent global financial and economic crisis. However, it is reasonable to assume that the crisis does not skew our results, as the German real-estate market was mostly unaffected by the crisis because interest rates for real estate finance are traditionally fixed for long periods of time in Germany and the average equity component is higher than in other countries (BMVBS 2012).

<sup>12</sup> The only exception is Saarland, where data were available only between 2010 and 2013, and therefore the latest real estate transfer tax increase is not included.

<sup>13</sup> For example, in Rhineland-Palatinate, the sales price of the property must be between € 40,000 and € 2,000,000 and the property size must be greater than 300 m<sup>2</sup> but less than 2,000 m<sup>2</sup>.

TABLE 1. DESCRIPTIVES: NUMBER OF TRANSACTIONS PER MONTH FOR DIFFERENT GERMAN STATES, THE LEVEL OF THE REAL ESTATE TRANSFER TAX AND THE LEVEL OF THE TAX INCREASE

<i>Variable</i>	<i>Time Frame</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Min</i>	<i>Max</i>	<i>Obs.</i>
<i>Number of transactions per month<sup>a</sup></i>	01/2005-08/2015	317	185	20	1,157	665
<i>... in Berlin</i>	01/2005-08/2015	255	73	85	711	128
<i>... in Brandenburg</i>	01/2005-12/2014	480	112	168	1,128	120
<i>... in Bremen</i>	01/2005-12/2014	98	33	20	214	120
<i>... in Rhineland-Palatinate</i>	01/2005-03/2015	545	157	120	1,157	123
<i>... in Saarland</i>	01/2010-12/2013	210	48	99	329	48
<i>... in Saxony-Anhalt</i>	01/2005-06/2015	253	56	84	417	126
<i>Level of Real Estate Transfer Tax</i>	01/2005-08/2015	4.17	0.74	3.50	6.00	665
<i>Level of Tax Increase</i>	01/2007-01/2014	0.875	0.361	0.5	1.5	12

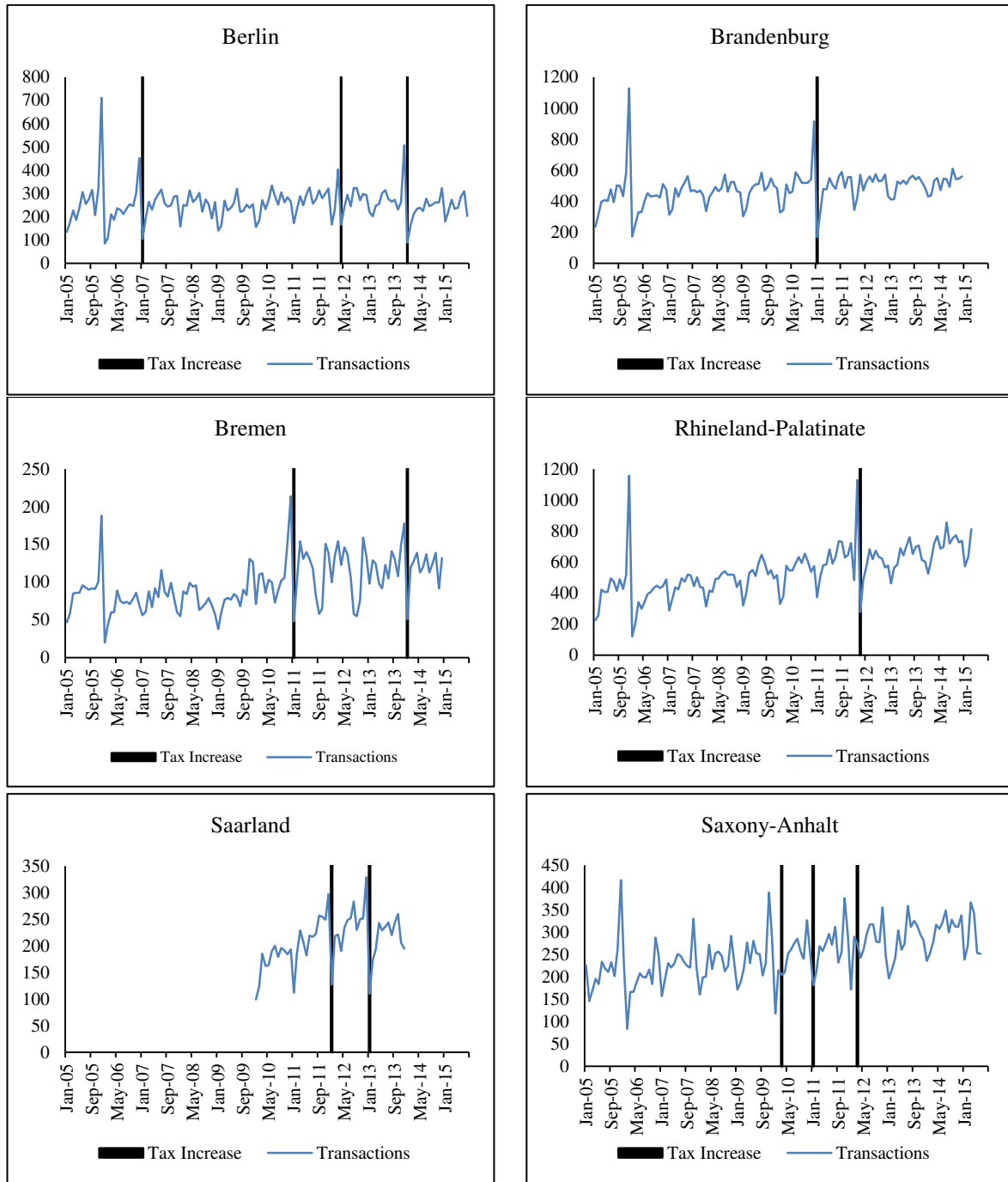
*Notes:* The table reports the descriptives of the data set. The data provided by Rhineland-Palatinate do not cover transactions in the cities of Kaiserslautern, Koblenz, Ludwigshafen am Rhein, Mainz, Trier and Worms.

Certain interesting features emerge from the descriptive statistics: The number of transactions per month varies greatly among states, which indicates that we included both rural and urban (i.e., city-states) areas in Germany. We have months with as few as 20 observations in one state and months with more than 1,000 transactions. The real estate transfer tax rate is equally distributed in the sample and averages approximately 4.2%.

Figure 8 plots the number of transactions per month for each included German state over time and suggests that some transactions have been accelerated and rescheduled to take place just before the tax increases. There clearly seems to be a bunching around the dates of tax increases. Apart from bunching at the tax increase notches, we notice bunching on an even grander scale at the end of 2005. This observation can be explained by the abolition of a large public funding instrument, the ‘*Eigenheimzulage*’.<sup>14</sup>

<sup>14</sup> The ‘*Eigenheimzulage*’ funding instrument was one of the largest public funding instruments in Germany. It was introduced in 1996 to support the acquisition of owner-occupied residential property for low-income households (Heitel et al. 2011). The financial burden for the federal budget associated with the ‘*Eigenheimzulage*’ was relatively high while the number of new homes completed was not as high as expected (Dorffmeister et al. 2011). As a result, the federal government considered abolishing the funding instrument, which led to massive anticipation effects for three years until the ‘*Eigenheimzulage*’ was actually abolished in January 2006 (Dorffmeister et al. 2011).

FIGURE 8. NUMBER OF SINGLE-FAMILY HOME TRANSACTIONS IN VARIOUS GERMAN STATES



Notes: The figure gives the number of transactions for each German state included in the sample over time. Data: Property Valuation Committees in Berlin, Brandenburg, Bremen, Rhineland-Palatinate, Saarland and Saxony-Anhalt.

Compared to the bunching effects around the tax increases, a decrease in overall real estate market activity is less obvious in Figure 8. The strong bunching effects and the high degree of seasonality make it difficult to identify a level shift in the number of transactions after tax increases. However, in the following econometric analysis, we isolate this long-term effect.

## 5. Estimating the Effects of a Tax Increase

### 5.1 Empirical Strategy

All German states began with the same real estate transfer tax levels at the outset of our observed time frame. However, state governments have been authorized to independently set their own tax rates since September 2006. Whenever a state changes its tax rate, the remaining states function as control groups. In our sample, many states have raised their tax rates by different amounts and at different times. Since state governments justify tax changes with household consolidation, we can assume that the changes do not depend on the number of single-family home transactions and thus rule out possible reversed causality (see Section 2). However, there might yet be interdependencies between states: When one state increases its transfer tax rates, households might choose not to move to this state but might instead migrate to another state. We are not able to control for this particular increase in transactions in that other state. However, there are only a few urban areas of different states that are sufficiently close to be considered geographical substitutes for migration decisions.<sup>15</sup> Moreover, state-specific characteristics (e.g., administrative divisions, educational systems or availability of nurseries) can be assumed to be more important to migration decisions than transfer taxes.<sup>16</sup> Altogether, we are provided with a setting that is suitable to identify the causal effects of real estate transfer taxes on the number of transactions.

Our regression design is a two-way least squares dummy variable estimation. The fixed effects panel regression is important to control for state-specific characteristics in our panel. We control for time-variant specifics affecting all states by including a date dummy for every month in our sample. The baseline estimation takes the following form:

$$\begin{aligned}
 T_{i,t} = & \alpha_i + \beta R_{i,t} + \sum_{h=1}^2 y_h \text{before}_{h,i,t} + \sum_{j=1}^2 \delta_j \text{after}_{j,i,t} \\
 & + \sum_{k=1}^2 \eta_k (\text{before}_{k,i,t} * \text{raiselevel}_{k,i,t}) + \sum_{l=1}^2 \theta_l (\text{after}_{l,i,t} * \text{raiselevel}_{l,i,t}) \\
 & + \sum_{m=1}^{128} \lambda_m \text{date}_{m,t} + \text{controls}_{i,t} + \varepsilon_{i,t}.
 \end{aligned}$$

$T_{i,t}$  denotes the log number of transactions in state  $i$  at time  $t$  as the dependent variable. On the right-hand side, we include the level of the real estate transfer tax,  $R_{i,t}$ . Furthermore, we add dummy variables

<sup>15</sup> This issue might be particularly relevant for so-called twin metropolitan areas like Mannheim and Ludwigshafen am Rhein, Ulm and Neu-Ulm and Mainz and Wiesbaden. Those cities are not included in our sample.

<sup>16</sup> However, we do conduct a robustness check in which we omit observations that might be influenced by border effects (see Section 6.3).



for  $h$  months before a particular state tax changes,  $before_{h,i,t}$ , and for  $j$  months after the tax changes,  $after_{j,i,t}$ . We further multiply these dummies by the level of the corresponding tax increase in percentage points and report the results. In this manner, we can test whether the anticipation effect depends on the extent of the increase. To control for any effects that affect all states simultaneously, we include  $m$  dummy variables,  $date_{m,t}$ , for each month of our panel. In another specification, we substitute the date dummies with dummies for the twelve months of the year to control for seasonal effects and dummies for each year to control for the time trend. The equation comprises group-specific constants  $\alpha_i$  and the error term  $\varepsilon_{i,t}$ . To allow heteroskedasticity, we employ Huber-White sandwich standard errors (see Huber 1967, White 1980).

To control for changes in other transaction costs, we include dummy variables for the changes in notary fees.<sup>17</sup> To capture possible bunching for this change as well as for the drop in transaction numbers, we use two dummies: July and August 2013. We do the same for the implementation or abolition of public funding instruments that affect the housing market (see Figure 8 in the appendix). We thereby only control for the bunching effects of further public funding instruments, not the level of funding. However, those instruments consist mostly of loans, which should have a rather small impact on housing decisions in times of low interest rates. The ‘*Eigenheimrente*’ and particularly the ‘*Eigenheimzulage*’ presumably have a greater influence on the number of transactions.<sup>18</sup> However, those two funding instruments and also the change in notary fees apply to all states concurrently. Thus, they have no effect on the regressions including date dummies and need only be included in the specification using dummies for years and months. We have no reason to believe that any further variables systematically distort the number of transactions. In conclusion, we expect the estimated relationship between the real estate transfer tax and the number of transactions to be of causal nature.

## 5.2 Results

Table 2 reports the regression output. In line with the primary stream of the previous literature, we find a significant negative correlation of the number of single-family home transactions and the level of the real estate transfer tax in all specifications. An increase in the transfer tax of one percentage point results in approximately 6% fewer transactions over the long run. On top of the long-run effects, we observe

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<sup>17</sup> For more details on why other transaction costs are not included in the model, see Figure 9 and the respective explanations in the appendix.

<sup>18</sup> Since the effects for the ‘*Eigenheimzulage*’ are quite large (see Figure 8), we use two months prior to and after its abolition. The ‘*Eigenheimrente*’ has no significant effect on the number of transactions, which may be because this public funding instrument remained little-known (BMVBS 2013).

massive anticipation effects for the months just before and just after a tax is raised. This ‘bunching around the time notch’ has also been observed in previous studies.

The first regression (1) suggests that the anticipation effect depends on the level of the tax increase. Aggregating the coefficients of the interaction terms with the plain anticipation coefficients results in approximately 43% more transactions just before the tax notch for a tax rate increase of one percentage point. Consistently, the results aggregate to a drop of 47% fewer transactions immediately following an increase. We observe similar results in the second specification (2) in which we omit the interaction terms. Here, we measure the pure anticipation dummies without controlling for the level of tax increases. The coefficients thus represent the anticipation effects for an average tax increase, which is 0.875 percentage points. The slightly lower coefficients of approximately 41% more transactions and 46% fewer transactions on either side of the time notch are thus consistent with previous findings.<sup>19</sup>

In specification (3), we use monthly and yearly dummies instead of date dummies. Compared to the first results, the coefficients seem quite robust, although the significance levels change. Column (4) omits all anticipation effects and reports a higher effect of the transfer tax level as a result. This result stems from the fact that for each state, the time frame with the lowest transfer tax includes a bunching of transactions due to the approaching increase but with no drop in transactions. Additionally, the time frame with the highest transfer tax for each state includes the period with a precipitous drop in the number of transactions immediately after a tax increase without including possible bunching for future tax increases. We measure 12.5% fewer transactions for a one percentage point higher transfer tax. When we control for the bunching effects, however, 6% fewer transactions remain as a long-run effect.

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<sup>19</sup> Although the anticipation effect before and after the tax increase is of similar magnitude, the drop in transactions after the tax increase is slightly larger. As the real estate transfer tax already controls for accelerating transactions and the long-term sales disincentive, we can only speculate about the underlying causal mechanism. A possible channel might be psychological in nature (in the sense of loss aversion; Thaler, 1985): In the absence of psychological factors, the bargaining solution might be to transact in the month immediately following a tax increase. However, the newly higher tax liability might be more present psychologically and might thus have a higher impact on utility than for transactions taking place even later. As a result, more people might be reluctant to transact. Evidence for overreactions to housing policy changes can be found for the case of Shanghai (Zhou, 2016).

TABLE 2. BASELINE RESULTS

Specification	Dependent Variable: Log Number of Single-Family Home Transactions			
	(1)	(2)	(3)	(4)
<i>Real Estate Transfer Tax</i>	-0.0552*	-0.0647*	-0.0637**	-0.1248***
	(0.0228)	(0.0258)	(0.0193)	(0.0286)
<i>Months Before the Tax Change</i>				
2	-0.0391	-0.0161	-0.0089	
	(0.2111)	(0.0712)	(0.1480)	
1	0.1020	0.4115***	0.1164	
	(0.1696)	(0.0830)	(0.1239)	
<i>Months After the Tax Change</i>				
1	-0.1855	-0.4597***	-0.1444	
	(0.1163)	(0.0740)	(0.1934)	
2	0.2054	-0.0420	0.2383	
	(0.2619)	(0.0547)	(0.2436)	
<i>Level of Tax Increase * Months Before Tax Change</i>				
2	0.0295		0.0385	
	(0.1741)		(0.0914)	
1	0.3267*		0.3325**	
	(0.1355)		(0.0988)	
<i>Level of Tax Increase * Months After Tax Change</i>				
1	-0.2839*		-0.2827	
	(0.0945)		(0.1538)	
2	-0.2466		-0.2612	
	(0.2206)		(0.1879)	
<i>Constant</i>	5.1789***	5.2120***	5.2376***	5.4212***
	(0.1655)	(0.1699)	(0.0556)	(0.1369)
<i>Controls</i>	YES	YES	YES	YES
<i>Date</i>	YES	YES	NO	YES
<i>Years</i>	NO	NO	YES	NO
<i>Months</i>	NO	NO	YES	NO
<i>Obs.</i>	665	665	665	665
<i>Adj. R-squared</i>	0.7606	0.6179	0.7004	0.7673

Notes: Significance levels (robust standard errors in brackets): \*\*\* 0.01, \*\* 0.05, and \* 0.10. Column (1) shows the results for the specification of the equation in section 5.1. The regression of column (2) omits the interaction terms. In column (3), we replace the date dummies with seasonal and year dummies. Column (4) presents the results of the regression without controlling for the anticipation effects around the increase notches.

## 6. Robustness Check

For robustness exercises, we apply a number of different specifications to our model. First, we consider different lengths for the anticipation period by comparing the baseline regressions with two dummy variables before and after tax increases with the case of one and three dummy variables. In section 6.2 below, we control for the possible effects of a temporary suspension of the real estate transfer tax for housing companies and cooperatives. Because this policy measure only affects Brandenburg in our data, our robustness regressions omit Brandenburg from the sample. Section 6.3 omits both Brandenburg and

Berlin to control for housing markets in our sample which might exceed state borders. In section 6.4, we show further subsample regressions by omitting each state, one at a time.

### *6.1 Different Lengths of Anticipation*

In the baseline setting, we generated dummy variables for the two months before and after tax increases. However, transactions might be accelerated over even longer time periods. Table 3 shows the regression results for different amounts of anticipation dummies.

In the first column of each specification, we use only one month before and after a tax increase. Transactions that are shifted in time outside of those two months are now calculated into the time frame before the tax increase. Thus, lower taxes are associated with even more transactions. A steep drop in transactions immediately following a tax increase stretching out farther than one month is calculated into the time period of a higher tax rate. Both effects lead to overestimating the long-term effects of transfer taxes on transactions. Using more dummy variables reduces the coefficient. However, the difference in coefficients for using one and two dummies is greater than for the setting with two and three month dummies. As expected, fewer transactions are accelerated when the transaction date absent the tax raise would have been further away from the time notch.

The specification with two month dummies before and two month dummies after the time notch is the one we trust most. Using even more dummies shows us that a slight overestimation of the long-term effect persists. However, when we stretch the anticipation period, we trim the time frame under which we estimate the long-term effects and thus increase uncertainty.

TABLE 3: RESULTS FOR DIFFERENT LENGTHS OF ANTICIPATION

		<i>Dependent Variable: Log Number of Single-Family Home Transactions</i>								
		(1)			(2)			(3)		
<i>#month dummies</i>		1	2	3	1	2	3	1	2	3
<i>Real Estate Transfer Tax</i>		-0.0606**	-0.0552*	-0.0521*	-0.0663**	-0.0647*	-0.0654*	-0.0711**	-0.0637**	-0.0618**
		(0.0229)	(0.0228)	(0.0252)	(0.0253)	(0.0258)	(0.0279)	(0.0216)	(0.0193)	(0.0205)
<i>Months Before the Tax Change</i>										
<i>3</i>				-0.1811			0.0007			-0.1174
				(0.1106)			(0.0731)			(0.0732)
<i>2</i>			-0.0391	-0.0418		-0.0161	-0.0163		-0.0089	-0.0092
			(0.2111)	(0.2197)		(0.0712)	(0.0717)		(0.1480)	(0.1493)
<i>1</i>		0.1014	0.1020	0.1015	0.4134***	0.4115***	0.4115***	0.1135	0.1164	0.1184
		(0.1548)	(0.1696)	(0.1740)	(0.0788)	(0.0830)	(0.0808)	(0.1169)	(0.1239)	(0.1238)
<i>Months After the Tax Change</i>										
<i>1</i>		-0.1634	-0.1855	-0.1877	-0.4567***	-0.4597***	-0.4589***	-0.1500	-0.1444	-0.1452
		(0.1155)	(0.1163)	(0.1184)	(0.0715)	(0.0740)	(0.0742)	(0.1894)	(0.1934)	(0.1957)
<i>2</i>			0.2054	0.2056		-0.0420	-0.0411		0.2383	0.2397
			(0.2619)	(0.2723)		(0.0547)	(0.0550)		(0.2436)	(0.2480)
<i>3</i>				0.0793			0.0105			0.0612
				(0.1406)			(0.0282)			(0.1051)
<i>Level of Tax Increase * Months Before Tax Change</i>										
<i>3</i>				0.1984						0.1504*
				(0.1094)						(0.0647)
<i>2</i>			0.0295	0.0301				0.0385	0.0400	
			(0.1741)	(0.1762)				(0.0914)	(0.0926)	
<i>1</i>		0.3272*	0.3267*	0.3290*				0.3323**	0.3325**	0.3340**
		(0.1321)	(0.1355)	(0.1376)				(0.0959)	(0.0988)	(0.1005)
<i>Level of Tax Increase * Months After Tax Change</i>										
<i>1</i>		-0.2985**	-0.2839**	-0.2854**				-0.2753	-0.2827	-0.2824
		(0.1040)	(0.0945)	(0.0920)				(0.1504)	(0.1538)	(0.1539)
<i>2</i>			-0.2466	-0.2484				-0.2612	-0.2626	
			(0.2206)	(0.2293)				(0.1879)	(0.1898)	
<i>3</i>				-0.0806						-0.0432
				(0.1344)						(0.0748)
<i>Constant</i>		5.1977***	5.1789***	5.1680***	5.2176***	5.2120***	5.2144***	5.2649***	5.2376***	5.2326***
		(0.1455)	(0.1655)	(0.1712)	(0.1507)	(0.1699)	(0.1741)	(0.0641)	(0.0556)	(0.0633)
<i>Controls</i>	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
<i>Date</i>	YES	YES	YES	YES	YES	YES	YES	NO	NO	NO
<i>Years</i>	NO	NO	NO	NO	NO	NO	NO	YES	YES	YES
<i>Months</i>	NO	NO	NO	NO	NO	NO	NO	YES	YES	YES
<i>Obs.</i>		665	665	665	665	665	665	665	665	665
<i>Adj. R-squared</i>		0.7690	0.7701	0.7710	0.7657	0.7660	0.7660	0.7085	0.7099	0.7106

Notes: Significance levels (robust standard errors in brackets): \*\*\* 0.01, \*\* 0.05, and \* 0.10. Column (1) shows the results for the specification of the equation in section 5.1. The regression of column (2) omits the interaction terms. In column (3), we replace the date dummies with seasonal and year dummies. Column (4) presents the result of the regression without controlling for the anticipation effects around the increase notches.

## 6.2 Temporary Suspension of the Real Estate Transfer Tax for Housing Companies and Cooperatives

In 2004, the German government approved a law that allowed for a temporary suspension of the real estate transfer tax for mergers of housing companies and housing cooperatives in eastern German states (*Gesetz zur Grunderwerbsteuerbefreiung bei Fusionen von Wohnungsunternehmen und Wohnungsgenossenschaften in den neuen Ländern, Drucksache 51/04*). This regulation lasted from December 2003 until December 2006 and aimed at incentivizing housing companies and cooperatives to undertake new investments and therefore to help them grow their businesses (see Bundesrat 2004).

As we included three eastern German states in our sample (Berlin, Brandenburg and Saxony-Anhalt) and as our chosen time frame overlaps with the temporary suspension of the real estate transfer tax, we must consider whether the suspension had an effect on the number of transactions. For the case of Saxony-Anhalt, mergers were excluded in the original data set. In Berlin, no mergers of housing companies and housing cooperatives took place between 2004 and 2006. Thus, we must only remove those mergers that took place in Brandenburg from our dataset. According to the Federation of German Housing and Real Estate Companies (*Bundesverband deutscher Wohnungs- und Immobilienunternehmen e. V., GdW*),<sup>20</sup> 15 mergers took place between 2004 and 2006. Unfortunately, no detailed information on these mergers is available; therefore, we omit Brandenburg as a whole from our sample to ensure that the distortive effects of that regulation are excluded.

Table 4 reports the regression results with and without Brandenburg. While the anticipation coefficients are very robust towards the omission of Brandenburg, the real estate transfer tax coefficient is slightly lower in all specifications. The reaction towards higher tax levels is thus higher in Brandenburg and possible mergers for single-family homes do not seem to cause an underestimation of the regression coefficients.

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<sup>20</sup> In Brandenburg, almost all housing and real estate companies are members of the Federation of German Housing and Real Estate Companies (see BBU 2015 and Statistische Ämter des Bundes und der Länder 2014).

TABLE 4: RESULTS WITH AND WITHOUT BRANDENBURG

Specification	<i>Dependent Variable: Log Number of Single-Family Home Transactions</i>							
	(1)		(2)		(3)		(4)	
<i>Brandenburg included?</i>	YES	NO	YES	NO	YES	NO	YES	NO
<i>Real Estate Transfer Tax</i>	-0.0552*	-0.0419	-0.0647*	-0.0507	-0.0637**	-0.0555*	-0.1248***	-0.1125**
	(0.0228)	(0.0282)	(0.0258)	(0.0327)	(0.0193)	(0.0228)	(0.0286)	(0.0326)
<i>Months Before the Tax Change</i>								
2	-0.0391	-0.1086	-0.0161	-0.0204	-0.0089	-0.0595		
	(0.2111)	(0.1922)	(0.0712)	(0.0775)	(0.1480)	(0.1117)		
1	0.1020	0.0419	0.4115***	0.3955**	0.1164	0.0643		
	(0.1696)	(0.1624)	(0.0830)	(0.0970)	(0.1239)	(0.0939)		
<i>Months After the Tax Change</i>								
1	-0.1855	-0.1780	-0.4597***	-0.4474***	-0.1444	-0.2331		
	(0.1163)	(0.1371)	(0.0740)	(0.0754)	(0.1934)	(0.1976)		
2	0.2054	0.1000	-0.0420	-0.0424	0.2383	0.1600		
	(0.2619)	(0.2521)	(0.0547)	(0.0503)	(0.2436)	(0.2162)		
<i>Level of Tax Increase * Months Before Tax Change</i>								
2	0.0295	0.1023			0.0385	0.0932		
	(0.1741)	(0.1471)			(0.0914)	(0.0628)		
1	0.3267*	0.3861**			0.3325**	0.3891**		
	(0.1355)	(0.1267)			(0.0988)	(0.0977)		
<i>Level of Tax Increase * Months After Tax Change</i>								
1	-0.2839**	-0.2929			-0.2827	-0.1845		
	(0.0945)	(0.1525)			(0.1538)	(0.2137)		
2	-0.2466	-0.1465			-0.2612	-0.1859		
	(0.2206)	(0.2352)			(0.1879)	(0.1743)		
<i>Constant</i>	5.1789***	5.0297***	5.2120***	5.0607***	5.2376***	5.0763***	5.4212***	5.2754***
	(0.1655)	(0.2362)	(0.1699)	(0.2425)	(0.0556)	(0.0641)	(0.1369)	(0.1806)
<i>Controls</i>	YES	YES	YES	YES	YES	YES	YES	YES
<i>Date</i>	YES	YES	YES	YES	NO	NO	YES	YES
<i>Years</i>	NO	NO	NO	NO	YES	YES	NO	NO
<i>Months</i>	NO	NO	NO	NO	YES	YES	NO	NO
<i>Obs.</i>	665	545	665	545	665	545	665	545
<i>Adj. R-squared</i>	0.7701	0.7553	0.7660	0.7516	0.7099	0.6893	0.7153	0.7033

Notes: Significance levels (robust standard errors in brackets): \*\*\* 0.01, \*\* 0.05, and \* 0.10. Column (1) shows the results for the specification of the equation in section 5.1. The regression of column (2) omits the interaction terms. In column (3), we replace the date dummies with seasonal and year dummies. Column (4) shows the results of the regression without controlling for the anticipation effects around the increase notches.

### 6.3 Regional Border Effects

When people just marginally prefer one state over another in a migrating scenario, an increase in real estate transfer taxes might have a decisive influence on the decision of where to move. Thus, we might see market activity that has nothing to do with the transfer taxes in that particular state but with raised taxes in a neighboring state.

As stated in section 5.1, people should seldom be on the verge of indifference when it comes to migrating to one state or another. Germany has scarcely any pairs of areas that are located in different states that

qualify as regional substitutes. In addition, area-specific differences other than geographical differences should have an impact on the housing decision. After all, two areas of different federal states are also located in different districts and different municipalities. The area-specific characteristics therefore also comprise all specific characteristics at different federal levels.

Nonetheless, we cannot fully exclude that the real estate transfer tax in one area affects market activity in another geographically close area of a different state. To a great extent, this concern can be eliminated by taking a closer look at our dataset. Affected areas might be so-called twin-metropolitan areas in which urban areas of two different states are located on opposite sides of the border, such as in some areas in Rhineland-Palatinate. Fortunately, our dataset does not include those particular areas.<sup>21</sup> In addition, the housing market in city-states like Bremen and Berlin, which are embedded in Lower Saxony and Brandenburg respectively, might be interdependent with the surrounding state. To the benefit of our analysis, Lower Saxony implements the exact same tax increases as Bremen, thus not distorting the interdependence of these two states and not causing any bias in our data for Bremen. However, since Berlin and Brandenburg differ in their transfer tax measures, our baseline results might be biased by border effects between these two states.

Table 5 compares the results of our baseline regressions with the omission of Berlin and Brandenburg from our dataset. Notably, in the remaining states, the bunching before a tax increase to a large extent stems from the second month after a tax increase. For the long-term effects, the coefficients are only slightly lower and thus confirm our previous findings.

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<sup>21</sup> Ludwigshafen am Rhein and Mannheim in Baden-Wuerttemberg, in addition to Mainz and Wiesbaden in Hesse, qualify as twin-metropolitan areas. However, none of these cities are included in our data (see section 4).



TABLE 5: RESULTS WITH AND WITHOUT BERLIN & BRANDENBURG

Specification	<i>Dependent Variable: Log Number of Single-Family Home Transactions</i>							
	(1)		(2)		(3)		(4)	
<i>Brandenburg or Berlin included?</i>	YES	NO	YES	NO	YES	NO	YES	NO
<i>Real Estate Transfer Tax</i>	-0.0552*	-0.0504	-0.0647*	-0.0596	-0.0637**	-0.0630**	-0.1248***	-0.1221***
	(0.0228)	(0.0274)	(0.0258)	(0.0350)	(0.0193)	(0.0119)	(0.0286)	(0.0178)
<i>Months Before the Tax Change</i>								
2	-0.0391	-0.0306	-0.0161	-0.0305	-0.0089	-0.0671		
	(0.2111)	(0.3581)	(0.0712)	(0.1223)	(0.1480)	(0.2039)		
1	0.1020	0.0256	0.4115***	0.3252**	0.1164	0.0031		
	(0.1696)	(0.2945)	(0.0830)	(0.0945)	(0.1239)	(0.1478)		
<i>Months After the Tax Change</i>								
1	-0.1855	-0.0372	-0.4597***	-0.4212**	-0.1444	-0.0071		
	(0.1163)	(0.2562)	(0.0740)	(0.1230)	(0.1934)	(0.4371)		
2	0.2054	0.3773*	-0.0420	-0.0039	0.2383	0.4461**		
	(0.2619)	(0.1424)	(0.0547)	(0.0806)	(0.2436)	(0.1053)		
<i>Level of Tax Increase * Months Before Tax Change</i>								
2	0.0295	0.0046			0.0385	0.0834		
	(0.1741)	(0.2589)			(0.0914)	(0.0652)		
1	0.3267*	0.3301			0.3325**	0.3953*		
	(0.1355)	(0.2414)			(0.0988)	(0.1455)		
<i>Level of Tax Increase * Months After Tax Change</i>								
1	-0.2839**	-0.3874			-0.2827	-0.3422		
	(0.0945)	(0.2645)			(0.1538)	(0.3984)		
2	-0.2466	-0.3816*			-0.2612	-0.4075**		
	(0.2206)	(0.1294)			(0.1879)	(0.0898)		
<i>Constant</i>	5.1789***	5.0521***	5.2120***	5.0848***	5.2376***	5.0505***	5.4212***	5.3020***
	(0.1655)	(0.3506)	(0.1699)	(0.3642)	(0.0556)	(0.0655)	(0.1369)	(0.2236)
<i>Controls</i>	YES	YES	YES	YES	YES	YES	YES	YES
<i>Date</i>	YES	YES	YES	YES	NO	NO	YES	YES
<i>Years</i>	NO	NO	NO	NO	YES	YES	NO	NO
<i>Months</i>	NO	NO	NO	NO	YES	YES	NO	NO
<i>Obs.</i>	665	417	665	417	665	417	665	417
<i>Adj. R-squared</i>	0.7701	0.7799	0.7660	0.7755	0.7099	0.7092	0.7153	0.7450

Notes: Significance levels (robust standard errors in brackets): \*\*\* 0.01, \*\* 0.05, and \* 0.10. Column (1) shows the results for the specification of the equation in section 5.1. The regression of column (2) omits the interaction terms. In column (3), we replace the date dummies with seasonal and year dummies. Column (4) shows the result of the regression without controlling for the anticipation effects around the increase notches.

#### 6.4 Further Subsamples

In addition to excluding Berlin and Brandenburg from our regression, we now regress specification (1) of the baseline results in Table 2 while omitting one state at a time. In this manner, we can analyze whether our coefficients are determined by observations in individual states.

The results are shown in Table 6. The coefficient for the real estate transfer tax level ranges from 4.2 to 7.5% and is insignificant for most of the specifications. However, the large drop in transaction numbers over the long run remains the same. Even more so, our results show lower standard errors for larger

(negative) coefficients. In addition, although the anticipation dummies and the interaction dummies vary strongly for different settings, aggregating these coefficients reduces most of that variance. The results suggest that the level of tax increase is differentially important throughout the German states.

TABLE 6: RESULTS FOR SUBSAMPLES

<i>State omitted</i>	<i>Dependent Variable: Log Number of Single-Family Home Transactions</i>					
	Brandenburg	Bremen	Saarland	Saxony-Anhalt	Berlin	Rhineland-Palatinate
<i>Real Estate Transfer Tax</i>	-0.0419 (0.0282)	-0.0593 (0.0284)	-0.0688** (0.0187)	-0.0449 (0.0326)	-0.0748** (0.0215)	-0.0429 (0.0310)
<i>Months Before the Tax Change</i>						
2	-0.1086 (0.1922)	-0.2551** (0.0747)	-0.0096 (0.1987)	0.1338 (0.3170)	0.0369 (0.3266)	0.0289 (0.2010)
1	0.0419 (0.1624)	-0.0289 (0.1418)	0.1039 (0.1793)	0.2907 (0.1590)	0.0932 (0.2841)	0.1225 (0.1857)
<i>Months After the Tax Change</i>						
1	-0.1780 (0.1371)	-0.1145 (0.2524)	-0.2620** (0.0890)	-0.2042 (0.0984)	-0.0181 (0.2226)	-0.2789** (0.0864)
2	0.1000 (0.2521)	-0.0712 (0.1933)	0.1957 (0.2774)	0.2185 (0.2761)	0.5050** (0.1528)	0.2944 (0.2659)
<i>Level of Tax Increase * Months Before Tax Change</i>						
2	0.1023 (0.1471)	0.2073* (0.0832)	-0.0052 (0.1809)	-0.0623 (0.2738)	-0.0548 (0.2428)	-0.0694 (0.1998)
1	0.3861** (0.1267)	0.4333*** (0.0805)	0.3481* (0.1408)	0.2050 (0.1667)	0.2780 (0.2419)	0.2909 (0.1823)
<i>Level of Tax Increase * Months After Tax Change</i>						
1	-0.2929 (0.1525)	-0.3354 (0.1707)	-0.2861** (0.0752)	-0.2924** (0.0761)	-0.3853* (0.1793)	-0.1426 (0.1242)
2	-0.1465 (0.2352)	-0.0057 (0.1671)	-0.2630 (0.2130)	-0.2692 (0.2429)	-0.4705** (0.1260)	-0.3356 (0.2201)
<i>Constant</i>	5.0297*** (0.2362)	5.4476*** (0.1653)	5.2536*** (0.1787)	5.0326*** (0.0903)	5.2653*** (0.1987)	5.0448*** (0.2139)
<i>Controls</i>	YES	YES	YES	YES	YES	YES
<i>Date</i>	YES	YES	YES	YES	YES	YES
<i>Years</i>	NO	NO	NO	NO	NO	NO
<i>Months</i>	NO	NO	NO	NO	NO	NO
<i>Obs.</i>	665	665	665	665	665	665
<i>Adj. R-squared</i>	0.7690	0.7701	0.7710	0.7657	0.7660	0.7660

Notes: Significance levels (robust standard errors in brackets): \*\*\* 0.01, \*\* 0.05, and \* 0.10.

## 7. Conclusion

The real estate transfer tax in Germany is a major part of all transaction costs in land purchases. An increase in the tax rate makes real estate acquisitions significantly more expensive. We conclude that the announcement of an increase in the real estate transfer tax leads to significant reaction of the housing market: Many market participants accelerate their planned transactions to take advantage of the lower tax rate. On top of that, a drastic drop in transactions can be observed after the tax increase.

However, the tax change also leads to long-run effects: Due to the higher tax rate, transactions become less attractive for buyers and sellers and therefore market activity decreases. The increase in the tax rate might be particularly relevant for so-called ‘threshold households’ which were *just* able to buy a house and for which even slight changes in the tax rate can cause greater financial burdens that they may not be able or willing to carry. Our results show that a one percentage point higher tax rate is accompanied by 6% fewer transactions. This finding questions the wisdom of real estate transfer tax increases when other political measures that attempt to support home-ownership creation are in place.

Increasing the tax leads to massive distortions around the time notch, whereas the long-run drop in transactions also curbs the tax revenue increase. Buettner (2017) shows that increases in the real estate transfer tax in Germany result in a less than proportional increase in tax revenues.

Transfer Taxes increase moving costs which can cause further distortions (see Kawata et al. 2016). These effects on the economy as a whole require further research. We were able to show that in many cases, the former first-best option – to buy or sell a single-family home – no longer constitutes the optimal choice for a household. Thus, we expect households to rent rather than to buy or sell, to choose cheaper houses and to stay longer in their home rather than to move. As a result, longer commutes might be possible which can have negative consequences on the urban labor market (see for example Ross and Zenou, 2008).

Additionally, future research efforts should be undertaken to develop a better understanding of the effects of the tax change on real estate transactions. Thus far, we have only been able to study tax increases, as no German state has yet decreased their real estate transfer tax. It would be interesting to learn whether the market would react similarly to a tax change in the opposite direction. Real estate transactions in other countries in which there have been both a tax increase and a tax decrease (or holiday) might provide valuable frameworks and insights to investigate this interrelation in more detail.

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## Appendix

TABLE 7. SHARES OF DIFFERENT TYPES OF HOME USAGE (OWNER-OCCUPIED VS. RENTED-OUT) IN GERMANY, 2011

	<i>Total Number of Dwellings</i>	<i>Share of Owner Occupied</i>	<i>Share of Rented Out</i>
Single-Family Homes <sup>a</sup>	18,681,375	74%	22%
Multi-Family Homes	21,863,942	16%	78%
<i>Total</i>	40,545,317	100%	100%

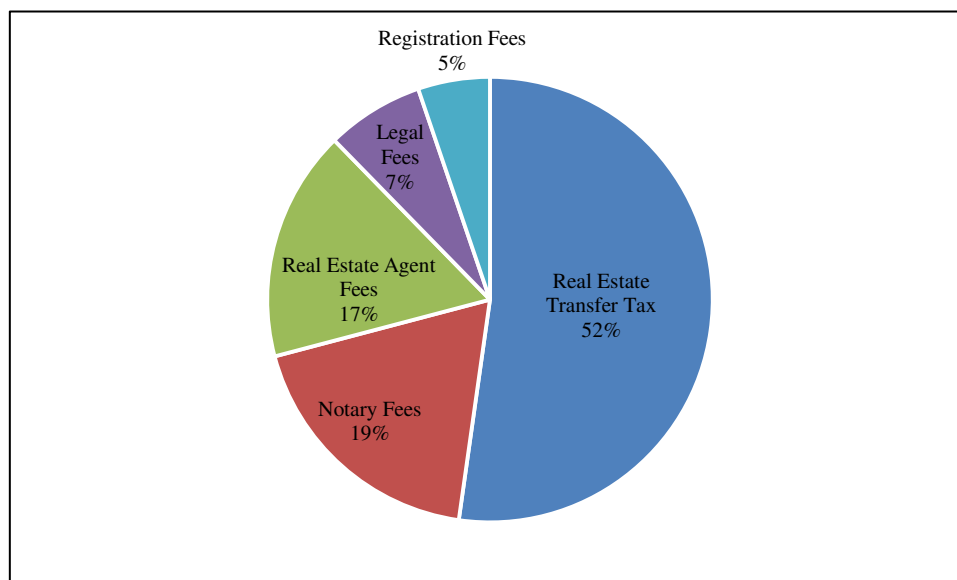
*Notes:* The table presents the share of owner-occupied homes and the share of rented-out homes for single-family homes and multi-family homes. If a dwelling is neither owner-occupied nor rented-out it is vacant or used as a holiday home. a) Single-Family Homes are defined as dwellings with one or two apartments. *Data:* Statistische Ämter des Bundes und der Länder (2014).

TABLE 8. MARKET SHARE OF AVERAGE PRICE OF SINGLE-FAMILY HOMES IN DIFFERENT GERMAN STATES, 2011

	<i>Share of People living in Single-Family Homes<sup>a</sup></i>	<i>Share of Single-Family Homes on all Residential Buildings</i>	<i>Average Transaction Price of Single-Family Homes</i>
Berlin	14%	54%	€ 294,261.91
Brandenburg	57%	84%	€ 124,355.66
Bremen	42%	75%	€ 174,307.93
Rhineland-Palatinate	66%	84%	€ 169,826.03
Saarland	72%	87%	€ 156,352.87
Saxony-Anhalt	51%	79%	€ 75,386.19

*Notes:* The table presents the share of people living in single-family homes in the total population and the share of single-family homes out of all residential buildings in different German states in 2011. a) Single-Family Homes are defined as dwellings with one or two apartments. *Data:* Statistische Ämter des Bundes und der Länder (2014) and Property Valuation Committee of Berlin, Brandenburg, Bremen, Rhineland-Palatinate, Saarland and Saxony-Anhalt (2015).

FIGURE 9. AVERAGE SHARE OF DIFFERENT TYPES OF COSTS ON TRANSACTION COSTS OF PROPERTY TRANSACTIONS IN GERMANY, 2011



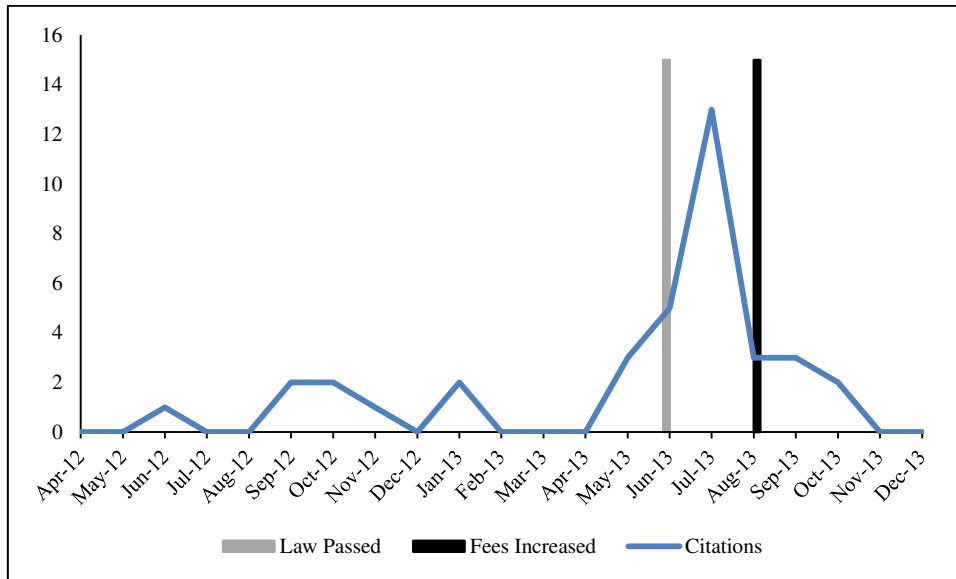
Notes: The figure shows the average share of different types of costs on the total transaction costs of property transactions in Germany for 2011. Transaction costs include notary and legal fees, real estate agent (broker's) fees and real estate transfer taxes. Data: Andrews et al. (2011).

Following transfer taxes, real estate agent and notary fees also play a significant part in the total transaction costs. As all other fees are relatively small, it can be assumed that they have little to no impact on the number of real estate transactions.

With regard to real estate agent fees, there is no legislative basis stipulating a certain fee level. Thus, real estate agents can theoretically ask for individual fees. However, agents typically align themselves to the fees suggested by the umbrella organization in their respective German state. During the time frame of our analysis, there has been no change in this suggested fee level recommended by these umbrella organizations. As a result, we do not include changes in real estate agent fees in our analysis.

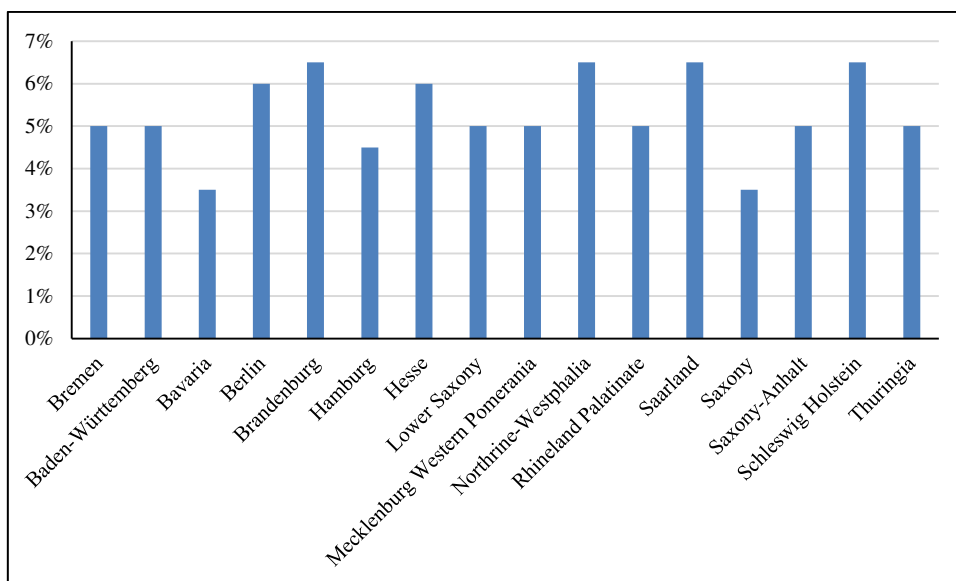
Notary fees are legally fixed; as of August 2013, a new law concerning legal and notary fees has been introduced (*Gerichts- und Notarkostengesetz*, former *Kostenordnung für Verfahren der freiwilligen Gerichtsbarkeit*). As a result, legal and notary fees increased on average by 0.5 percentage points for all German states. Figure 10 charts the media coverage on this topic and the date the increase in fees took effect. The data suggest that the timing of the change in the fees has not been much anticipated as most media coverage only took place in the month preceding the increase of the fees. We control for the change in notary fees in our baseline setting.

FIGURE 10. MEDIA CITATIONS OF THE INCREASE IN LEGAL AND NOTARY FEES IN GERMANY



Notes: The figure presents the media citations of ‘*Gerichts- und Notarkostengesetz*’ (‘Law on Court and Notary Fees’). Media coverage was particularly heavy immediately before the fee increase. Further, all citations in the months before the law passed can be considered as from rather professional journals, which leads us to the assumption that people have not been particularly aware of the increase in legal and notary fees. Media citations from *Der Betrieb*, *Betriebsberater*, *Bundesrat Parlamentsdrucksachen*, *Bundestag Parlamentsdrucksachen*, *Gesetzgebungskalender*, *Haufe*, *Bundesanzeiger*, *Immobilienzeitung*, *Tierischer Volksfreund*, *NotBZ*, *Gießener Anzeiger*, *Coburger Tageblatt*, *Die Kitzinger*, *Saale Zeitung*, *Fränkischer Tag*, *Bayrische Rundschau*, *Bonner Generalanzeiger*, *Kölnische Rundschau*, *Welt am Sonntag*, *Handelsblatt*, *Sächsische Zeitung*, *Berliner Morgenpost*, *Freue Presse*, *Badische Zeitung*, *Euro*, *Nürnberger Nachrichten*, *news aktuell*, *Brauwelt*, and *Miet-Rechts-Berater*. Data: <http://www.genios.de>.

FIGURE 11. TAX RATE OF THE REAL ESTATE TRANSFER TAX IN GERMAN STATES AS OF 2016



Notes: The figure shows the tax rate of the real estate transfer tax for all German states as of 2016. Apart from Bavaria and Saxony, all German states have increased their real estate transfer tax rates since 2007.



TABLE 9. OVERVIEW OF PUBLIC FUNDING INSTRUMENTS ENCOURAGING HOME OWNERSHIP IN GERMANY

<i>Name</i>	<i>Funding Type</i>	<i>Geographical Coverage</i>	<i>Funding Amount</i>	<i>Funding Period</i>
Eigenheimzulage	tax allowance	Germany	1% of purchase price	until 12/2005
Eigenheimrente	loan/tax allowance	Germany	154-454 € annually	since 01/2008
IBB Familienbaudarlehen	loan	Berlin	max. 60% of collateral value	since 03/2015
ILB Brandenburg Kredit	loan/grant	Brandenburg	max. 50,000 €	since 01/2013
ISB Darlehen Wohneigentum	loan	Rhineland-Palatinate	max. 150,000 €	since 04/2013
Saarländische Wohnraumförderung	loan	Saarland	max. 400 €/m <sup>2</sup>	since 04/2008

*Notes:* The table presents all public funding instruments encouraging home ownership in Germany that were introduced or abolished during the time period of our sample. Funding instruments at the municipal level have been excluded due to their limited impact on transactions at the state level. *Data:* <http://www.genios.de> and <http://www.bauforderer.de>.