Who Truly Bears (Bank) Taxes?
Evidence from Just Shifting Statutory Incidence

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Abstract

We show economic incidence and distortionary effects of just shifting statutory incidence (i.e., the agent on which taxes are levied), without a tax *rate* change. For identification, we exploit a tax change and administrative data from the credit market: (i) a policy change in 2018 in Spain shifting a mortgage tax to being levied on banks instead of on borrowers; (ii) some regions, for historical reasons, were exempted from paying this tax (or have different tax rates); and (iii) an exhaustive matched credit register. First, after the policy change, the average mortgage rate increases consistently with a strong (but not complete) tax pass-through. Second, there is a large heterogeneity in such pass-through: larger for borrowers with lower income, less lending relationships, not working for the lender, or facing less banks in their zip-code. Third, despite no variation in the tax rate, the tax shift increases banks' risk-taking: more affected banks reduce costly mortgage insurance in case of loan default (especially so if banks have weaker ex-ante balance sheets) and expand into non-affected but riskier consumer lending.

JEL Codes: G21; G28; G51; E51; H22.

Keywords: taxes; incidence, banks; inequality; risk-taking; mortgages.

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1. Introduction

Taxation –given its impact on the economic decisions of agents– is one of the most studied issues in economics. The study of (economic) tax incidence, which agent bears the economic burden of the tax, helps to identify relevant characteristics of markets, such as price elasticities or existing frictions, and in doing so can serve as a sufficient statistic for welfare analysis of various policy measures (e.g. Chetty, 2009).

One key principle governing the understanding of taxation is that tax incidence is independent of on which agent taxes are levied, i.e. the irrelevance of statutory or physical incidence (e.g. Kotlikoff and Summers, 1987): shifting the agent on which the tax is levied does not change the economic incidence of the tax, as price adjustments compensate such shift.[1] However, there are circumstances under which such principle can be violated (see e.g. Weyl and Fabinger, 2013), and in such cases the decision of on which agent are taxes levied on is first order.

In this paper we analyze the overall and heterogenous effects of just shifting the agent on which taxes are levied on (i.e., shifting statutory incidence), without any change in tax rates. We revisit this key classical question by exploiting a tax shift in the banking industry (the credit market) in conjunction with supervisory (administrative) mortgage data.

While showing effects of a shift in statutory incidence is relevant (as it should not matter in principle), focusing on the banking industry, and in mortgages in particular, is also crucial. Not only are banks interesting due to their centrality for the economy and their strong moral hazard problems (Freixas and Rochet, 2008), but also similar loans to different borrowers have different prices (rates), thereby allowing to identify possible heterogeneous tax incidence through different pass-through. Moreover, public debate about introducing taxes to banks due to their role in crises, e.g. expensive tax-payers' bailouts or central bank liquidity injections, is also salient (e.g. G20 proposal, IMF (2010)). Further, taxes on real estate are also a key source of government revenues around the world (Besley, Meads and Surico, 2014; Best and Kleven, 2018) and soft lending standards in mortgages were at the core of the 2008 financial crisis (Jaffee et al., 2009).

[1] This principle is sometimes referred to as tax liability side equivalence, "Dalton's Law" (Hugh Dalton, 1922), invariance of incidence proposition, or physical neutrality and can be traced to Jenkin (1871-72). The study of tax incidence and its relevance for economics can be traced back to the studies of Quesnay.

To study (economic) incidence and distortionary effects of shifting statutory incidence, we exploit in particular: (i) a policy change in Spain in November 2018 that shifts a mortgage tax from being levied on borrowers to being levied on lenders, without any change on the tax rates; (ii) the fact that some regions, for historical reasons, are exempted from paying this tax, or have different tax rates; and (iii) an exhaustive credit register matched with borrower and lender information.

We find that, after the policy change, the average mortgage rate increases consistently with a strong (but not complete) tax pass-through, of approximately 80% of the tax base. Importantly, we show a large heterogeneity in the pass-through: the pass-through is larger for borrowers with lower income, with previous debt, less lending relationships, not working for the lender, or facing a smaller number of banks in their zip-code. Moreover, despite that there is no change in the tax rate (which could have led to e.g. the typical inefficiencies associated with tax increases), we find that the shift in the statutory incidence of the tax affects banks' decisions, in particular those related to bank risk-taking. We find that banks more affected by the tax shift (those banks with a larger share of their assets affected by the tax shift) exhibit a decrease in their profits and increase their risk-taking by reducing costly mortgage insurance in case of loan default (especially so if banks have ex-ante weaker balance sheets in terms of higher non-performing loans (NPLs)) and by increasing the likelihood of granting applications of non-affected but (much) riskier consumer lending (i.e. spillovers to the riskiest lending).

To the best of our knowledge, this is the first paper that shows economic effects of statutory (or physical) incidence, not associated to a tax rate change (or to any other change in policy or to tax evasion activities) but only associated to a shift of levying a tax from one set of agents to others – specifically from borrowers to lenders in the credit market, or more generally from buyers/consumers to sellers/producers (see below the differences of our study with the related papers in the literature review subsection). The policy change as well as the banking setting and administrative matched datasets allow us identification. Importantly, our findings suggest strong (overall and heterogeneous) economic incidence effects (e.g. affecting more lower income people with less bank connections) as well as results consistent with distortionary effects in terms of reducing costly bank guarantees and increasing non-affected but riskier lending (especially by more affected banks with characteristics that proxy for higher moral hazard problems –those with weaker balance sheets, in terms of higher ex-ante NPLs– that have a higher likelihood of future help from taxpayers and/or central banks).

Overview of the paper. In the rest of this Introduction we provide an overview of the different sections of the paper and our contribution to the existing literature.

In Section 2 we explain the institutional details. On November 10th 2018, the Spanish government passed a law determining that, from that date onwards, "households will stop paying" a mortgage related tax (*Actos Juridicos Documentados*), and "the tax will be paid by the bank" granting the mortgage.[2] The tax base is the so-called mortgage liability, which serves as an insurance for the bank in case of mortgage default (given that it is the maximum amount collateralized) and is one of the features set by the bank in the mortgage contract. Importantly, this tax is administered at the regional level (*comunidades autónomas)*, and ranges from 0.5% to 1.5% of the aforementioned mortgage liability, with a region in Spain, the Basque Country, where primary residence mortgages are exempted (for historical reasons) from such tax. As already explained, tax rates were not altered by the policy change. One relevant feature of mortgages in Spain (similarly in Europe) is that they are full-recourse: in case of mortgage default, the bank has the right to full repayment of the mortgage obligations over and above the house with present and future household wealth and income. Therefore, even in the 2008-14 crisis, mortgage defaults and loss given defaults were relatively low, see e.g. Bank of Spain's Financial Stability Report (2017).

In Section 3 we explain the datasets. We exploit the exhaustive Spanish credit register (CIR), a proprietary database owned by Banco de España in its role as supervisor of the Spanish banking system. This administrative database contains all household bank loans granted in Spain by all operating banks on a monthly basis and data on new loan applications of households that are not currently borrowing from the requesting bank.[3] We know whether a loan application is granted, and for those granted applications, we observe the loan rate, loan amount, the mortgage liability, the maturity, the zip-code of the borrower and of the real state property, the future credit performance of the loan (defaults) as well as the loan-to-value ratio.

We analyze the universe of household loans in this period, in particular, on all new primary residence mortgages granted between January 2018 and June 2019.[4] Primary residence mortgages are exempted for this tax in the Basque country and are the majority of mortgages across Spain; nevertheless we also analyze in robustness the secondary residence mortgages. Moreover, we also analyze other household loans (consumer credit) which were not subject to the policy change (i.e. spillovers of the policy change). We have borrower-level information such as employment status,

[2] For the change in this law, see https://www.boe.es/diario_boe/txt.php?id=BOE-A-2018-15344, and for taxes in general in Spain, see https://www.agenciatributaria.es/AEAT.internet/en_gb/Inicio/. The legal procedures surrounding the change in the law occurred during October 2018 and are explained in detail in Section 2.

[3] See also Jiménez et al. (2012, 2014, 2017) for a thorough description of the database.

[4] The policy change took place in November 2018. As we explain in the main text, there were important discussions in October 2018. In June 2019 another change in mortgage regulation took place, so our sample stops in May 2019.

age, gender, job, previous leverage and credit history, as well as a proxy for income via the average income in their zip code[5]. Finally, we also match the data to supervisory bank balance sheets and income statements (e.g., the capital ratio, size, NPLs, liquidity ratio, ROA).

In Section 4 we explain the empirical strategy. Our main empirical strategy consists of a difference-in-difference analysis of those mortgages that because of their location are subject to the regulatory change (treatment group), and those mortgages not subject to it (control group). For the control group we first exploit the Basque country where there was (is) no tax,[6] where we also exploit loans granted in areas close to the administrative border of the region (both in treatment and control groups). Having an area in which the tax did not exist in practice, the Basque country, allows us to have an unaffected area,[7] and e.g. control for any general trend occurring during such period that could cofound our results. Moreover, we also analyze the change in outcomes over a very narrow time window (two weeks), and control in some regressions for many lender and borrower observables and unobservables (e.g. different type of borrowers or lenders that could be driving the results), as well as loan characteristics, and also check whether those controls change the estimated coefficients (following e.g. Oster 2019, and Altonji et al., 2005).

Second, we exploit differences in the intensity of treatment as different regions have different tax rates, and therefore were differentially affected by the (central/ "federal") government policy decision. Third, we exploit that banks could be differentially affected by the policy, as banks differ in their regional exposure, and mortgages in treated areas represent a higher fraction of their portfolio for some banks. Finally, to further understand the channels, we exploit borrower heterogeneities across, e.g., income, LTV ratios, previous indebtedness and proxies for imperfect competition (borrower-lender relationships and number of banks at the zip code level), as well as lender heterogeneities (not only being more or less affected by the policy but also measures of the strength of balance sheets that proxy for bank moral hazard problems like bank NPLs, see e.g. Freixas and Rochet, 2008).

In Section 5 we summarize the results (the tables are at the end of the paper). We first proceed by analyzing the difference on the average mortgage rate before and after the regulatory change. We

[5] Throughout the paper we assign the zip code of the household to the zip code of the property associated to the mortgage.
6 As already noted, primary residence mortgages in the Basque Country where exempt from paying the tax before and after the policy change.
7 Not only are taxes in one region 0% but the policy shock is relatively small, and hence a difference in difference analysis identifies the effects, as a small shock will in principle not generate significant general equilibrium effects. The average tax for the median mortgage (which is around 118,000 Euros) accounts for 1,900 Euros.

show how there is a 10 basis-point increase in the yearly total mortgage rates when comparing mortgages granted in treated areas with those granted in the control region (the Basque Country). Ten basis points represents 5% of the average mortgage rate. This result is robust to introducing various borrower, lender, and location controls as well as a variety of fixed effects. We perform various simulations that suggest that the average 10 basis point increase accounts for at most 80% of the tax. We show how the banking industry adjusts rapidly as the majority of the pass-through already happens during the first two weeks of the policy change. Consistent with an intensity of treatment setting, when we exclude the Basque Country we find that the pass-through is 2 basis points larger in the regions that had a larger tax (regions with tax rate between 1%-1.5%) than those with lower tax (regions with tax rate between 0.5%-1%).[8]

We then document the heterogeneity in the pass-through to mortgage rates and how it depends on both borrower and bank characteristics. We find a substantial lower pass-through for borrowers with higher income, higher amount of banking relationships, higher number of banks operating in their neighborhood, those borrowers working for the lender and without previous debt as of December 2017. For instance, households in the 75% compared to those in the 25% of the income distribution see their relative loan interest rates to decrease in 8 basis points after the policy change. Similarly, households in zip codes with more banks (75% versus 25% of the distribution of banks' presence) have, on average, 2 basis points less increase in the loan interest rates; and 17 basis points less increase for households with more banking relationships (again 75% versus 25% of the distribution of banking relationships). Finally, if the borrower works for the lender, loan interest rate is 17 basis points lower after the policy change, as compared to other borrowers, and 13 basis points higher if the borrower was indebted prior to our sample (as of December 2017). We rule out unobservable risk as a plausible explanation of the documented heterogeneity in the pass-through, and argue that these heterogeneous effects are an unintended consequence of the tax shift, consistent with higher income, less leveraged and importantly more bank-connected borrowers having higher bargaining power.

Importantly, we also document no change in the *observable* characteristics of those individuals that were granted a mortgage after (versus before) the regulatory change, which ameliorates the concern of endogenous selection by borrowers driving the results.[9] Moreover, controlling for

[8] Given data limitations we cannot analyze mortgage fees at the borrower level. Nevertheless, in order to analyze potential effects in fees we conduct an analysis of loan related fees at the bank level and do not find any differential effects of the policy on loan related fees, while we do find differential effects of loan related interest income (higher for more affected banks) and total bank profits (lower for more affected banks).

[9] We also find no relevant aggregate quantity effects regarding the amount or volume of mortgages surrounding the policy (non-reported), which is consistent with borrowers not changing their decisions regarding mortgages around the policy

borrower and loan characteristics, that increase the R-square by 35 percentage points, keep the estimated coefficient completely identical, thereby suggesting that *unobservables* are not driving the results (following Altonji et al., 2005; Oster, 2019). To further rule out possible changes in credit conditions as drivers of loan rate changes, we find that there is no change in other key characteristics such as the amount of the mortgage, the loan to value ratio or the maturity of the mortgage.

We argue that the fact that certain borrowers (high income, high amount of banking relationships, bank employees) experience a smaller increase in their mortgage rates than other borrowers, i.e. weaker pass-through, when the tax is imposed to banks instead of to them, is evidence not consistent with statutory incidence being irrelevant for tax incidence.[10] Borrowers with weaker pass-through have lower costs (net of taxes) of obtaining a mortgage after the shift in regulation and, given that we do not find any other changes in mortgage characteristics (LTV, maturity, volume), the results suggest that these borrowers increase their relative welfare as they are obtaining the same mortgage at a lower total cost compared to the borrowers with higher pass-through (e.g. lower income borrowers or with less number of potential or actual lenders).[11]

Once we show the overall and heterogeneous effects of the tax shift on borrowers, we analyze whether the tax shift causes distortions in banks' decisions. If banks do not fully pass-through the cost of the tax to borrowers (see the above results), the policy change may reduce bank revenues, thereby increasing bank risk taking incentives (e.g. Keeley, 1990 and Hellman, Murdock and Stiglitz, 2000). We first document that those banks more affected by the tax shift (i.e. those banks with a higher proportion of their assets as mortgages in regions affected by the tax shift) suffer a higher relative decrease in their ROA,[12] and increase risk by changing their mortgage and non-mortgage lending strategies. We find that more affected banks reduce more the costly mortgage liability (i.e.

change. Nevertheless, results are significant if we omit the period just before and just after the tax change (e.g., without the months of October and November 2018).

[10] For evidence not consistent with statutory incidence being irrelevant for tax incidence, note that these heterogeneous effects are in addition to the strong but not complete pass-through to loan rates and to the distortionary effects that we will discuss below.

[11] We also document how certain bank characteristics are important for the intensity of the mortgage rate increase. The increase is higher the higher the capital to asset ratio of the bank, which we argue is consistent with equity being the more expensive source of financing for the banks (Freixas and Rochet, 2008) and hence the shift being more costly for those banks. The increase is also higher for banks with lower ratio of mortgages to total assets (consistent with these banks being less specialized in mortgages), and for banks with higher NPLs, consistent with higher costs of funding due to higher provisioning.

[12] Moreover, there are no differential effects with respect to fees. The overall results on profits, fees and loan-level rates are consistent with our estimations of the pass-through being below 100%.

an insurance in case of mortgage default) and increase more lending to non-affected (but much riskier) consumer loans after the tax shift.

The amount set as mortgage liability serves as the collateral of the mortgage, i.e. it is the maximum amount that the bank can directly appropriate from selling the house in case of the mortgage defaulting. Hence, the tax shift makes banks increase their risk as they are more exposed to loses (lower recoveries) in case of mortgage defaults, and have a riskier portfolio, as they grant more consumer loans, which are substantially riskier than mortgages (e.g. higher defaults and higher loss given default (LGD) as they are generally non-collateralized). This increase in bank risk is probably an unintended consequence of the tax shift (note also that banks are generally bailed-out in case of problems and receive generous central bank liquidity injections), thereby highlighting the relevance of statutory incidence in affecting lenders' behaviors.

Regarding the aforementioned mortgage liability, we find that the reduction in mortgage liability after the law is higher for banks more affected by the law and higher also in treated areas. Interestingly, we find that the reduction in mortgage liability is stronger for more affected banks with weaker ex-ante balance sheets, in terms of higher NPLs which can proxy for those banks having bigger moral hazard problems (see Freixas and Rochet, 2008). We also find that the reduction in mortgage liability is unrelated to observable characteristics of individuals (which, see above results, are key drivers of pass-through to mortgage rates).[13] This latter finding suggests that decisions regarding the reduction in mortgage liabilities were taken at the bank level and not on a borrower by borrower basis (differently from the observed borrower-based heterogeneity in the pass-through to mortgage rates). One important side effect of the reduction in mortgage liability is the reduction of tax collection by the government: given that mortgage liability is the base of the tax, by reducing it banks lower the overall tax payment that the government receives from this tax.

Regarding non-affected household loans (i.e., consumer loans), we find that the propensity of accepting a consumer loan application after the tax law is higher for banks more affected by the law and higher also in treated areas.[14] We also show that there was no change in the conditions of granted consumer loans (loan rate, maturity or loan amount) but that there was an increase in the ex-post

[13] The only borrower characteristic that we find is relevant both for pass-through in mortgage rates and mortgage liability is whether the borrower works for the lender. We also show that our results regarding the heterogeneity in pass-through are robust to introducing (the endogenous) mortgage liability as a control.

[14] While we also find that the effect is stronger for more affected banks with weaker ex-ante balance sheets in terms of higher NPLs, this result is not significant at conventional significance levels.

default rate of these loans (consistent with a relaxation of the lending standards regarding consumer loans, i.e. higher risk-taking of more affected banks).

Related literature. We contribute to the literature in two main directions. First, on the literature analyzing the implications of tax interventions in markets in general, and second, on the literature studying the economic effects of credit market distortions.

As previously argued, the literature analyzing how taxes affect economic decisions and its incidence is ample, e.g. Kotlikoff and Summers (1987) and Fullerton and Metcalf (2002) provide excellent reviews of the literature. The novelty of our study relies on its focus in one important aspect of taxation rarely analyzed, statutory incidence, as tax changes are normally associated to changes in tax rates, but not just shifts in the agents on which taxes are levied on. Moreover, we analyze statutory incidence in one crucial market –the credit market– using a real policy change (in conjunction with administrative datasets).

Our study is related to those studies analyzing on how different tax characteristics determine its incidence. Chetty et al. (2009) shows the relevance of saliency for tax incidence. Saez et al. (2012) finds that, after a reform in payroll taxes in Greece, employers compensate for the extra employer payroll taxes but not for the extra employee payroll taxes. Kopczuk et al. (2016) shows the relevance of tax evasion abilities for tax incidence in the diesel industry. In comparison to these studies, we analyze a shift in the credit market exploiting a pure shift in statutory incidence without a change in tax rate, tax evasion, or any other related policy or event, and show that there are important heterogeneous effects on borrowers (borrower income and borrower bank connections) and a change in bank risk taking related decisions of lenders more affected by statutory incidence. Interestingly, while we find that banks reduce the mortgage liability when they bear the statutory incidence (which reduces their tax base and the income for the government without performing tax evasion but increasing banks' risk exposure in case of mortgage default), we also document that there is an heterogeneous loan rate pass-through which is independent of such decision and depends on measures related to borrowers' bargaining power (income and borrower access to other sources of finance). Moreover, by analyzing credit markets and banks, our results suggest distortionary effects due to the change in statutory incidence as more affected banks by the policy, and especially those with higher moral hazard problems (ex-ante riskier assets), take substantial higher risk after the policy (in terms of reducing costly insurance).

Our interest in mortgage taxes relates our study to those analyzing the incidence of transaction taxes in housing markets. Best and Kleven (2018) and Besley et al. (2014) study the effects of

introducing stamp duty holidays in the UK. Crucially, our analysis differs from these previous studies as we analyze a change in statutory incidence without changing the tax rate (as a stamp duty holiday implies) and find important effects associated with such change both at the borrower and bank level, including heterogeneous effects associated with borrower (-bank) connections and income, as well as results on consistent with excessive risk-taking.

Finally, our findings on how changes in credit market conditions, in our case statutory incidence, affects (heterogeneously) borrowers and lenders, relates our study to a large literature analyzing the economic consequences of distortions in credit market (see e.g. Chodorow-Reich 2014, Kwhaja and Mian 2008, Paravisini 2008). Our results on how changes in market conditions affect banks' risk taking relates to various studies analyzing the determinants of bank risk taking decisions. Previous research has shown how banks' risk taking can be shaped by various policy measures: e.g. capital requirements (Hellman et al., 2000), competition (Keeley, 1990) or monetary policy interventions (Jimenez et al., 2014), and how, in line with our findings, targeted interventions in a given market can have (unintended) spillover effects on other markets (Chakraborty et al., 2019). Our main contribution to this literature is to show how statutory incidence generates relevant effects for banks, resulting in higher risk taking, and for borrowers, given the heterogeneous pass-through to different type of borrowers.

In Section we discuss the institutional details. Section 3 describes the data, Section 4 the empirical strategy, while in Section 5 we summarize the results of the paper. Finally, Section 6 concludes.

2. Institutional details

Mortgages in Spain are subject to an administrative tax that has to be paid upon the formalization of the mortgage (*Actos Juridicos Documentados*). This tax accounts for 1.5% of the mortgage value on average and is based on the so-called mortgage liability (*responsibilidad hipotecaria*), which is based on the value of the mortgage at inception and its main role is to determine the maximum amount that the lender can directly appropriate by selling the house in the case of mortgage default, i.e. the collateral amount of the mortgage. Hence, the mortgage liability can be seen as a costly insurance for banks: costly because of the tax, and insurance because of the collateral.

This tax is administered at the regional level (*comunidades autónomas*), and ranges from 0.5% to 1.5% of the aforementioned mortgage liability.[15] Interestingly, a region in Spain, the Basque

[15] Table 3 in the Appendix provides details on the exact base tax rate in each region. The exact tax rate depending on whether the mortgage is for primary residence, or the age of the borrower. To reduce this dispersion, only primary

Country, has primary residence mortgages exempt from such tax. The underlying reason from such exemption is that, for historical reasons, the Basque Country has a special tax system different from the other regions in Spain.[16]

Originally the tax was levied on the households who borrow via a mortgage, i.e. statutory incidence fell on borrowers. However, on the 18th October 2018, the Supreme Court in Spain stated a new mandate by which the agent that should pay the tax was the bank. One day later, on the 19th of October 2018, such mandate was put on hold given the "important economic and social impact" of the issue. On the 6th of November 2018 the decision of the Court was to maintain the original mandate in which the tax was levied on households. The day after, 7th of November 2018, the prime minister of Spain, Pedro Sanchez, stated "*never again will Spaniards pay such tax, it will be paid by banks*". On the 8th of November 2018 a new law –a Royal Decree– was approved declaring that the tax has to be paid by the banks granting the mortgage (Real Decreto-ley 17/2018) from that moment onwards. Such law started to be effective on the 10th of November 2018, shifting statutory incidence to lenders.

In short, on the 10th of November 2018 the tax shifted from being levied on households to being levied on banks –i.e., from borrowers (credit demand)/consumers to lenders (credit supply)/ producers. Given the timing of the rulings, there may be some anticipation effects being already present during October 2018.[17] Importantly, as tax rates were not altered by the policy change, only there was a change in statutory or physical incidence.

Another relevant development regarding the mortgage market in Spain is that on 16th of March 2019 the Spanish government passed a new law (Ley 5/2019) regulating various aspects of mortgages in Spain, which would take effect three months later (part of the objective of this new law is to transpose into the Spanish legislation the European directive 2014/17/UE). This suggests that after (or on) June 2019 there are other relevant developments in the mortgage market that could confound our results. For this reason, and in order to have a balanced number of periods before and after the policy shock, we start our analysis on January 2018 and end it on May 2019. Moreover, we show the

residential mortgages are considered in the main analysis and the age of the borrower is included as a control. In Spain, the mortgage liability of the average mortgage is around 1.5 times the amount of the loan.

[16] In Spain (similarly in Europe), mortgages are full-recourse. That is, in case of loan default, the bank has the right to full repayment of the mortgage obligations over and above the house with present and future household wealth and income. Therefore, even in the 2008-14 crisis, mortgage defaults and loss given defaults were relatively low, see e.g. Bank of Spain's Financial Stability Report (2017). In particular, in 2015 loan delinquencies (i.e. delays in payments over 90 days or more) were 8% and LGD was (approximately) 16%. Mortgage volume over GDP was around 50%.

[17] Figures 2, 3 and Figure 4 in Appendix show how anticipatory effects were either inexistent or very small. We also perform robustness analysis excluding October and November 2018, in order to eliminate possible anticipation effects, and find that results are robust. See below the section on Results.

estimated effects for the main regression for every month in our sample data, to check for pre-trends, potential anticipation effects, and effects after March 2019 given the announcement of the new law.

3. Datasets

In our study we combine three (matched) administrative datasets: (i) the Spanish Credit Register with information on loan level data, including borrower (household) and lender (banks); (ii) supervisory bank balance sheet information; and (iii) loan application data.

We exploit the Spanish Credit Register (CIR), a confidential loan-level database that contains all loans granted in Spain by any bank operating in the country since 1984 at monthly frequency. For the purpose of the paper we put the focus of attention on loans to households and, in particular, on all primary residence mortgages granted between January 1, 2018 and May 31, 2019. We also analyze secondary residence mortgages (statutory incidence also changed, also there was no tax change rate in these mortgages, but all tax rates are positive for these mortgages though with different tax rates) and consumer lending (not affected by the change in the tax law).

Importantly, in 2016 the CIR was modified to, among other changes, reduce its declaration threshold to be included in the register from 6,000 euros to 0 euros, i.e. we have the universe of loans. This improvement was also reflected on the quality of both borrower and loan level information reported. In addition to the usual information about loan characteristics provided by the previous CIR (such as the type of instrument, currency, degree of collateralization, default status, the amount granted and the borrower nationality), many other characteristics of the loan were included or improved such as the loan interest rate (amount and type), the exact maturity, the mortgage liability, the loan to value ratio (LTV) and the zip code of the property among others. Moreover, since 2016 the CIR also began to store information of the borrower such as his employment status (unemployed, public servant, student, banking group employee…), age and gender. We exploit all this information along with his credit history and previous indebtedness of the borrower. Moreover, we proceed to proxy the gross income of the household with information at the zip code level. We use the average gross income of the households at the zip code level in 2016 (which is the last available year) provided by the Spanish Statistical Office (INE), where the the number of zip codes in our analysis is 4,420. We also proxy borrowers' bargaining power by including the number of banks granting loans in the zip code and also the number of banking relationships that the borrower has as of December 2017.

For our main regressions, we focus on newly originated primary residence mortgages, excluding from our sample those households who have a self-employed worker among their members. We exclude self-employed workers as these workers sometimes use their residences as

workplace and we do not have their firm related information and could be very relevant. Moreover, we do not include renovations or refinancing of mortgages, given the special characteristics of this type of operations.[19] As a robustness, we also consider secondary residence mortgages despite that for this type of mortgages tax rates were positive in all regions (the Basque country only exempts primary mortgages).

As well as newly granted mortgages, in Section 5.2.2 we also analyze newly granted consumer loans. In particular, we also exploit a new dataset of consumer loan applications during the same period of time. This database contains information of loan applications made by borrowers without pre-existing relationships with the lender. Once this information is merged with the CIR, it is possible to know whether the loan application was finally accepted by the bank and granted. For a more detailed description of the CIR see, for instance, Jiménez et al. (2012, 2014, 2017). We also have information on loan rates, volumes, maturity, and defaults. Importantly, consumer loans were not affected by the policy change and those loans are substantially riskier than mortgages with much higher default probabilities and generally uncollateralized.

Finally, we use the balance sheets and income statements of banks as of 31st December of 2017 (when our sample starts). The Bank of Spain, in its role of supervisor, receives periodically the reports with information of bank's balance sheet and profit and loss account. In this paper, we consider the log of total assets as a proxy of the size of the bank, the capital ratio as the ratio of owns funds over total assets, the ratio of liquid assets over total assets, the return on assets (ROA) for total bank profitability, the NPL (non-performing loan) ratio capturing the risk profile of the bank and the mortgage volume over total assets as a measure of the bank portfolio concentration on mortgages. We also include some other borrower-bank variables to capture the strength of the relationship such as whether the bank was the main lender of the household as of December 2017, whether the bank was the leader bank (highest mortgage market share) in the zip code, or how much mortgage exposure the bank has in the most affected areas.

4. Empirical Identification

We start by analyzing, for Spain, the impact on loan interest rates of newly originated mortgages of shifting the statutory incidence of the mortgage tax. For economic tax incidence, we analyze overall pass-through as well as heterogeneous effects. We then analyze bank risk-taking by more affected banks and in more affected areas, in particular costly insurance (mortgage liability) and consumer

[19]Primary residence mortgages are the main share of mortgages in Spain. Renovations and refinancing represent less than 20% of the mortgage market in Spain during 2018. www.ine.es.

lending (i.e., lending to households not affected by the change in the tax law); we also analyze whether effects are stronger for banks with higher ex-ante moral hazard problems proxied by ex-ante NPLs.

As explained in detail in the previous sections, on November 10, 2018, a Royal Decree entered into force changing the taxpayer of the tax from the borrower to the bank, a shift in the statutory incidence, with heterogeneity across regions (in Spain this tax is transferred to the regions), and without a change in the tax rate (just a change on whom the tax is levied on).

The territorial idiosyncrasies of Spain moreover help with the identification strategy, as the Basque Country has its own tax regime, which means that the Royal Decree has no effect on this jurisdiction. Moreover, given that the Basque Country has a tax rate of 0% before and after the introduction of the law for the primary residence mortgages, we use a difference-in-differences specification to fit the quasi-experiment that arises after the modification of the law. As explain below, we also exploit zip codes around the border of the Basque country and other regions, as well as we also analyze all the regions via differential intensity in treatment as tax rates vary across regions from 0% to 1.5% (there are 19 regions in Spain, including two autonomous cities).

We construct a treatment variable as the product of the dummies *Post* and *Treated*, where $Post_t$ refers to periods after November 10, 2018 (the day when the Royal Decree entered into force), and $Treated_i$ refers to all new mortgages of households whose property is located in the territory on which the Royal Decree applies. Hence, the control group are all mortgages on properties located in the Basque Country as they are not affected by the law but can be subject to other relevant macroeconomic shocks.[20]

Thus, if we denote by $Interest\ rate_{ijt}$ the loan interest rate of mortgage *i* granted by bank *j* at day *t*, we estimate by OLS the following diff-in-diff regression:

$$Interest\ rate_{ijt} = \beta Treated_i * Post_t + \eta_i + \eta_{ijt} + \varepsilon_{ijt} \quad (1)$$

where η_i *is* a set of controls related to some head-of-the-household[21] characteristics associated to a particular mortgage, η_{ijt} is a vector of fixed effects at mortgage-bank-time (year:quarter, year:month or year:month:day) and ε_{ijt} is the error term. We show the estimated effects without any control, progressively saturate the regression and also show the results with all the controls.

[20] The case of Navarra is singular because although it has its own regional regime such as the Basque Country, it decided to change its own law to align with the rest of Spain. Results are the same if we exclude mortgages from Navarra.

[21] The head-of-the-household is considered the oldest of the debtors of the mortgage.

The set of household characteristics controls for observable and unobservable time-invariant household specific factors that affect equally the interest rates of all mortgages and allow us to reduce possible differences between the households assigned to the treatment and control groups. Note that we cannot include household fixed effects as these are mortgages around the change in the law for buying a primary residence for the household. Our set of household controls include a set of dummies depending on the specification we use: zip code*employment status and zip code*employment status*foreign, where zip code captures average household income and wealth, and employment status distinguishes between public servant, bank group employee (of the lender), student and unemployment, homeworker or rest of employees, and foreign is a dummy capturing whether the head of the family is a resident but with foreign nationality. The set of household controls also includes, in some specifications, other observable household characteristics such as its credit history, number of banking relationships and a dummy capturing whether the household was indebted prior to the start of our sample (as of December 2017). Moreover, we control in some regressions for other loan characteristics such as the maturity or the amount granted or mortgage liability to check the stability of the estimated coefficients.

The bank-time (η_{jt}) fixed effects control for observable and unobservable time-variant bank factors. In the most stringent specification we interact this set of bank-time effects with the type of mortgage loan (fix or variable rate). The inclusion of the type of mortgage loan by the time when the loan was granted by each bank has the advantage of homogenizing all mortgages and allow us to better compare loan rates. Standard errors are triple-clustered at the bank, time, and zip code level to allow for serial correlation across mortgages of the same bank and those granted in the same period or in the same zip code over time.

The coefficient β on the product of *Treated*Post* captures the impact on loan interest rates of the Royal Decree after its introduction in the regions where it applies with respect to the control group. We will analyze both the overall effects of the tax change, and also heterogeneous effects across difference household variables such as household income and bank connections. To test for heterogeneous effects in our variable of interest, we estimate the analogous of Eq. (1) including an additional interaction term. The equation takes the form:

$$Interest\ rate_{ijt} = \beta Treated_i * Post_t + \gamma Treated_i * Post_t * X_{ij} + \eta_i + \eta_{ijt} + \varepsilon_{ijt}, \qquad (2)$$

where, X_{ij} is a vector of household or household-bank (or bank) characteristics such as income, number of bank relationships, whether the borrower works for the bank or bank NPL.

Additionally, in order to estimate the effects on other relevant mortgage related variables (such as maturity, loan to value ratio, loan amount or loan amount/mortgage liability) we replace the left hand side variable of the above equations by each of the aforementioned loan variables. For consumer loans we also study the likelihood of granting a loan application where we can control for borrower fixed effects as there may be multiple (at least two) applications per borrower and some lenders may be more affected by the change in law as they have higher exposure to mortgages in the treated areas.

Crucially, to interpret the estimated coefficients as the causal impact of the new regulation on loan interest rates the underlying assumptions of the difference-in-differences specification have to be fulfilled. First, there are significant regional differences as the Basque Country is one of the richest regions in Spain. We try to reduce this problem by saturating the model with a large set of observable and unobservable borrower, bank and mortgage loan characteristics. Moreover, in some specifications we reduce our sample to the mortgage loans granted in the zip codes adjacent to the border of the Basque Country, which allow us to compare households of very similar characteristics that only differ in their place of primary residence. Second, the parallel trend assumption has to hold. The results suggest that all these assumptions are met in our study.

First, regarding the possible differences in observables between the treatment and control groups, Columns 1 to 3 of Table A1 in the Online Appendix (at the end of the paper) illustrates the differences of mortgage loans between those granted in the Basque Country and outside. It shows, for some household, bank and loan observed characteristics, the average differences by treatment and control group. For comparison among groups, we use the Imbens and Wooldridge (2009) statistic, which avoids the sample-size dependence on the mean test by computing the difference of the means of each variable for the two groups normalized by the square root of the sum of the variances of the variables. Its absolute value is compared with 0.25, a heuristic value proposed by Imbens and Rubin (2015) to test whether the differences should be considered significant or not. As expected, the gross income of the households in the Basque Country seems to be larger (10.42 vs. 10.28), which is in line with the fact that the loan amount is higher and the interest rate lower (11.68 vs. 11.45 and 1.57 vs. 2.10, respectively). Moreover, the average bank that grants mortgages to households in the treatment group is bigger and riskier. This evidence highlights the importance of controlling for income proxies of the household and for bank factors, either through fixed effects or with observed characteristics.

The last three columns of Table 1 provide the same comparison but restricting the sample to the mortgage loans granted in the zip codes adjacent to the border of (both outside and within) the Basque Country. The observed differences diminish, making the two groups more similar. For example, for household characteristics only the number of banks per household is significantly

different. Nevertheless, in addition to controlling for different characteristics (observables and then unobservables through fixed effects), we will also test selection on further unobservables following Altonji et al. (2005) and Oster (2019), see the results section (the R-squared increases by 35 percentage points and the estimated coefficient slightly increase in absolute value but not different statistically, thereby suggesting significant results even if we could control for further unobsevables).

In addition, we also test whether before versus after the Decree there are differences in the observed variables. No household, loan or bank variable has an absolute normalized test higher than 0.25. The variable with the higher difference is loan rates (with absolute normalized value equals 0.16), which is consistent with higher loan rates after the tax law in the treated areas. The results do not suggest a shift in the composition of demand (household characteristics) or supply (bank characteristics) for mortgages following the change in the Royal Decree. At this point it is important to recall that the tax represents less than 1.5% of the total cost of buying a house.

Second, with regard the parallel trend assumption, Figure 1 plots the monthly average interest rate of newly mortgage loans by treatment and control groups using January 2018 as the reference date. It shows that, before the tax law, the average loan rates are very similar. With the entrance into force of the Decree, the interest rate of treated mortgage loans begins to diverge increasing at a higher pace than the control mortgage loans (we see some differences already in October, that will vanish in the econometric specification, see the previous section on when there was the first announcement of a possible change in the law and the next sections on results). We can see that both loan interest rates follow the increased trend set by the Euribor during that period, highlighting the relevance of having a control group that is subject to similar economic developments as the treatment group (variable versus fixed loan rate mortgages). Moreover, for our main results we will also show the difference in difference estimated coefficients for each month in our sample (Figure 2 and 3), which also show parallel trends (see the Results section).

Complementary to our identification strategy based on regional differences in the introduction of the Royal Decree, we also analyze how banks that were differentially affected by the policy change reacted. To do so, we classify banks regarding the weight of their mortgage portfolio outside the Basque country at the end of 2017 (when our sample starts) over their total assets, as the banks most exposed to this type of mortgages should be the ones most affected by the change in the tax law. The equation that we estimate in this case is the following:

$$Interest\ rate_{ijt} =$$

$$\beta High\ Exposure\ to\ Mortgages\ outside\ Basque\ Country_j * Post_t + \eta_{it} + \eta_j + \varepsilon_{ijt}. \qquad (3)$$

In this specification *High Exposure to Mortgages outside Basque Country* is a dummy that takes the value of 1 if the ratio of mortgages outside the Basque Country over total assets of the bank that grants the loan is above the median value of the distribution, and 0 otherwise; and η_{it} is a set of household observable characteristics and loan controls, as in Eq. (1), and we also include the fixed effects zip code*employment status*foreign and type of mortgage loan (fixed or variable rate)*granted time (year:month:day); and η_j are bank fixed effects. We also estimate this equation by OLS and the standard errors are multi-clustered at three levels: bank, time, and zip code.

Additionally, to test for possible heterogeneous effects of our variable of interest, we estimate the analogous of Eq. (3) including an additional interaction term. The equation takes the form:

$$Interest\ rate_{ijt} =$$

$$\beta High\ Exposure\ to\ Mortgages\ outside\ Basque\ Country_j * Post_t +$$

$$\gamma High\ Exposure\ to\ Mortgages\ outside\ Basque\ Country_j * Post_t * X_j + \eta_{it} + \eta_j + \varepsilon_{ijt}, \quad (4)$$

where X is a vector of bank characteristics, in particular bank NPL which proxies for the strength of the bank balance sheet and hence how subject to moral hazard issues the bank is (see Freixas and Rochet, 2008). The higher bank NPL, the higher probability of bank failure, and hence the need of rescue by the government or need of central bank public liquidity (implicit guarantees), or to activate the deposit insurance (explicit guarantees).

The previous analyses are done at the loan level but we also work at the bank level when the information does not allow a more granular approach or for some key variables such as bank total profits (also split by loan interest income versus fees). In particular, we explain the interest income of loans over total assets, loan fees over total assets and ROA of the banks using quarterly data from 2018Q1 to 2019Q2. The equation estimated in each case is the following:

$$Bank\ variable_{jt} =$$

$$\beta High\ Exposure\ to\ Mortgages\ outside\ Basque\ Country_j * Post_t + \eta_t + \eta_j + \varepsilon_{ijt}, \quad (5)$$

where η_t are year:quarter time dummies and η_j are bank fixed effects. We estimate the equations by OLS and we cluster standard errors at the bank level.

4.1 Summary statistics

The first part of the paper uses a loan database that consist on all new primary residence mortgage loans granted to households in Spain between January 1, 2018, and May 31, 2019.[22] Table 1 reports the mean, standard deviation, first, second and third quartile of the distribution of the main variables that we use in the analysis. The sample is classified depending on the value of the dummies *Post* and *Treated*.

As Table 1 shows, 43.9% of mortgage loans were granted after the tax change, and the percentage of loans potentially affected by this measure represents 94.2% of the overall sample (for all the regions, see also Table 2) and 57.4% for the of the sample restricted to the border zip codes around the Basque country (see also Table 3). The main dependent variable, the interest rate charged to the mortgage loans, has an average value of 2.07 with a large dispersion evidenced by a coefficient of variation of 48%. The average value of the maturity (in months) of the mortgage is 299 while the average loan amount (in euros) is 117,607. We also consider other key dependent variables in the mortgage data: loan amount over mortgage liability (costly insurance for mortgages) with an average value of 73%; and LTV, with an average value of 65.9.[23]

Regarding household (borrower) characteristics, the log of the gross income (in euros) has a mean of 10.29 and a standard deviation of 0.19 (the average gross income is 29.995 Euros). For 8% of the households, the head of the family is a public servant, for 2.8% it is a pensioner, for 1.4% it is an employee of the same bank group that the bank that granted the loan, for 2.8% it is a student, and for 2% it is either home employed or unemployed. The omitted category includes the rest of employed workers. The average log of age (in months) of the head of the family is 6.15 (40 years). Almost 46% of the households were indebted prior to our sample (as of December 2017). The average value of the log of one plus the number of banks with which the household has a loan at the end of 2017 is 0.33 (that corresponds to 0.52 banks), and the average of the log of one plus the number of banks that have a branch operating in the zip code of the mortgage real estate is 1.9 (which corresponds to 5.7 banks).

Regarding the average characteristics of the lender just prior to our sample (at the end of 2017), the log of total assets has a mean of 18.62 (230,510 million euros), 8.49% is the average value for the capital ratio, and 0.38% is the average value for bank profits measured by the ROA. The non-performing loan (NPL) ratio has an average value of 6. The average weight of loans to households over the total portfolio of the bank accounts for 26%. The bank that granted the mortgage was the

[22] As a robustness exercise, in Section 5.1.2, we also show that results are the same if secondary residence mortgages are also taken into account.
[23] We analyze these variables as dependent variables in some regressions (see Table 7), but also as (endogenous) controls in some columns (e.g. last two columns in Table 2) to test the stability of the main estimated coefficient.

main lender of the households as of December 2017 for the 16% of the loans analyzed and 24% of the times the lender is the main provider of loans in the zip code of the mortgage. A key treatment variable for part of our analysis (Section 5.2.1) is whether the lender has a high exposure to mortgages outside the Basque country, and, hence, it is potentially more affected by the change in the tax law. As we define this variable as whether the exposure is higher than the median, we have the average of high exposure being 0.54. We also use some bank level variables as dependent variable to check the overall impact of the law on the some bank variables such as bank profits (with an average of 0.51%), fees related to loans (with an average of 0.08%) and interest income from loans (with an average of 0.94%).

The last part of the paper uses the consumer loans database that includes a loan application dataset for the consumer loan applications, and, as in the previous part of the paper, all the new granted consumer loans. 51% of the loan applications are accepted and granted during our sample period. The average interest rate of newly granted consumer loans is 9.5%, much higher than that of mortgages (as these loans are much riskier), where the average (log) size and maturity of the consumer loan is 8.7 and 3.9, respectively (which corresponds to 9,693 euros and 58 months). The future default rate is also very high (12.2%) for this type of loans.

5. Results

In this section we first analyze in section 5.1 the effect that the shift in statutory incidence has on mortgage rates, documenting how there is a strong, positive (but not full) pass-through to mortgage rates, which is highly dependent on borrower characteristics, some of them related to borrowers' bargaining power. We then, in section 5.2, analyze the effects of the shift in the tax on two main risk-taking decisions of banks: the mortgage liability ratio (costly insurance) and the probability of granting (riskier) consumer credit (which was not affected by the law), showing that the policy change increases risk-taking by banks (consistent with the policy reducing bank revenues given that banks do not fully pass through the tax), especially by banks with weaker balance sheets (consistent with higher moral hazard problems).

5.1 Impact on mortgage interest rates

Table 2 begins by reporting the results of Equation (1), the difference-in-differences specification to capture the casual impact of the change in the tax law on the interest rate of mortgages. We show a step-by-step analysis where each new specification adds more covariates to the previous one (starting with no controls in column (1) to fully saturating the regression in column (8)). To avoid

different estimated coefficients due to changes in the sample, we use an identical sample of 168,250 mortgages, the one associated with the most saturated specification.

In column (1) of Table 2 there are no controls. The estimated β is 0.153**. Column (2) includes bank, time (year:month) and type of the mortgage (fix or variable) fixed effects. The estimated coefficient decreases to 0.095** (though the two coefficients are not statistically different, as one standard deviation is around 0.5). Column (3) saturates model (2) with the triple interaction *bank*time*fix/variable interest rate* fixed effects (estimated coefficient equals 0.099**) and column (4) changes the time to control for *year:month:day* fixed effects. The estimated coefficient does not change significantly from the previous specification, 0.106**.

In the next estimations (columns) we control for potential unobservable confounding factors by proxying the income and wealth of households to reduce the differences between the mortgages in the control and in the treatment group (see Table A1 of the Appendix and previous section). Column (5) adds the *zip code*employment status* fixed effects and column (6) splits these fixed effects into foreign and national households. Column (7) adds loan characteristics (size and maturity) and column (8) the rest of household controls explained in Table 1, in which the estimated coefficient on the treatment variable is 0.106***.

Thus, results show that, after the introduction of the Royal Decree, banks increase mortgage interest rates by around 10 basis points on average, which accounts for a 5% increase on mortgage rates (see Table 1). In terms of the quantification of the results with respect the potential interest rate that banks should have charged to fully compensate the cost of the new tax, we show, through simulations (see Section 5.1.4), that, on average, the 10 estimated basis points represents at most 80% of the increase in cost due to the tax change. It is important to highlight that this estimation of the 80% pass-through has some caveats: the one is that we are assuming that banks react only through changes in the mortgage rates and not through changes in other fees as we do not have loan-level information about mortgage related fees. However, as we show in section 5.2, we do not find that more affected banks increase loan related fees, which is suggestive of banks not changing their mortgage fees differentially;[24] moreover, total bank profits for affected banks are reduced after the law as compared to less affected banks, again suggesting that banks do not fully pass-through the tax.

Finally, given that the R-squared increased from 34.1% in column (2) to 70.1% in column (8), doubling the R-squared and with an absolute increase of more than 35 percentage points, while the

[24] Given the assumptions we make in our simulation, which are explained in more detail in Section 5.1.4, we see this 80% figure as representing a conservative upper bound of the pass through.

estimated value of the coefficient of interest does not decrease and it is very similar (0.095 versus 0.106), results suggest that, following Oster (2019) and Altonji et al. (2005), the estimated effects do not suffer from biases due to (further unobservable) omitted variables.[25]

5.1.1 Adjoining zip codes to the border of the Basque Country

Another way to increase the similarities between the treated and the control groups, in this subsection we consider only those mortgage loans granted in the municipalities around the border of the Basque Country. In Table A1 of the Appendix we show that this strategy is useful to reduce differences in observable characteristics of households, but has the disadvantage of greatly reducing the number of observations: from 168,250 to 1,121, a 99% reduction in the sample. Nevertheless, Table 3 shows identical results.

Table 3 follows the same structure as Table 2 where we progressively saturate the specifications. Analogously, we find very similar results along all the columns within Table 3, and also between Table 3 and Table 2. In column (7), the most saturated regression, the estimated impact of the tax reform on mortgage loans is around 10 basis points, which is identical to Table 2 (although only statistically significant at 10% due to higher standard errors, as the number of observations is much lower). As in Table 2, column 2 and the last column of Table 3 have identical estimated coefficients despite the change in R-squared and the fixed effects (0.108 versus 0.100).

5.1.2 Further robustness tests

In Table 4 we show further robustness tests. First of all, we analyze whether there are regional differences in the impact of the tax reform depending on the tax rate charged by the regions before the introduction of the Royal Decree. As previously discussed, outside the Basque Country, tax rates were between 0.5% and 1.5%, with the more common base tax rate being 1.5% (see Table A3 in the Appendix). The first three columns of Table 4 exploit these regional differences. Column (1) replicates the same model that the one showed in the last column of Table 2 but for the mortgages charged with a tax lower than 1% (where the control group is still the Basque Country). The number of observations drops to 66,167 and the estimated coefficient is 0.091***. Column (2) considers only mortgages with a tax rate of at least 1%, plus all those granted in the Basque Country (the control group). The estimate is now higher, 0.117***, as expected. Column (3) follows a difference in treatment approach and uses as the control group all mortgages with a tax rate lower than 1%

[25] Altonji et al. (2005) and Oster (2019) analyze the sensitivity of the estimation results to the inclusion of observable and unobservable controls checking the stability of the explanatory variable of interest to significant increases in the R-squared.

(excluding those from the Basque Country) and as a treatment group all mortgages with a tax rate higher than 1%. In such case the estimated coefficient is 0.019**. Therefore, results suggest that, for banks, the intensity of the pass-through is proportional to the magnitude of the impact of the measure, captured by the ex-ante level of the tax rate.

With the aim of mitigating the effect of other possible contemporaneous shocks, or the impact of other subsequent spillover effects, column (4) only considers the mortgages granted in a window of 2 weeks before and after the Royal Decree. Again, there is an important reduction in the number of mortgages analyzed, of around 97%, but nevertheless the estimated coefficient on the treatment is 0.088**, which is very similar to our baseline estimation. While we do not observe any aggregate effects in the total amount of mortgages granted around the announcement (not reported), in column (5) we estimate our coefficients excluding October and November 2018 in order to exclude any strategic behaviors around the announcement date. The estimated coefficient is now 0.117***, again very similar to the main one.

Finally, the last column of Table 4 analyzes a much smaller set of mortgages related to secondary residence, which were subject in the Basque Country to a 0.5% tax rate, and, given the special status of the Basque Country, were not subject to a change in statutory incidence. We show how in such case the pass-through is still positive but lower, with an estimated coefficient of 0.054*.

Lastly, one of the diff-in-diff assumptions in which the validity of our results relies is the absence of pre-trends in the treatment versus control groups. Moreover, all of our results are based on the assumption that the banks reacted after the date the Royal Decree went into effect, not earlier, and for later dates an average effect is computed. All these assumptions can be checked allowing the coefficient on the *Treated* variable to vary over time. This is what we do in Figure 2, which can also be seen as a placebo test for the dates before the measure was taken (allowing us to further exclude possible anticipation effects). Figure 2 shows the year:month estimated coefficients for our baseline specification. The estimated coefficient is insignificant before November 2018 (2018M11) and then becomes statistically significant.[26]

5.1.3 Heterogeneity

We explore the existence of heterogeneous effects on the effects of Royal Decree on mortgage rates at the household, bank and loan level in Table 5, where we show the results of estimating

[26] The reason why the effect somewhat fades in May 2019 may be due to the entry of the new mortgage law (Ley 5/2019) in June 2019 approved in March 2019, as discussed in Section 2.

Equation (2). We start with the household dimension by first introducing the interaction of the treatment variable with the log of gross income and then later adding, progressively, the rest of covariates (columns (1) to (4)). We then do the same exercise but just introducing bank controls (columns (5) to (6)). In column (7) we include all interaction terms previously considered at the same time. Column (8) tests the robustness of the estimation controlling for (endogenous) loan characteristics (size and maturity), and column (9) controls for loan amount/liability (the insurance for the bank). It is important to note that when we introduce interactions into the estimation, we demean all variables so that the variables in levels reflect the average impact.

Our results suggest that borrower income, previous indebtedness as well as borrower variables further proxying bargaining power play a prominent role in the heterogeneous transmission of the tax to loan interest rates. Looking at column (9), the negative and statistically significant coefficient of the interaction of the treatment variable with the log of the gross income of the household, -0.265** indicates that the richer households are less affected by the pass-through (higher loan rates due to the policy change). A 30% increase in the income, that corresponds to the difference between households in the 25% and 75% of the income distribution (see Table 1), decreases loan interest rates in 8 basis points after the tax change, similar to the overall level effect that we find in Table 2. Not surprisingly the pass-through is higher for borrowers with previous debt (0.128*, column 9).

Moreover, when the number of banks in the zip code of the mortgage (which can be seen as a proxy of bank competition) increases, the pass-through of the tax law is lower (-0.033*, column 9). This result is consistent with borrower's bargaining power, as with a higher number of banks, the borrower has more opportunities to switch to a lender that requests a lower loan interest rate. Furthermore, the pass-through is lower for households with more bank relationships ex-ante (-0.247*, column 9), which again is consistent with such households having a higher bargaining power as it is easier for them to find a cheaper loan offer. Effects are also quantitatively strong: an increase of the number of bank relations distribution, that corresponds to the difference between households in the 25% and 75%, decreases loan interest rates after the tax change in 17 basis points.

Our results also show that there is a group of borrowers that is not affected by the Royal Decree: borrowers who work in the lender's banking group (-0.166*, column 9). It is relevant to note that there are particular agreements between the bank and its workers that generally involve mortgage loans with an advantageous pre-established interest rate that is established annually, and in order to change it a new agreement with the unions is needed.

The heterogeneity in the pass-through of the tax reflects that statutory incidence has highly asymmetric effects on borrowers, as some borrowers suffer very low (or zero) increases in their loan rates (low pass-through) while others suffer much higher increases (high pass-through). This highlights the relevance of borrower characteristics (some of them related to borrowers' bargaining power) for the overall effects of changing the statutory incidence of the tax. One relevant issue regarding our heterogeneity in pass-through results, is that, even though we control for a variety of household characteristics, some of these variables could be proxying for different risk profiles of the borrower, which would also affect the pass-through. We analyze in more detail this issue in section 5.1.4 and our results suggest that observed differences in the pass-through cannot be (plausibly) explained by differences in unobservable borrower's risk.

Finally, we also find heterogenous results in the pass-through regarding bank variables. More capitalized banks and those more specialized on households are those for which the transmission of the shock to interest rates is higher. For instance, an additional percentage point of the leverage ratio (or of the ratio between loans to households over total assets) increases the interest rate by 4.5% (0.5%). There is also some weaker evidence, column (9) that banks with riskier assets and hence weaker balance sheets (proxied by higher NPLs) increase the pass-through to loan rates after the tax reform.

5.1.4 Pass-through simulation

In this section we simulate the interest rates that would fully compensate the cost of the tax for banks. The simulated rates provide a benchmark simulated pass-through which allows to understand the estimated effects that we find in the previous sections. We first obtain an upper bound estimate of the effective pass-through done by banks, and then analyze the possible relevance of unobserved risk factors as a main driver of the documented heterogeneous pass-through.

Given the maturity, the loan amount, the interest rate charged and the cost of the tax (which, as previously explained, is based on the mortgage liability and the prevailing tax rate in the region), it is possible to use standard annuity formulas, simulate for each mortgage loan the interest rate that compensates the cost of the tax for banks (allowing banks to obtain the same profits as when the tax was paid by the borrower). We compute such simulated interest rate for each mortgage granted before the tax shift. In order to do so we assume a discount rate of 0 and no default.[27]

[27] We assume a discount rate equalled to 0, consistent with the low yields of near risk-free assets during 2018 and 2019 (Euribor rates were between -0.19% and -0.12% during 2018) and in order to be conservative regarding our pass-through estimates. Higher discount rates lead to higher predicted loan rates and, hence, lower estimates of the observed pass-through of banks. We have considered other assumptions about the discount factor such as using the contracted rate as a

As a first exercise, we use the simulated interest rates to replace the observed interest rate for treated mortgages before the entrance into force of the Royal Decree. In Table 6 we report the results of estimating Eq. (2) with this simulated mortgage rates. Column (1) of Table 6 shows the result of estimating the baseline model (that in column (8) of Table 2) but using the simulated interest rates for treated mortgages just before the regulatory change took place instead of the observed ones. The estimated coefficient on the treatment is -0.024, with a standard error of 0.040, rendering it insignificant at the standard confidence intervals.[28] We argue that our conservative assumptions regarding discount rates allow us to conclude that on average the pass-through was at most of 80% of the tax as in our preferred specification the pass-through accounts for 10 basis points instead of the 12 basis points we simulate.[29]

In the next columns of Table 6 we replicate Table 5, the heterogeneous effects, using the same approach, i.e. with the simulated interest rates replacing the observed ones when *Treated=1* and *Post=0*. Given that our simulated interest rates do not reflect the heterogeneity observed in the real rates, we want to show that if the estimated heterogeneity is due to the introduction of the Royal Decree, then we should obtain the same results as in Table 5. This is what we find in columns (1) to (8) of Table 6.

As a second exercise, we investigate the relevance of mortgage defaults for our estimations. We do so by taking into account the possibility of mortgages defaulting and resulting in losses in case of default (LGD). This exercise allows us to understand whether the documented heterogenous pass-through effects could be driven by unobserved risk characteristics of the borrowers. In this exercise for a given mortgage we compare the predicted pass-through assuming no risk of default (as in the first exercise) with the one obtained assuming a positive probability of mortgage default. In doing so, we assume that the values of the probability of mortgage default and LGD are 10% and 20% respectively. Both of these values are larger than any of the historical estimations (even in the worst months of the financial crisis) of banks' Advance internal rate based (IRB) model parameters (banks' estimations) in Spain (recall that mortgages in Spain are full recourse). This choice results in a conservative estimation of the effects of default (in the sense of allowing default to have a larger explanatory power).

discount factor and results are robust to reasonable changes in this assumption (resulting in lower predicted pass-through). The simulated (FULL?) pass-through for the median mortgage in our sample is 12 basis points if we assume a discount rate of 0 and is 15 basis points if we assume the median contracted interest rate of 1.94%.

[28] The high standard errors of our estimated coefficient point out to the aforementioned heterogeneity in the pass-through.

[29] Assuming the median interest rate as a discount rate the pass-through would have been of 66%.

For the median mortgage in our sample, the simulated difference in the pass-through between a risk free and a (very) risky mortgage is 1.3 basis points, highlighting that our observed differences in heterogeneous pass-through are not only (plausibly) driven by differences in underlying risk profiles. As an example, the difference in the pass-through for households in the 25% versus the 75% of the income or bank relationships distributions (which are 8 and 17 basis points respectively), could only be explained if the mortgage risk would increase from 0% for those on the 75% of the distribution (high income or high number of bank relationships) to 40% and 60%, respectively, for those on the 25% of the distribution (low income or low number of bank relationships).[30]

5.1.5 The effects on other mortgage terms

Table 7 presents the estimation results of our baseline model for different dependent mortgage variables: the loan amount, the maturity, loan-to-value ratio and the mortgage liability ratio. For the first two regressions we resort to estimate a Poisson model in order to reduce possible biases arising from a classical log linear estimation (see Santos Silva and Tenreyro, 2006),[31] while we use an OLS estimation for the other two ratios. Robust standard errors are again corrected for clustering at the bank, Year:month:day and zip code.

The mortgage liability ratio is the logit transformation of the ratio of the loan amount over the mortgage liability (given that it is bounded by 0 and 1), thus higher values of this ratio, keeping the numerator fixed, are due to reductions in the mortgage liability. As previously explained this variable is relevant for the computation of the tax, given that the amount paid by the tax is directionally proportional to its amount. Interestingly, this variable is decided by the bank and, therefore, it could be that once the banks have to pay the tax, they decide to reduce this amount to lower their taxes. If banks reduce the mortgage liability following the tax shift, the tax reform would de facto imply a greater risk-taking by banks, as banks would be more exposed in case of a mortgage default (as they would hold lower collateral). Another relevant side effect of this decision would be that the tax revenues of the government would fall.

Columns (1) to (4) of Table 7 shows that the tax reform has no effect on the loan amount (neither at loan level, column (1), nor at zip-code level, column (2)), on the maturity or on the loan

[30] The estimated pass-through assuming a discount rate equal to the median mortgage rate and 0.1 and 0.2 for probability of mortgage default and LGD respectively is 16.65 basis points. In such case the difference between the risk free and the risky mortgage would imply an extra pass-through of 1.65 basis points. The probabilities of defaults that would be consistent with a difference in pass-through of 8 and 17 basis points in such case are 35% and 54% respectively.

[31] Results are the same if we use an OLS estimation instead. For instance, the estimated coefficients (and standard errors) are 0.013 (0.010) for column (1) and -0.004 (0.005) for column (2).

to value ratio.[33] However, it affects the mortgage liability ratio (column (5)). The coefficient on the mortgage liability ratio is positive and statistically significant (0.092*), which means that, given that the loan amount is unaffected (column (1)), banks on average decrease this (costly) insurance, increasing their risk. This reduction in mortgage liability also has an impact on tax revenues of the government as it reduces by 2.5% the revenue that the government receives by this tax (representing around 1.7 million Euros per month).

To be sure that this observed effect is due to the introduction of the tax reform, Figure 3 shows the time-varying estimated coefficients for every month. The estimated coefficients are close to zero and insignificant until October 2018, and then they jump afterwards (in November it increases but it is not significant at conventional levels). In December 2018 the estimated coefficient becomes statistically significant, which suggests that on average banks react by lowering the mortgage liability from the beginning, but more strongly after one month. Importantly, this risk-taking result is consistent with the reduction in bank profits and the incomplete pass-through, as shocks to bank net worth (profits) imply more risk-taking in many banking theories (see Freixas and Rochet, 2008).

5.2 Impact on bank risk-taking decisions

In this section we proceed to further investigate the previous result on costly loan insurance in which we further analyze the risk-taking effects of the Royal Decree. We proceed by first, using the identification strategy explained in Eq. (3) and Eq. (4), analyzing whether banks more affected by the policy—in terms of a higher proportion of their assets as mortgages outside of the Basque country—react differently in the (loan-level) mortgage rates, mortgage liability, consumer loans, and especially so for banks with higher moral hazard problems proxied by ex-ante NPLs. We also analyze bank level loan rates, fees related to rates and profits to test whether more affected banks reduce their profits due to the tax reform (confirming our previous results on not a full pass-through). Once we analyze these results, we end by analyzing in more detail the risk-taking in mortgage liability and consumer loans using the same treatment variable as in section 5.1, i.e. comparing loans in regions that were affected versus those in the control region.

5.2.1 Bank exposure results

[33] Until now we have seen that, after the policy change, banks react by modifying the interest rates of their mortgages. Table A2 in the Appendix shows evidence that the type of loan, borrower and bank characteristics are similar before and after the tax change (which also happens for the zip-codes in border of the Basque Country). Based on the results of columns (1) to (4) in Table 7, we argue that the underlying reason for household demand not reacting to changes in the tax is given the small amount of the tax for borrowers with respect to the price of the house (the average mortgage tax accounts for 1,900 Euros on an average 118,000 Euros mortgage) and that there was a 80% pass-through (see previous subsection). Nevertheless, the estimate coefficient in column (1) is consistent with cheaper loans, though not statistically significant at conventional levels.

In this subsection we first show the results of the estimation of Eq. (3), where banks are classified as more affected by the Royal Decree based on the ex-ante weight of their mortgage portfolio outside the Basque Country before the tax reform (more affected by the tax reform). As Columns (1) and (3) in Panel A Table 8 show, we find that, in line with the results in section 5.1, more affected banks increase more loan rates and reduce more mortgage liabilities of their loans. Interestingly, we find that more affected banks risk related decisions are more distorted, as not only do they reduce more their mortgage liability, but also increase more the probability of granting consumer loans (which are substantially riskier than mortgages), Column (5) of Panel A in Table 8. Moreover, results also show that the increase in loan rates, reduction in mortgage liability and increase in the probability of granting consumer loans is higher for those banks with weaker balance sheets (proxied by higher ex-ante NPLs), see Columns (2), (4) and (6). [34]

We next use bank-level information, Panel B Table 8, where we find that banks more affected by the policy change increase the interest income (consistent with the loan-level results that show that they increase more the loan rates), but there is no differential change in fees related to loans and, given these results and the previous ones from Table 2 and 6, bank profitability consistently decreases more for more affected banks. That is, results suggest that more affected banks lose more with the reform.

Overall, our estimates show how banks that were more affected by tax reform increase the interest rate of the mortgages by 11 basis points more after the Royal Decree, have a larger decrease in their ROA of 18%, decrease more the mortgage liability (increasing by 3.4% the ratio of loan amount over mortgage liability), and increase the probability of granting applications for consumer loans by around 3.7%. Moreover, for banks with higher NPLs (75% versus 25% of the distribution) the effect on mortgage liability more than double (7.7%) and the interest rate increases by 18 basis points. Note that all these results are consistent with standard moral hazard theories in banking, where the tax reform by reducing bank profits (due to the incomplete pass-through) implies higher risk-taking in the mortgage market (via reducing costly mortgage insurance) and spillovers in the riskiest market (via higher granting of loan applications in consumer lending).

5.2.2 Further distortionary effects

We now proceed to, following the identification strategy of section 5.1 in which loans are classified as treated if they are located in the a region on which the Royal Decree applies, exploit loan

[34] Note that the positive estimated coefficient for the probability of granting consumer loan applications for more affected banks that have higher NPLs is not significant at standard significance levels.

level information to further analyze the determinants of the aforementioned risk-taking effects: mortgage liability and probability of granting consumer loans.

Table 9 investigates the heterogeneity of the results for the mortgage liability ratio, similarly to Table 5. The most saturated model, presented in column (8), shows that the only borrower characteristic that affects the reduction in mortgage liability is whether the borrowers are employees of their banking group. It is important to note that we do not find that the mortgage liability is lowered for those individuals with differential bargaining power, e.g. higher income, more bank relationships or more banks competing in their neighborhood, which we find is the case for mortgage rates. Hence, we can exclude that the lower mortgage rates were due to lower mortgage liabilities for those individuals.[35] Moreover, there are relevant bank characteristics that determine the reduction in mortgage liability after the tax reform, as riskier banks (higher ex-ante NPL and ROA, which also proxies for riskier portfolio with higher profits and higher risk) report a subsequent lower mortgage liability. For instance, after the tax reform and for treated areas, the impact on mortgage liability doubles for banks with more NPL ratio and increases a 50% for more profitable banks (75% versus 25% of the distribution in both cases).

Finally, in Table 10 we analyze the consequences that the shift on the tax has on consumer loans. Our objective is to further analyze whether banks modify their credit standards for consumer loans comparing treatment and control regions as in Eq. (1). Importantly these loans were not affected by tax law (i.e. they represent spillovers from the tax reform), and they are substantially riskier (defaults higher than 10% and with high LGD, consistently with loan rates for consumer loans of 9% as compared to 2% for mortgages).

We show the results on the granting of loan applications in the first two columns of Table 10. As in the previous exercises we follow a diff-in-diff specification. In column (2) the sample is restricted to consumer loan applications made in the zip codes adjacent to the border of the Basque Country. In columns (3) to (5) we analyze the terms of granted consumer loans: interest rate, loan amount and maturity. Last column of Table 10 investigates the future performance of the loan to test whether more affected banks (by the mortgage tax change) increase their appetite for risk in consumer loans as a response of the new cost faced in their mortgage portfolio. The structure of the estimation is identical to the one of Table 7: a Poisson estimation for amount and maturity and an OLS for the

[35] As a robustness test we control for mortgage liability in column (9) of Table 5 and show that the results regarding heterogenous pass-through remain very similar.

rest. Standard errors are triple-clustered at the bank, year:month:day and zip code level. The time period analyzed is again 20018M1 to 2019M5. We have more than 1.7 millions of consumer loans.

The estimated coefficient on the treatment variable is positive and significant in the analysis of loan applications, both for the whole sample and for the areas surrounding the control group. For instance, the 0.023** coefficient implies that in the treated areas after the tax reform the acceptance rate (of the riskiest segment of household loans) increases by 4.53%. Differently, there are no statistical effects neither on the loan interest rate nor in the amount or in the maturity of granted consumer loans. However, for future default the coefficient is positive and statistically significant (0.007**), which implies that after the Royal Decree for treated areas the probability of default increased by 5.72%, implying riskier strategies in non-affected loans to households (consumer lending) of banks more affected after the mortgage tax measure.

We can conclude that the results in Section 5.2 are in line with banks pursuing a higher risk-taking strategy both in consumer loans and in mortgages. Such evidence as well as results in Table 8 and Table 6 are consistent with banks not passing through all the cost imposed by the tax and reacting to the lower profits by increasing their risk, especially by the banks more subject to moral hazard issues.

6. Conclusions

In this paper we analyze the overall and heterogenous effects of just shifting the agent on which taxes are levied on (i.e., shifting statutory incidence), without any change in tax rates. We revisit this key classical question by exploiting a tax shift in the banking industry (the credit market) in conjunction with supervisory mortgage data. In particular, to study (economic) incidence and distortionary effects of shifting statutory incidence, we exploit: (i) a policy change in Spain in November 2018 that shifts a mortgage tax from being levied on borrowers to being levied on lenders, and crucially without any change on the tax rates; (ii) the fact that some regions, for historical reasons, are exempted from paying this tax, or have different tax rates; and (iii) a set of matched administrative datasets (an exhaustive credit register matched with borrower and lender information).

We find that, after the policy change, the average mortgage rate increases consistently with a strong (but not complete) tax pass-through, of approximately 80% of the tax base. Importantly, we show a large heterogeneity in the pass-through: the pass-through is larger for borrowers with lower income, with previous debt, less lending relationships, not working for the lender, or facing a smaller number of banks in their zip-code. Moreover, despite that there is no change in the tax rate (which could have led to e.g. the typical inefficiencies associated with tax increases), we find that the shift

in the statutory incidence of the tax changes banks' decisions, in particular those related to bank risk-taking. We find that banks more affected by the tax shift (those banks with a larger share of their assets affected by the tax shift) exhibit a decrease in their profits and increase their risk-taking by reducing costly mortgage insurance in case of loan default and by increasing the likelihood of granting applications of non-affected but riskier consumer lending –especially by more affected banks with characteristics that proxy for higher moral hazard problems (those with weaker balance sheets, in terms of higher ex-ante NPLs) that have a higher likelihood of future help from taxpayers and/or central banks.

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TABLE 1

SUMMARY STATISTICS

		Mean	S.D.	P25	Median	P75
LOAN LEVEL						
MORTGAGES						
Interest rate of the mortgage	%	2.068	0.987	1.510	2.118	2.569
Log(Size of the mortgage)	Log(Euros)	11.465	0.656	11.060	11.486	11.878
Log(Maturity of the mortgage)	Log(Months)	5.656	0.330	5.497	5.720	5.900
Loan Amount/Mortgage Liability	%	73.123	13.476	66.667	77.700	83.262
Log(Loan to value (LTV) of the mortgage)	Log(%)	4.120	0.440	4.006	4.257	4.377
Treated	0/1	0.942	0.233	1.000	1.000	1.000
Treated Border	0/1	0.574	0.495	0.000	1.000	1.000
Post	0/1	0.439	0.496	0.000	0.000	1.000
Household Characteristics						
Log(Gross income)	Log(Euros)	10.291	0.189	10.138	10.281	10.435
Public servant	0/1	0.081	0.273	0.000	0.000	0.000
Banking group employee	0/1	0.014	0.118	0.000	0.000	0.000
Student	0/1	0.028	0.165	0.000	0.000	0.000
Unemployed or homemaker	0/1	0.020	0.139	0.000	0.000	0.000
Log(Age)	Log(Months)	6.153	0.238	5.974	6.155	6.321
Indebted	0/1	0.463	0.499	0.000	0.000	1.000
Log(1+No.of banking relationships)	Log	0.331	0.396	0.000	0.000	0.693
Log(1+No. of banks in the zip code)	Log	1.902	0.596	1.609	2.079	2.303
Bank Characteristics						
Log(Total assets of the bank)	Log(1000Euros)	18.626	1.502	17.613	19.546	19.546
Own funds/total assets of the bank	%	8.491	2.883	6.156	7.125	9.560
Liquidity ratio of the bank	%	15.190	11.277	11.415	11.415	17.310
ROA of the bank	%	0.382	0.432	0.371	0.508	0.587
Non-performing loan (NPL) ratio of the bank	%	6.592	1.740	5.988	6.150	7.528
Loans to households/total assets of the bank	%	26.049	8.366	23.019	27.290	31.139
Main bank	0/1	0.159	0.365	0.000	0.000	0.000
Leader bank in the zip code	0/1	0.241	0.428	0.000	0.000	0.000
High Exposure to Mortgages outside Basque Country	0/1	0.535	0.499	0.000	1.000	1.000
CONSUMER LOANS						
Loan application	0/1	0.507	0.500	0.000	1.000	1.000
Interest rate of the loan	0/1	9.493	4.828	6.688	8.785	10.416
Log(Size of the loan)	Log(Euros)	8.748	0.935	8.112	8.765	9.393
Log(Maturity of the loan)	Log(Months)	3.936	0.531	3.611	3.912	4.290
Future default	0/1	0.122	0.328	0.000	0.000	0.000
BANK LEVEL						
Interest Income of Loans/Total Assets	%	0.938	0.367	0.729	0.942	1.172
Loan Fees/Total Assets	%	0.079	0.101	0.022	0.044	0.081
ROA	%	0.509	0.428	0.355	0.532	0.729

Notes: This table reports means, standard deviations and first/second/third quartiles of the main variables used in the paper.

TABLE 2

EFFECT OF A SHIFT OF STATUTORY INCIDENCE ON INTEREST RATES

Dependent Variable: Mortgage interest rate								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treated*Post	0.153**	0.095**	0.099**	0.106**	0.102***	0.110***	0.107***	0.106***
	(0.066)	(0.047)	(0.038)	(0.041)	(0.038)	(0.033)	(0.034)	(0.033)
Bank Fixed Effects	No	Yes	-	-	-	-	-	-
Year:month Fixed Effects	No	Yes	-	-	-	-	-	-
Fixed/Variable/Mixed Interest Rate Fixed Effects	No	Yes	-	-	-	-	-	-
Bank*Year:month*Fixed/Variable Interest Rate Fixed Effects	No	No	Yes	-	-	-	-	-
Bank*Year:month:day*Fixed/Variable Interest Rate Fixed Effects	No	No	No	Yes	Yes	Yes	Yes	Yes
Zip Code*Employment Status Fixed Effects	No	No	No	No	Yes	-	-	-
Zip Code*Employment Status*Foreigner Fixed Effects	No	No	No	No	No	Yes	Yes	Yes
Loan Characteristics	No	No	No	No	No	No	Yes	Yes
Household Characteristics	No	No	No	No	No	No	No	Yes
Observations	168,250	168,250	168,250	168,250	168,250	168,250	168,250	168,250
R-squared	0.024	0.341	0.429	0.596	0.665	0.676	0.697	0.701

Notes: The table above reports OLS regression results of the interest rates of new granted mortgages between 2018M1 and 2019M5 on the treatment variable *Treated*Post*. *Treated* is a dummy variable that takes the value of one for the primary residence mortgage loans granted in any Spanish provinces but those granted in Basque Country, and zero otherwise. *Post* is a dummy variable that takes one for all the periods after 8 November 2018, and zero otherwise. Coefficients are listed in the first row, robust standard errors are reported in the row below which are corrected for clustering at the bank, Year:month:day and zip code, and the corresponding significance levels are in the adjacent column. "Yes" indicates that the set of characteristics or fixed effects is included, "No" that is not included and "-" that is comprised by the included set of fixed effects. *** Significant at 1%, ** significant at 5%, * significant at 10%.

TABLE 3

EFFECT OF A SHIFT OF STATUTORY INCIDENCE ON INTEREST RATES: ZIP CODES ADJOINING TO THE BORDER OF THE NON-TREATED PROVINCES

Dependent Variable: Mortgage interest rate							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Treated*Post	0.177*	0.108**	0.094*	0.107*	0.131**	0.116**	0.100*
	(0.090)	(0.040)	(0.053)	(0.054)	(0.053)	(0.055)	(0.057)
Bank Fixed Effects	No	Yes	-	-	-	-	-
Year:month Fixed Effects	No	Yes	Yes	Yes	Yes	Yes	Yes
Fixed/Variable Interest Rate Fixed Effects	No	Yes	-	-	-	-	-
Bank*Year:quarter*Fixed/Variable Interest Rate Fixed Effects	No	No	Yes	Yes	Yes	Yes	Yes
Zip Code*Employment Status Fixed Effects	No	No	No	Yes	-	-	-
Zip Code*Employment Status*Foreigner Fixed Effects	No	No	No	No	Yes	Yes	Yes
Loan Characteristics	No	No	No	No	No	Yes	Yes
Household Characteristics	No	No	No	No	No	No	Yes
Observations	1,121	1,121	1,121	1,121	1,121	1,121	1,121
R-squared	0.033	0.516	0.583	0.632	0.657	0.682	0.690

Notes: The table above reports OLS regression results of the interest rates of new granted mortgages between 2018M1 and 2019M5 on the treatment variable *Treated*Post* for the zip codes adjoining to the border of the non-treated provinces (which are the three provinces of the Basque Country). *Treated* is a dummy variable that takes the value of one for the primary residence mortgage loans granted in any Spanish provinces but those granted in Basque Country, and zero otherwise. *Post* is a dummy variable that takes one for all the periods after 8 November 2018, and zero otherwise. Coefficients are listed in the first row, robust standard errors are reported in the row below which are corrected for clustering at the Year:month:day and zip code, and the corresponding significance levels are in the adjacent column. "Yes" indicates that the set of characteristics or fixed effects is included, "No" that is not included and "-" that is comprised by the included set of fixed effects. *** Significant at 1%, ** significant at 5%, * significant at 10%.

TABLE 4

SHIFT OF STATUTORY INCIDENCE ON INTEREST RATES: FURTHER ROBUSTNESS

Dependent Variable: Mortgage interest rate						
	Intensity					
	(1)	(2)	(3)	(4)	(5)	(6)
	Tax rate<1% & Basque Country	Tax rate≥1% & Basque Country	Treated= (Tax rate≥1%) Without Basque Country	Within two weeks arond treatment date	Without 2018M10 & 2018M11	Secondary residence mortgages
Treated*Post	0.091***	0.117***	0.019**	0.088**	0.117***	0.054*
	(0.027)	(0.042)	(0.009)	(0.041)	(0.039)	(0.033)
Bank*Year:month:day*Fixed/Variable Interest Rate Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Zip Code*Employment Status*Foreigner Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Loan Characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Household Characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Observations	66,167	105,075	158,352	6,773	147,637	33,029
R-squared	0.697	0.719	0.703	0.743	0.706	0.701

Notes: The table above reports OLS regression results of the interest rates of new granted mortgages between 2018M1 and 2019M5 on the treatment variable *Treated*Post*. *Treated* is (except for column (3)) a dummy variable that takes the value of one for the primary residence mortgage loans granted in any Spanish provinces but those granted in Basque Country, and zero otherwise. *Post* is a dummy variable that takes one for all the periods after 8 November 2018, and zero otherwise. Column (1) restricts the sample to loans with a tax rate lower than 1% plus Basque Country. Column (2) restrict the sample to loans with a tax rate lower higher than 1% plus Basque Country. Column (3) re-defines the treated group to those loans with a tax rate higher than 1 and the sample does not include the Basque Country. Column (4) restricts the sample to two weeks before and after the entry of the law. Column (5) drops 2018M10 and 2018M11. Column (6) uses only secondary residence mortgages. Coefficients are listed in the first row, robust standard errors are reported in the row below which are corrected for clustering at the bank, Year:month:day and zip code, and the corresponding significance levels are in the adjacent column. "Yes" indicates that the set of characteristics or fixed effects is included, "No" that is not included and "-" that is comprised by the included set of fixed effects. *** Significant at 1%, ** significant at 5%, * significant at 10%.

TABLE 5

EFFECT OF A SHIFT OF STATUTORY INCIDENCE ON INTEREST RATES: HETEROGENEITY

Dependent Variable: Mortgage interest rate									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Treated*Post	0.133***	0.134***	0.145***	0.145***	0.084***	0.086***	0.116***	0.104***	0.164***
	(0.035)	(0.033)	(0.033)	(0.035)	(0.026)	(0.026)	(0.026)	(0.027)	(0.030)
Household Characteristics									
Treated*Post*Log(Gross income)	-0.313**	-0.313**	-0.300**	-0.306**			-0.312**	-0.258**	-0.265**
	(0.122)	(0.122)	(0.121)	(0.125)			(0.121)	(0.113)	(0.108)
Treated*Post*Public servant		0.011	0.002	0.008			0.023	0.022	0.016
		(0.063)	(0.061)	(0.065)			(0.064)	(0.065)	(0.070)
Treated*Post*Banking group employee		-0.151*	-0.170**	-0.160*			-0.199**	-0.177*	-0.166**
		(0.084)	(0.084)	(0.087)			(0.098)	(0.093)	(0.083)
Treated*Post*Student		0.036	0.023	0.014			0.001	0.001	0.009
		(0.079)	(0.073)	(0.087)			(0.082)	(0.075)	(0.070)
Treated*Post*Unemployed or homemaker		0.019	0.044	0.047			0.077	0.057	0.061
		(0.128)	(0.126)	(0.129)			(0.138)	(0.137)	(0.136)
Treated*Post*Log(Age)			0.044	0.071			0.049	0.088	0.083
			(0.055)	(0.054)			(0.059)	(0.056)	(0.052)
Treated*Post*Log(LTV)			0.023	0.020			-0.024	-0.029	-0.038
			(0.062)	(0.064)			(0.061)	(0.050)	(0.049)
Treated*Post*Log(1+No. of banks in the zip code)				-0.036**			-0.038*	-0.033*	-0.033*
				(0.018)			(0.020)	(0.019)	(0.020)
Treated*Post*Indebted				0.155**			0.127**	0.126*	0.128*
				(0.069)			(0.061)	(0.065)	(0.067)
Treated*Post*Log(No.of banking relationships)				-0.243**			-0.245**	-0.242**	-0.247**
				(0.102)			(0.103)	(0.102)	(0.104)
Bank Characteristics									
Treated*Post*Log(Total assets of the bank)					0.011	0.011	0.006	0.014	-0.087**
					(0.021)	(0.023)	(0.021)	(0.022)	(0.036)
Treated*Post*Own funds/total assets of the bank					0.056***	0.055***	0.053***	0.053***	0.094***
					(0.013)	(0.013)	(0.012)	(0.012)	(0.012)
Treated*Post*Liquidity ratio of the bank					-0.002	-0.002	-0.002	-0.002	-0.000
					(0.006)	(0.006)	(0.005)	(0.005)	(0.005)
Treated*Post*ROA of the bank					0.026	0.019	0.042	0.016	0.198
					(0.127)	(0.132)	(0.135)	(0.130)	(0.134)
Treated*Post*NPL ratio of the bank					-0.003	-0.003	-0.002	-0.008	0.077**
					(0.020)	(0.020)	(0.021)	(0.021)	(0.037)
Treated*Post*Loans to households/total assets of the bank					0.012***	0.011***	0.011***	0.011***	0.011***
					(0.004)	(0.004)	(0.003)	(0.003)	(0.003)
Treated*Post*Main bank						0.035	0.069	0.066	0.064
						(0.044)	(0.053)	(0.054)	(0.054)
Treated*Post*Leader bank in the zip code						-0.027	-0.028	-0.036	-0.046
						(0.031)	(0.032)	(0.030)	(0.032)
Bank*Year:month:day*Fixed/Variable Interest Rate Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Zip Code*Employment Status*Foreigner Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan Characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household Characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan Characteristics	No	No	No	No	No	No	No	Yes	Yes
Loan Amount/Mortgage Liabitity	No	No	No	No	No	No	No	No	Yes
Observations	168,250	168,250	168,250	168,250	168,250	168,250	168,250	168,250	168,250
R-squared	0.701	0.704	0.705	0.705	0.702	0.702	0.705	0.706	0.706

Notes: The table above reports OLS regression results of the interest rates of new granted mortgages between 2018M1 and 2019M5 on the treatment variable *Treated*Post* and its interactions. *Treated* is a dummy variable that takes the value of one for the primary residence mortgage loans granted in any Spanish provinces but those granted in Basque Country, and zero otherwise. *Post* is a dummy variable that takes one for all the periods after 8 November 2018, and zero otherwise. Coefficients are listed in the first row, robust standard errors are reported in the row below which are corrected for clustering at the bank, Year:month:day and zip code, and the corresponding significance levels are in the adjacent column. "Yes" indicates that the set of characteristics or fixed effects is included, "No" that is not included and "-" that is comprised by the included set of fixed effects. *** Significant at 1%, ** significant at 5%, * significant at 10%.

TABLE 6

EFFECT OF A SHIFT OF STATUTORY INCIDENCE ON INTEREST RATES: SIMULATION

Dependent Variable: Mortgage interest rate									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Treated*Post	-0.024	-0.004	-0.004	0.007	0.007	-0.024	-0.024	-0.026	-0.039
	(0.040)	(0.039)	(0.037)	(0.035)	(0.037)	(0.040)	(0.040)	(0.030)	(0.031)
Household Characteristics									
Treated*Post*Log(Gross income)		-0.269**	-0.270**	-0.222*	-0.227*			-0.239*	-0.210*
		(0.118)	(0.120)	(0.119)	(0.125)			(0.123)	(0.111)
Treated*Post*Public servant			-0.002	0.000	0.006			0.014	0.018
			(0.064)	(0.063)	(0.065)			(0.064)	(0.065)
Treated*Post*Banking group employee			-0.135	-0.136	-0.128			-0.174*	-0.177*
			(0.085)	(0.089)	(0.091)			(0.099)	(0.093)
Treated*Post*Student			0.039	0.036	0.027			0.012	0.004
			(0.076)	(0.072)	(0.084)			(0.076)	(0.073)
Treated*Post*Unemployed or homemaker			0.013	0.038	0.041			0.068	0.056
			(0.125)	(0.126)	(0.129)			(0.135)	(0.137)
Treated*Post*Log(Age)				-0.069	-0.046			-0.088	0.015
				(0.058)	(0.057)			(0.064)	(0.060)
Treated*Post*Log(LTV)				0.129*	0.125			0.050	0.004
				(0.075)	(0.077)			(0.062)	(0.057)
Treated*Post*Log(1+No. of banks in the zip code)					-0.034*			-0.036*	-0.031
					(0.017)			(0.020)	(0.019)
Treated*Post*Indebted					0.155**			0.128**	0.115*
					(0.069)			(0.062)	(0.066)
Treated*Post*Log(No.of banking relationships)					-0.235**			-0.238**	-0.233**
					(0.106)			(0.106)	(0.105)
Bank Characteristics									
Treated*Post*Log(Total assets of the bank)						0.027	0.027	0.024	0.036
						(0.019)	(0.021)	(0.022)	(0.022)
Treated*Post*Own funds/total assets of the bank						0.055***	0.054***	0.051***	0.049***
						(0.013)	(0.013)	(0.013)	(0.013)
Treated*Post*Liquidity ratio of the bank						-0.002	-0.002	-0.002	-0.002
						(0.006)	(0.006)	(0.006)	(0.006)
Treated*Post*ROA of the bank						-0.025	-0.030	-0.002	-0.017
						(0.135)	(0.139)	(0.145)	(0.139)
Treated*Post*NPL ratio of the bank						-0.026	-0.026	-0.024	-0.032
						(0.021)	(0.021)	(0.024)	(0.023)
Treated*Post*Loans to households/total assets of the bank						0.013***	0.013***	0.012***	0.012***
						(0.004)	(0.004)	(0.004)	(0.004)
Treated*Post*Main bank							0.016	0.068	0.066
							(0.046)	(0.054)	(0.055)
Treated*Post*Leader bank in the zip code							-0.024	-0.025	-0.033
							(0.032)	(0.032)	(0.031)
Bank*Year:month:day*Fixed/Variable Interest Rate Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Zip Code*Employment Status*Foreigner Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan Characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household Characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan Characteristics	No	No	No	No	No	No	No	No	Yes
Observations	168,250	168,250	168,250	168,250	168,250	168,250	168,250	168,250	168,250
R-squared	0.698	0.698	0.701	0.701	0.701	0.698	0.698	0.702	0.702

Notes: The table above reports OLS regression results of the simulated and observed interest rates of new granted mortgages between 2018M1 and 2019M5 on the treatment variable *Treated*Post* and its interactions. Simulated interest rates are computed for all mortgages before 8 November 2018. Simulated rates are obtained by assuming a full pass-through of the tax assuming a conservative scenario of no default and no discount rate. For mortgages after 8 November 2018 we use the observed interest rates. *Treated* is a dummy variable that takes the value of one for the primary residence mortgage loans granted in any Spanish provinces but those granted in Basque Country, and zero otherwise. *Post* is a dummy variable that takes one for all the periods after 8 November 2018, and zero otherwise. Coefficients are listed in the first row, robust standard errors are reported in the row below which are corrected for clustering at the bank, Year:month:day and zip code, and the corresponding significance levels are in the adjacent column. "Yes" indicates that the set of characteristics or fixed effects is included, "No" that is not included and "-" that is comprised by the included set of fixed effects. *** Significant at 1%, ** significant at 5%, * significant at 10%.

TABLE 7

EFFECT OF A SHIFT OF STATUTORY INCIDENCE ON OTHER LOAN TERMS:
AMOUNT, MATURITY, LOAN TO VALUE AN LOAN AMOUNT/MORTGAGE LIABILITY

	(1)	(2)	(3)	(4)	(5)
	Loan Amount		Maturity	Loan to Value	Loan Amount/Mortgage Liability
Dependent Variable	Zip-code Level				
Treated*Post	0.010	-0.012	-0.003	-0.014	0.092*
	(0.013)	(0.028)	(0.004)	(0.011)	(0.048)
Bank*Year:month:day*Fixed/Variable Interest Rate Fixed Effects	Yes	No	Yes	Yes	Yes
Zip Code*Employment Status*Foreigner Fixed Effects	Yes	No	Yes	Yes	Yes
Loan Characteristics	Yes	Yes	Yes	Yes	Yes
Household Characteristics	Yes	Yes	Yes	Yes	Yes
Zip Code Fixed Effects	-	Yes	-	-	-
Year:month Fixed Effects	-	Yes	-	-	-
Observations	168,250	39,839	168,250	168,250	168,250
R-squared	0.728	0.891	0.367	0.631	0.862

Notes: The table above reports OLS (for columns (3) and (4)) and Poisson regression (for columns (1) and (2)) and results of other loan terms of new granted mortgages between 2018M1 and 2019M5 on the treatment variable *Treated*Post*. *Treated* is a dummy variable that takes the value of one for the primary residence mortgage loans granted in any Spanish provinces but those granted in Basque Country, and zero otherwise. *Post* is a dummy variable that takes one for all the periods after 8 November 2018, and zero otherwise. Columns (1) uses as dependent variable the loan amount in euros. Columns (2) uses as dependent variable the maturity is months. Columns (3) uses as dependent variable the log of the loan to value ratio. Columns (4) uses as dependent variable the logit transformation of the ratio of loan amount over mortgage liability. Coefficients are listed in the first row, robust standard errors are reported in the row below which are corrected for clustering at the bank, Year:month:day and zip code, and the corresponding significance levels are in the adjacent column. "Yes" indicates that the set of characteristics or fixed effects is included, "No" that is not included and "-" that is comprised by the included set of fixed effects. *** Significant at 1%, ** significant at 5%, * significant at 10%.

TABLE 8

BANK-LEVEL DIFFERENTIAL EXPOSURE TO THE SHIFT OF STATUTORY INCIDENCE: EX-ANTE CLASSIFICATION OF BANKS

PANEL A: LOAN LEVEL

	(1)	(2)	(3)	(4)	(5)	(6)
	Mortgages				Consumer Loans	
Dependent Variable:	Interest Rate		Loan Amount/Mortgage Liability		Loan Application Granted	
Estimation:	OLS	OLS	OLS	OLS	OLS	OLS
High Exposure to Mortgages outside Basque Country*Post	0.113*	0.174***	0.125**	0.174***	0.019*	0.016**
	(0.064)	(0.052)	(0.063)	(0.060)	(0.011)	(0.008)
High Exposure to Mortgages outside Basque Country*Post*Bank NPL ratio		0.042*		0.105**		0.005
		(0.025)		(0.040)		(0.004)
Borrower Fixed Effects	No	No	No	No	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year:month:day*Fixed/Variable Interest Rate Fixed Effects	Yes	Yes	Yes	Yes	No	No
Zip Code*Employment Status*Foreigner Fixed Effects	Yes	Yes	Yes	Yes	-	-
Province Fixed Effects*Application Year:month:day	No	No	No	No	Yes	Yes
Household Characteristics	Yes	Yes	Yes	Yes	-	-
Observations	168,250	168,250	168,250	168,250	889,366	889,366
R-squared	0.496	0.497	0.824	0.831	0.731	0.732

PANEL B: BANK LEVEL

	(1)	(2)	(3)
Dependent Variable:	Interest Income Loans/Total Assets	Loan Fees/Total Assets	ROA
Estimation:	OLS	OLS	OLS
High Exposure to Mortgages outside Basque Country*Post	0.054*	0.001	-0.093**
	(0.028)	(0.006)	(0.046)
Year:quarter Fixed Effects	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes
Observations	390	390	390
R-squared	0.973	0.35	0.693

Notes: Panel A above reports OLS regression results of the SHIFT OF STATUTORY INCEDENCE on new mortgages and consumer loans applications between 2018M1 and 2019M5 on the treatment variable *High Exposure to Mortgages outside Basque Country*Post*. *High Exposure to Mortgages outside Basque Country* is a dummy variable that takes the value of one is the ratio of mortgages loans over total assets of the bank before the change in the regulation (December 2017) is above its median value (i.e., an ex-ante variable), and zero otherwise. *Post* is a dummy variable that takes one for all the periods after 8 November 2018, and zero otherwise. Bank NPL is the non-performing loan ratio. For Panel A, columns (1) and (2) use as dependent variable the interest rate, and columns (3) and (4) the logit transformation of the ratio of loan amount over mortgage liability. Panel B reports OLS regressions results at the bank level between 2018Q1 and 2019Q2. For Panel B, column (1) uses as dependent variable interest income of loans over total assets of the bank, column (2) the loan fees over total assets, and column (3) the ROA of the bank. Coefficients are listed in the first row, robust standard errors are reported in the row below which are corrected for clustering at the bank, Year:month:day and zip code (for Panel A) and at the bank level (for Panel B), and the corresponding significance levels are in the adjacent column. "Yes" indicates that the set of characteristics or fixed effects is included, "No" that is not included and "-" that is comprised by the included set of fixed effects. *** Significant at 1%, ** significant at 5%, * significant at 10%.

TABLE 9

EFFECT OF A SHIFT OF STATUTORY INCIDENCE ON LOAN AMOUNT OVER MORTGAGE LIABILITY: HETEROGENEITY

Dependent Variable: Loan amount/mortgage liability	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treated*Post	0.106**	0.104**	0.095***	0.094***	0.088**	0.088**	0.099***	0.119**
	(0.051)	(0.049)	(0.034)	(0.034)	(0.035)	(0.034)	(0.035)	(0.047)
Household Characteristics								
Treated*Post*Log(Gross income)	-0.195*	-0.191*	-0.212*	-0.208			-0.164	-0.111
	(0.109)	(0.108)	(0.122)	(0.132)			(0.127)	(0.102)
Treated*Post*Public servant		-0.038	-0.033	-0.033			-0.001	0.004
		(0.059)	(0.055)	(0.054)			(0.051)	(0.049)
Treated*Post*Banking group employee		0.043	0.046	0.046			0.045	0.071*
		(0.044)	(0.037)	(0.039)			(0.043)	(0.040)
Treated*Post*Student		0.039	0.044	0.043			0.043	0.044
		(0.044)	(0.043)	(0.045)			(0.045)	(0.046)
Treated*Post*Unemployed or homemaker		-0.040	-0.062	-0.061			-0.077	-0.083
		(0.055)	(0.046)	(0.062)			(0.061)	(0.062)
Treated*Post*Log(Age)			-0.064	-0.057			-0.003	-0.009
			(0.064)	(0.067)			(0.045)	(0.040)
Treated*Post*Log(LTV)			-0.095	-0.095			-0.014	0.009
			(0.089)	(0.090)			(0.059)	(0.067)
Treated*Post*Log(1+No. of banks in the zip code)				-0.002			-0.001	0.002
				(0.024)			(0.022)	(0.021)
Treated*Post*Indebted				0.015			-0.003	0.005
				(0.052)			(0.046)	(0.045)
Treated*Post*Log(No.of banking relationships)				-0.031			-0.007	-0.006
				(0.074)			(0.065)	(0.062)
Bank Characteristics								
Treated*Post*Log(Total assets of the bank)					-0.022	-0.025	-0.026	-0.040
					(0.028)	(0.028)	(0.028)	(0.027)
Treated*Post*Own funds/total assets of the bank					0.006	0.007	0.008	0.013
					(0.016)	(0.016)	(0.015)	(0.015)
Treated*Post*Liquidity ratio of the bank					0.006	0.006	0.006	0.006
					(0.004)	(0.004)	(0.004)	(0.004)
Treated*Post*ROA of the bank					0.227**	0.231**	0.226**	0.258**
					(0.113)	(0.113)	(0.107)	(0.103)
Treated*Post*NPL ratio of the bank					0.070**	0.071**	0.070***	0.072***
					(0.027)	(0.027)	(0.024)	(0.025)
Treated*Post*Loans to households/total assets of the bank					0.003	0.003	0.003	0.002
					(0.005)	(0.005)	(0.005)	(0.005)
Treated*Post*Main bank						0.004	0.013	0.014
						(0.017)	(0.018)	(0.020)
Treated*Post*Leader bank in the zip code						0.024	0.026	0.024
						(0.031)	(0.030)	(0.028)
Bank*Year:month:day*Fixed/Variable Interest Rate Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Zip Code*Employment Status*Foreigner Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan Characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household Characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan Characteristics & Inteerst Rate	No	No	No	No	No	No	No	Yes
Observations	168,250	168,250	168,250	168,250	168,250	168,250	168,250	168,250
R-squared	0.861	0.861	0.861	0.861	0.862	0.862	0.862	0.863

Notes: The table above reports OLS regression results of the logit transformation of the rate of the loan amount over mortgage liability of new granted mortgages between 2018M1 and 2019M5 on the treatment variable *Treated*Post* and its interactions. *Treated* is a dummy variable that takes the value of one for the primary residence mortgage loans granted in any Spanish provinces but those granted in Basque Country, and zero otherwise. *Post* is a dummy variable that takes one for all the periods after 8 November 2018, and zero otherwise. Coefficients are listed in the first row, robust standard errors are reported in the row below which are corrected for clustering at the bank, Year:month:day and zip code, and the corresponding significance levels are in the adjacent column. "Yes" indicates that the set of characteristics or fixed effects is included, "No" that is not included and "-" that is comprised by the included set of fixed effects. *** Significant at 1%, ** significant at 5%, * significant at 10%.

TABLE 10

EFFECT OF A SHIFT OF STATUTORY INCEDENCE ON CONSUMER LOANS

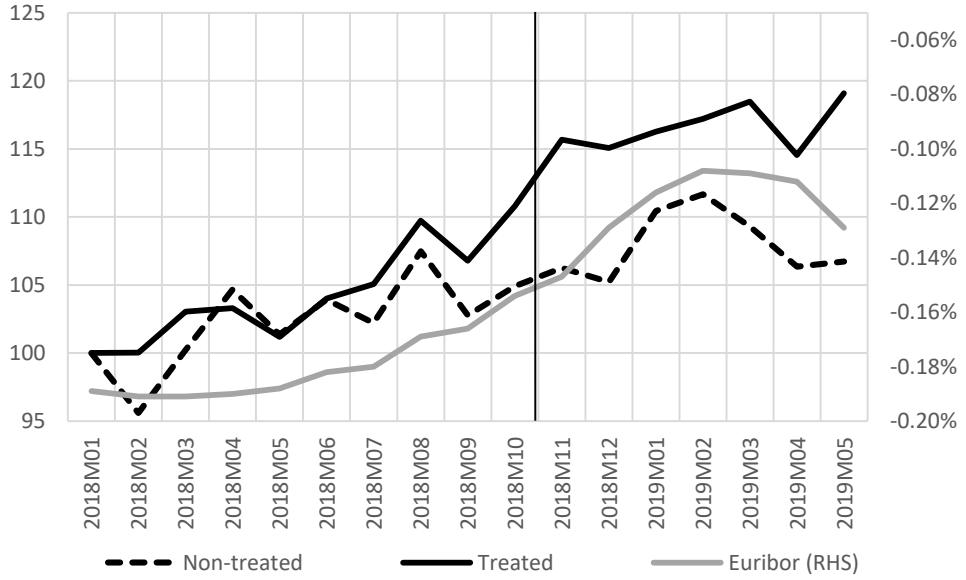
	(1)	(2)	(3)	(4)	(5)	(6)
	Loan Applications		Newly Granted Loans			
		Adjoining zip codes				
Dependent Variable:	Loan Application Granted		Interest Rate	Loan Amount	Maturity	Future Default
Treated*Post	0.023**	0.095**	0.042	0.011	-0.002	0.007**
	(0.011)	(0.044)	(0.050)	(0.022)	(0.003)	(0.003)
Borrower Fixed Effects	Yes	Yes	No	No	No	No
Bank Fixed Effects	-	Yes	-	-		-
Year:month:day Fixed Effects	-	Yes	-	-		-
Bank*Year:month:day Fixed Effects	Yes	No	-	-	-	-
Bank*Year:month:day*Fixed/Variable Interest Rate Fixed Effects	No	No	Yes	Yes	Yes	Yes
Zip Code*Employment Status*Foreigner Fixed Effects	-	-	Yes	Yes	Yes	Yes
Zip Code*Bank Fixed Effects	No	No	Yes	Yes	Yes	Yes
Loan Characteristics	No	No	Yes	Yes	Yes	Yes
Household Characteristics	-	-	Yes	Yes	Yes	Yes
Observations	889,366	4,587	1,760,791	1,760,791	1,760,791	1,760,791
R-squared	0.731	0.748	0.495	0.598	0.348	0.187

Notes: The table above reports regression results of the shift of statutory incidence on consumer loans. In column (1) and (2) the dependent variable is a dummy that takes the value of 1 if at least a loan application is granted for the borrower in the following three months given the loan application, and 0 otherwise. Column (2) is similar to column (1) but for the zip codes adjoining to the border of the non-treated provinces. Column (3) analyzes the interest rates of new granted consumer loans, column (4) the loan amount in euros, column (5) the maturity in months and column (6) the future default of the consumer loans granted. Columns (4) and (5) estimates a Poisson model while an OLS model is used in the other cases. The time period is 2018M1-2019M5. Coefficients are listed in the first row, robust standard errors are reported in the row below which are corrected for clustering at the bank, Year:month:day and zip code for all columns but (1), where borrower level is added. The corresponding significance levels are in the adjacent column. "Yes" indicates that the set of characteristics or fixed effects is included, "No" that is not included and "-" that is comprised by the included set of fixed effects. *** Significant at 1%, ** significant at 5%, * significant at 10%.

ONLINE APPENDIX

FIGURE 1

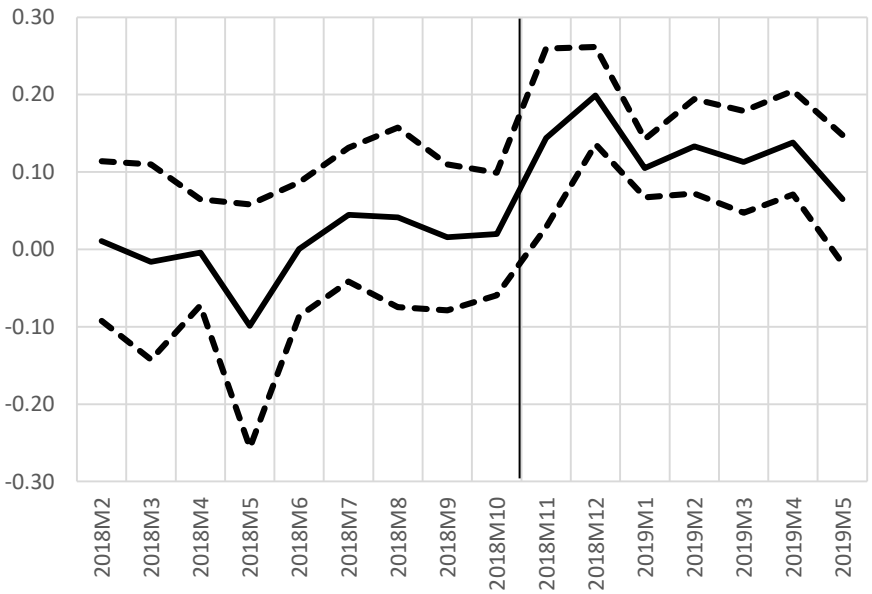
EFFECT OF A SHIFT OF STATUTORY INCIDENCE ON INTEREST RATES



Notes: The table above reports the average of the interest rates of new granted mortgages between 2018M1and 2019M5. *Treated* is the group of primary residence mortgage loans granted in any Spanish provinces but those loans granted in the provinces of the Basque Country. Base reference January 2018=100.

FIGURE 2

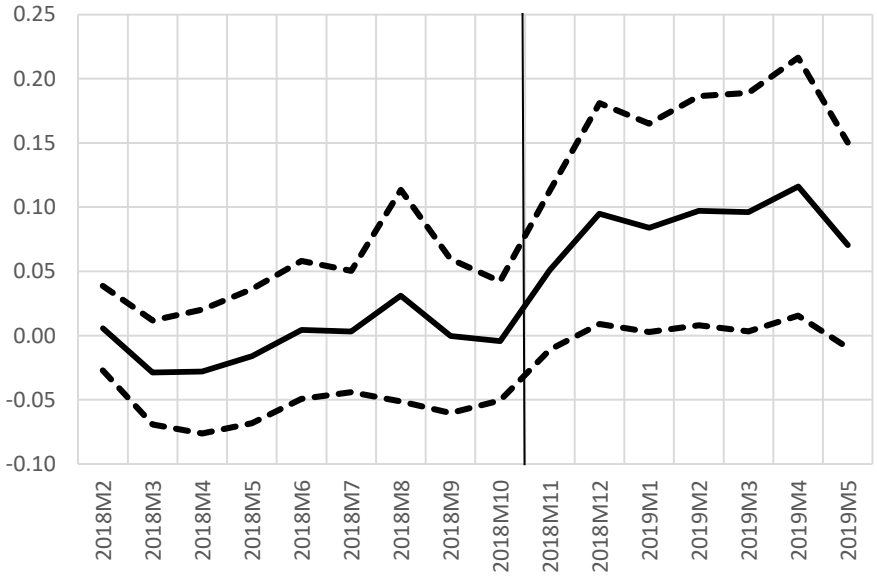
EFFECT OF A SHIFT OF STATUTORY INCIDENCE ON INTEREST RATES BY MONTH



Notes: The table above reports the time-varying coefficients of OLS regression results using the specification of Table 2, column 8, of the interest rates of new granted primary residence mortgage loans between 2018M1 and 2019M5 on the variable *Treated*Time* dummies. *Treated* is a dummy variable that takes the value of one for the primary residence mortgage loans granted in any Spanish provinces but those loans granted in the provinces of the Basque Country, and zero otherwise. Confidence bands are at 90%.

FIGURE 3

EFFECT OF A SHIFT OF STATUTORY INCIDENCE ON THE RATIO OF LOAN AMOUNT OVER MORTGAGE LIABILITY BY MONTH



Notes: The table above reports the time-varying coefficients of OLS regression results using the specification of Table 7, column 4, where the dependent variable is the logit transformation of the rate of the loan amount over mortgage liability of new granted mortgages between 2018M1 and 2019M5 on the variable *Treated*Time* dummies. *Treated* is a dummy variable that takes the value of one for the primary residence mortgage loans granted in any Spanish provinces but those loans granted in the provinces of the Basque Country, and zero otherwise. Confidence bands are at 90%.

TABLE A1

COMPARING TREATED WITH NON-TREATED MORTGAGES. MEAN TESTS

	All sample			Adjoining Zip Codes		
	Treated=0	Treated=1	Normalized Differences	Treated=0	Treated=1	Normalized Differences
	Mean	Mean	test	Mean	Mean	test
Household Characteristics						
Log(Gross income)	10.42	10.28	-0.63	10.37	10.34	-0.20
Public servant	0.05	0.08	0.10	0.03	0.06	0.11
Banking group employee	0.04	0.01	-0.12	0.02	0.00	-0.11
Student	0.02	0.03	0.05	0.01	0.02	0.02
Unemployed or homemaker	0.01	0.02	0.04	0.01	0.02	0.08
Log(Age)	6.15	6.15	0.00	6.15	6.12	-0.09
Log(LTV)	4.05	4.12	0.12	4.10	4.16	0.12
Log(1+No. of banks in the zip code)	1.92	1.90	-0.02	1.65	2.00	0.32
Indebted	0.45	0.46	0.01	0.52	0.43	-0.12
Log(No.of banking relationships)	0.32	0.33	0.02	0.36	0.31	-0.10
Bank Characteristics						
Log(Total assets of the bank)	17.87	18.67	7.17	17.93	18.47	0.25
Own funds/total assets of the bank	7.98	8.52	-1.67	8.07	8.04	-0.01
Liquidity ratio of the bank	13.39	15.30	0.14	12.87	11.41	-0.19
ROA of the bank	0.54	0.37	-0.33	0.55	0.52	-0.10
NPL ratio of the bank	5.67	6.65	0.34	5.59	5.93	0.11
Loans to households/total assets of the bank	31.93	25.69	-0.50	32.67	29.25	-0.27
Main bank	0.18	0.16	-0.04	0.22	0.16	-0.11
Leader bank in the zip code	0.15	0.25	0.17	0.22	0.29	0.11
Loan Characteristics						
Log(Loan amount)	11.68	11.45	-0.27	11.59	11.32	-0.36
Log(Loan maturity)	5.72	5.65	-0.15	5.71	5.64	-0.19
Interest rate	1.57	2.10	0.41	1.73	1.93	0.20
No. of Observations	9,703	158,547		477	644	

Notes: This table reports means of a set of variables of the new mortgages granted between 2018M1 and 2019M5. Mortgages are classified depending on the *Treated* dummy, which is a dummy variable that takes the value of one for the primary residence mortgage loans granted in any Spanish provinces but those loans granted in the provinces of the Basque Country, and zero otherwise. Columns 3 and 6 report the normalized difference test proposed by Imbens and Wooldridge (2009), for which Imbens and Rubin (2015) suggested a heuristic threshold of 0.25 in absolute value. The normalized difference statistic tests the null of no differences in means between treated and control group through a scale-and-sample-size-free estimator.

TABLE A2

COMPARING TREATED MORTGAGES BEFORE AND AFTER THE SHOCK. MEAN TESTS

	Before the shock Post=0		After the shock Post=1		Normalized Differences
	Mean	S.D.	Mean	S.D.	test
Household Characteristics					
Log(Gross income)	10.29	(0.19)	10.29	(0.19)	-0.02
Public servant	0.08	(0.27)	0.08	(0.27)	0.01
Banking group employee	0.01	(0.12)	0.01	(0.12)	0.00
Student	0.03	(0.16)	0.03	(0.17)	0.01
Unemployed or homemaker	0.02	(0.14)	0.02	(0.14)	0.01
Log(Age)	6.15	(0.24)	6.16	(0.24)	0.02
Log(LTV)	4.13	(0.43)	4.11	(0.46)	-0.04
Log(1+No. of banks in the zip code)	1.93	(0.60)	1.87	(0.58)	-0.07
Indebted	0.45	(0.50)	0.47	(0.50)	0.03
Log(No.of banking relationships)	0.32	(0.39)	0.34	(0.40)	0.03
Bank Characteristics					
Log(Total assets of the bank)	18.74	(1.44)	18.48	(1.56)	-0.12
Own funds/total assets of the bank	8.64	(2.93)	8.30	(2.81)	-0.08
Liquidity ratio of the bank	15.18	(10.35)	15.21	(12.37)	0.00
ROA of the bank	0.40	(0.40)	0.36	(0.47)	-0.06
NPL ratio of the bank	6.66	(1.66)	6.51	(1.83)	-0.06
Loans to households/total assets of the bank	25.74	(8.40)	26.45	(8.30)	0.06
Main bank	0.16	(0.37)	0.15	(0.36)	-0.02
Leader bank in the zip code	0.26	(0.44)	0.22	(0.42)	-0.05
Loan Characteristics					
Log(Loan amount)	11.47	(0.65)	11.46	(0.67)	0.00
Log(Loan maturity)	5.66	(0.32)	5.66	(0.34)	0.00
Interest rate	1.97	(0.89)	2.20	(1.09)	0.16
No. of Observations	94,466		73,784		

Notes: This table reports means of a set of variables of the new mortgages granted between 2018M1 and 2019M5. Mortgages are classified depending on the *Post* dummy, which is a dummy variable that takes one for all the periods after 8 November 2018, and zero otherwise. Column 5 reports the normalized difference test proposed by Imbens and Wooldridge (2009), for which Imbens and Rubin (2015) suggested a heuristic threshold of 0.25 in absolute value. The normalized difference statistic tests the null of no differences in means between treated and control group through a scale-and-sample-size-free estimator.

TABLE A3

BASE TAX RATE BY REGION

Region (Comunidades Autonómas and Ciudades Autonómas)	(Base) Tax rate
Andalucía	1.5%
Aragón	1.5%
Asturias	1.2%
Baleares	1.2%
Comunidad Valenciana	1.5%
Canarias	1%
Cantabria	1%
Castilla La Mancha	1.25%
Castilla y León	1.5%
Cataluña	1.5%
Ceuta	0.5%
Extremadura	1.2%
Galicia	1.5%
La Rioja	1%
Comunidad de Madrid	0.75%
Melilla	0.5%
Murcia	1.5%
Navarra	0.5%
Basque Country	0%

Notes: This table reports the base tax rate for primary residence mortgages in each of the Spanish regions (Autonomous Communities and Autonomous Cities of Ceuta and Melilla).