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December 2020



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# *Paraísos Fiscales*, Wealth Taxation, and Mobility\*

David R. Agrawal<sup>†</sup>     Dirk Foremny<sup>‡</sup>     Clara Martínez-Toledano<sup>§</sup>

December 2020

## Abstract

This paper analyzes the effect of wealth taxation on mobility and the consequences for tax revenue and wealth inequality. We exploit the unique decentralization of the Spanish wealth tax system in 2011—after which all regions levied positive tax rates except for Madrid—using linked administrative wealth and income tax records. We find that five years after the reform, the stock of wealthy individuals in the region of Madrid increases by 10% relative to other regions, while smaller tax differentials between other regions do not matter for mobility. We rationalize our findings with a theoretical model of evasion and migration, which suggests that evasion is the mechanism most consistent with all of the mobility response being driven by the *paraíso fiscal*. Combining new subnational wealth inequality series with our estimated elasticities, we show that Madrid’s status as a tax haven reduces the effectiveness of raising tax revenue and exacerbates regional wealth inequalities.

**Keywords:** Wealth Taxes, Mobility, Inequality, Enforcement, Fiscal Decentralization, Tax Havens, Evasion

**JEL:** E21, H24, H31, H73, J61, R23

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Rising capital shares of income and the associated increases in inequality observed in many countries have spurred new interest in the taxation of wealth. Many policy discussions have focused on whether wealth taxes are enforceable, as taxpayers might respond to wealth taxes by *moving* assets to tax havens.<sup>1</sup> Indeed, empirical evidence finds that a significant fraction of financial assets owned by the wealthy is held offshore (Alstadsæter et al., 2019). The risk of tax-induced mobility was a motivating factor in Piketty (2014)’s call for a *global* wealth tax: “if not all countries implement a wealth tax, then mobile capital would simply flow to tax havens where wealth tax rates are zero.”

Analyzing the mobility responses to wealth taxes is, however, an empirical challenge. Wealth taxes provide limited sources of exogenous variation, as they are often implemented at the national level and for the very top of the wealth distribution. Given the difficulty of cross-country comparisons, little variation in wealth taxes exists across individuals or regions within a country, and when they do exist, they often do not feature a prominent tax haven. Furthermore, any study of migration must know where the taxpayer originated from and migrated to, which requires potential harmonization of multiple countries’ or regions’ administrative tax records. Thus, despite the importance of an annual wealth tax in recent policy and academic debates, important questions necessary to evaluate its suitability remain unanswered. How large are the mobility responses to wealth taxation and what role do tax havens play? Are these mainly avoidance (i.e., real migration) or evasion (i.e., fraudulent declaration of fiscal residence) responses? How do these responses shape wealth tax revenues and wealth inequality dynamics?

We break new ground on these issues by using arguably exogenous variation in wealth tax rates across sub-national regions (*Comunidades Autónomas*) within Spain. Prior to 2008, Spain had a mostly uniform wealth tax, which was briefly suppressed. It is only after its reintroduction in 2011 that regions started to substantially exercise their autonomy to change wealth tax schedules. As a consequence, large differences in effective tax rates emerged across regions under this residence-based tax system. Madrid plays a special role in this setting as an internal *paraíso fiscal* with a zero effective tax rate on wealth. The presence of this salient tax haven distinguishes Spain from one other country with decentralized wealth taxes—Switzerland—where the variation results from tax rate differentials, but with all regions

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<sup>1</sup>Recent political debates, including in the United States, have centered around the wealth tax as a revenue source to fund public programs and to reduce wealth inequality. Beyond national proposals, states such as California have proposed decentralized state-level wealth taxes (Gamage et al., 2020).

levying positive tax rates due to federal restrictions that prevent regions to abolish the tax.<sup>2</sup> This distinction is critical to testing Piketty’s claim that tax havens play a special role in undermining wealth taxation. Moreover, the presence of a single zero-tax region internal to Spain—likely to arise in decentralized federations considering wealth taxes in the absence of federal restrictions—creates unique incentives for escaping wealth taxation that do not arise in a setting with small tax differentials, but no salient tax haven.

To conduct the analysis, we assemble administrative wealth tax records for a regionally stratified and longitudinal random sample prior to the suppression of the wealth tax (2005-2007) and merge them to administrative personal income tax records before and after decentralization (2005-2015). The individual personal income tax records contain information on fiscal residence, which is unique to all personal taxes, making it possible to follow the location of wealth tax filers before and after decentralization.

[Figure 1 about here.]

The key result of our paper can be seen in the raw administrative data (Figure 1). We plot the change in the number of individuals who would be subject to the post-reform wealth tax for Madrid and the average of the other regions. Following Madrid’s decision to become a tax haven, the number of wealth tax filers reporting Madrid as their fiscal residence increases by over 6,000. The other regions see an average decline of 375 filers. Relative to 2010, this represents an approximately 10% increase in the stock of wealth tax filers in Madrid.

To analyze the effect of wealth taxation on mobility, we proceed in three steps. First, we present descriptive evidence on the number of movers between all pairs of Spanish regions. Following decentralization, the number of wealth tax filers moving to Madrid is substantially higher than the number of moves to any other region, including larger regions.

Second, we aggregate the individual data to the region-year-wealth tax filer level and compare the population of wealth tax filers in Madrid to the population of wealth tax filers in other regions. We find a 10% increase in the relative population in Madrid by five years after decentralization of the wealth tax. Identification follows from a difference-in-differences design. Any threat to identification would come from a shock that makes Madrid relatively more attractive compared to other regions. To address this, we add an additional difference exploiting information on the relative population of wealth tax filers and high capital income individuals not subject to the wealth tax. Thus, any shock threatening our results must only

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<sup>2</sup>Hines (2010) and Hines and Rice (1994) define tax havens as jurisdictions that have low tax rates or loopholes on particular assets and self-promote themselves as a center for those assets, which Madrid satisfies. Furthermore, the popular press and politicians have dubbed Madrid a tax haven. Madrid, however, is unlike much of the stereotypical tax competition and tax havens literature (Hines, 2010; Dharmapala and Hines, 2009; Kessler and Hansen, 2001), where low-tax jurisdictions are small.

affect wealth tax filers, but not high capital income non-filers. We document that non-filers do not view Madrid any more attractive after the reform. Furthermore, we show that migration effects follow tax changes and do not predate them; there are no significant pretrends in the periods prior to the reform. Furthermore, most wealth tax filers are either pure rentiers or have limited labor income, so that Spain's regional differences on labor income taxes are irrelevant. The elasticity with respect to the net-of-tax rate on *wealth* is 7.9, which translates to an elasticity with respect to a capital *income* tax of 0.34. This elasticity is in the range of short-run elasticities in the income-tax literature (Kleven et al., 2020).

Finally, in addition to the aggregate analysis, we exploit an orthogonal source of variation relying on the progressivity of the wealth tax in the context of an individual location choice model. This specification allows us to account for region-by-year fixed effects, which control for shocks that may influence preferences for a particular region in a particular year, such as time varying amenities or other regional policies. This approach also accounts for fixed characteristics of the mover that are constant across alternative regions, for any sorting based on characteristics, and for other policy changes that affect all wealth tax filers. Further, this model allows us to analyze heterogeneous effects across individuals. In line with the aggregate analysis, we find that only the tax rate of Madrid matters for relocation choices: Madrid's population increases due to its zero tax rate, but the populations of regions with low but positive tax rates remain approximately unchanged. There is little heterogeneity across individual characteristics. We only find larger effects at the top of the wealth distribution, as the incentives to escape wealth taxation are higher the further up one moves along the wealth distribution due to the progressivity of the tax.

To shed light on the mechanisms behind the mobility responses, we build a simple theoretical model in which taxpayers have the choice over migrating or evading. In a standard mobility model without evasion, even a small tax differential will attract some individuals at the margin. However, in the presence of evasion, if audit probabilities are sufficiently small, an individual who finds it advantageous to evade will *never* find it optimal to falsely declare a region *other* than the tax haven. Given our empirical analysis shows that almost all fiscal residence changes involve Madrid, the theoretical model indicates our results are likely driven by evasion rather than real responses. Further, we then digitize region-specific wealth tax audit records and correlate the audit rates with mobility changes. In standard models of evasion, the audit probability increases with the amount evaded. Consistent with this, we show that audit rates are positively correlated with mobility to Madrid, but not with mobility to other regions, suggesting that the tax authority believes that most fraudulent moves involve Madrid. Taken together, evasion is the dominant mechanism behind fiscal residence changes.

We then use our estimates to study the effect of tax-induced mobility on wealth and

income tax revenues by means of counterfactual simulations. We simulate the evolution of wealth and income tax revenue absent tax-induced mobility, a scenario that could potentially be achieved by extensive enforcement, tax harmonization, or minimum tax rates. We find that Spain foregoes on average 5% of total wealth tax revenue due to tax-induced mobility, with substantial differences across regions. We also find important differences in foregone income tax revenue across regions due to tax-induced mobility, but little income tax revenue is foregone at the national level.

An unresolved theoretical debate is whether tax harmonization or minimum tax rates are Pareto improving (Kanbur and Keen, 1993). To shed light on this, we also simulate the evolution of revenue under a centralized wealth tax system in which all regions would have a uniform wealth tax schedule and a system with minimum tax rates. Abolishing the decentralized system in favor of a centralized system leads to large revenue gains mainly due to the added tax revenue from taxing the base in Madrid. However, we show that this is not a Pareto improvement unless harmonization is to a rate that is very close to the maximum decentralized rate. Minimum tax rates could instead increase revenue in all regions.

Finally, we study the interplay between the observed mobility responses and regional wealth inequality dynamics.<sup>3</sup> To do this, we build new top national and regional wealth distribution series. The main novelty is that we decompose the wealth shares at the *regional* level: this is the first attempt to construct harmonized top wealth shares across sub-national regions. Most prior studies of spatial inequality focus on income inequality, economic opportunity or poverty—not on wealth inequality—and emphasize the importance of analyzing spatial variation along with socioeconomic variables to determine optimal policy responses (Chetty and Hendren, 2018b; Chetty and Hendren, 2018a). Our new regional wealth distribution series reveal the existence of significant differences in both the level and trend in wealth concentration across Spanish regions.

We take advantage of the regional wealth series to simulate the spatial dynamics of wealth inequality absent tax-induced mobility. The mobility of wealthy taxpayers to Madrid has led to a significant rise in wealth concentration in the region. In particular, between 2010 and 2015 the top 1% wealth share growth rate in Madrid (16%) was almost double the growth rate had tax-induced mobility not existed (8.7%). This finding contrasts with the decline in the top 1% wealth share in the rest of Spain after decentralization. Overall, these results reveal that Madrid’s status as a tax haven has exacerbated regional wealth inequalities. Even though

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<sup>3</sup>For the literature on wealth inequality and progressive wealth taxation, please see Kopczuk and Saez (2004) Piketty and Saez (2014), Piketty and Zucman (2014), Kopczuk (2013), Kopczuk (2015), Jones (2015), Saez and Zucman (2016), Smith et al. (2019b), Saez and Zucman (2019a), and Kopczuk (2019). Alvaredo and Saez (2009) document wealth inequality in Spain. See Bonhomme and Hospido (2013) and Bonhomme and Hospido (2017) for measures of income inequality in Spain.

much of the mobility is due to tax evasion, increases in regional wealth inequality are relevant as they are highly correlated with political influence (Gilens and Page, 2014). Individuals who change their fiscal domicile to Madrid via evasion do not care about the provision of public services, but instead may lobby for policies that are not necessarily aligned with the preferences of residents by protecting their own financial interests via lower taxes.

This paper contributes to three main strands of the literature. First, the nascent empirical literature studying behavioral responses to wealth taxation is based on estimation of taxable wealth elasticities, placing an upper bound on the mobility elasticity (Kleven et al., 2020).<sup>4</sup> One exception is Brülhart et al. (2016), which uses data for Swiss cantons and shows that observed cross-canton responses can mostly be attributed to changes in wealth holdings rather than mobility across localities in Switzerland. However, all Swiss cantons (must) levy a positive wealth tax. Our paper is thus the first to study mobility responses to a tax haven, or put differently, adopting or not adopting a wealth tax. Such analysis is critical to testing Piketty’s claim that a wealth tax cannot be successful unless globally adopted.

Second, our work also relates to the literature on the effect of taxes on mobility. Individuals (and wealth) moving across borders may threaten the ability to engage in redistribution or to raise revenue. Given that top-taxpayers contribute a disproportionate share of taxes, much of the literature has focused on top-income earners.<sup>5</sup> However, the literature on wealth-tax induced mobility is scant, and there is no evidence about how these responses might shape wealth inequalities across receiving and sending regions.<sup>6</sup> We contribute to this literature by using our wealth tax-induced mobility responses to study the impact of tax havens, and the resulting mobility induced therein, on the dynamics of the wealth distribution.

Finally, our results also have important implications for the literature on tax enforcement and the ability of governments to raise revenue from decentralized capital taxes. Recent empirical evidence has shown that behavioral responses of high wealth individuals depend on the enforcement environment (Slemrod, 2019, Londoño-Vélez and Ávila-Mahecha, 2020). The link between our mobility estimates and the dynamics of tax revenue sheds new light on the importance of the degree of enforcement and the extent of fiscal decentralization. In

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<sup>4</sup>With respect to the elasticity of taxable wealth, studies generally find large effects: Jakobsen et al. (2020) use administrative wealth records from Denmark; Zoutman (2016) for The Netherlands; Seim (2017) for Swedish wealth tax payers, Londoño-Vélez and Ávila-Mahecha (2020) for Colombia, and Durán-Cabré et al., 2019 for Catalonia. This literature generally does not focus on off-shoring of wealth and its mobility.

<sup>5</sup>Although estimates vary, at the margin, taxes appear to be a factor in the location choices of top earners (Agrawal and Foremny, 2019, Akcigit et al., 2016, Kleven et al., 2013, Kleven et al., 2014, Schmidheiny and Slotwinski, 2018, Moretti and Wilson, 2017, Muñoz, 2019, Young and Varner, 2011, Young et al., 2016).

<sup>6</sup>There is a nascent literature on bequest and estate taxes suggesting that the location decisions of the elderly are not very responsive (Brülhart and Parchet, 2014, Bakija and Slemrod, 2004, Conway and Rork, 2006), except at the very top (Moretti and Wilson, 2019). Brülhart et al. (2016) decompose the elasticity of taxable wealth and find that mobility accounts for one quarter of the effect.



particular, our decentralized setting allows us to compare several policy reforms—tax harmonization, minimum tax rates, and increased enforcement—debated theoretically, but for which empirical comparisons of their effects are nonexistent. Although our estimates suggest that decentralized wealth taxation is possible in the *short-run*, consistent with Piketty’s call for a global wealth tax, the case of decentralized taxation in Spain falls victim to the presence of a fiscal paradise. Although a centralized tax would be subject to mobility opportunities external to the country, it could be coupled with more aggressive enforcement mechanisms. As an alternative to centralization, our results show that any coordinated tax schedule that will have the political support of all regions must be at a tax rate sufficiently close to the maximum rate. Absent a political consensus to harmonize the wealth tax, appropriate enforcement measures must be in place: centrally imposed minimum tax rates, increased auditing and information sharing between the central and regional governments, or the taxation of immobile assets such as land according to the source-principle. Nonetheless, increases in enforcement may only be met with modest success (Johannesen et al., 2020), as enforcement mechanisms may induce new evasion strategies.

## 1 Institutional Details

The Spanish wealth tax was introduced in 1978 (Law 50/1977) to complement the personal income tax. The tax was briefly suppressed between 2008 and 2010. All regions are subject to this tax except for Basque Country and Navarre, which due to their special status are autonomous to design most taxes and hence, they have their own wealth tax. The tax schedule is progressive and it is applied to the sum of all individual wealth components net of debts. Since 2011, it is only levied if net taxable wealth (i.e., taxable assets - liabilities) are above 700,000 Euro (approximately the top 0.5% of the total adult population in 2015). Over the period 2002-2007, the filing threshold was 108,182.18 Euro (approximately 2.7% of the total adult population in 2007). Given the tax is on individual, and not joint wealth, joint assets are split among spouses.<sup>7</sup>

[Figure 2 about here.]

Since 1997, the rights to modify the amount exempted and the tax rates were ceded to the regions, under the condition of keeping the national statutory minimum bracket and minimum marginal tax rates (default schedule). In 2002, the regions were given the right to change or include deductions in the wealth tax and the condition of requiring a minimum bracket

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<sup>7</sup>For further details, see Appendix A.1.

and marginal tax rates was suppressed. All regions kept the national wealth tax schedule (i.e., 0.2-2.5%) during the 1990's and early 2000's. In the mid-2000's a few small changes were implemented by some regions. Thus, it is only after its reintroduction in 2011 when significant differences in the wealth tax emerge. For instance, Madrid decided to keep the wealth tax suppressed after 2011, contrary to Andalusia and later regions such as Catalonia and Extremadura who have raised the marginal tax rates above the default schedule. The first panel of Figure 2 shows the marginal tax rates under the centralized wealth tax and the remaining panels show the variation in tax rates across the fifteen regions following 2011.

The reintroduction of the wealth tax was authorized in September 2011 and initially came with substantial uncertainty over when or if it would actually be reimplemented by regional governments. The authorization was sunset to only apply retroactively for 2011 and the following year. Immediately after the central government's decision, the regional government in Madrid announced the suppression of the wealth tax and applied a 100% tax credit. To have a different tax schedule than the national default, regions must actively pass a law. However, many other regions did not formulate their wealth tax schedules immediately. This created additional delays over what each region's tax schedule would look like. In September 2012, the central government announced the extension of the wealth tax until 2013 and this procedure continues on annually (Durán-Cabré et al., 2019).

For the purposes of this study, it is important to know the definition of fiscal residence and to understand how taxpayers can change their fiscal residence by "*moving*". The fiscal residence is the property that constitutes the primary residence of the taxpayer and it is the same for all personal taxes. For a property to be qualified as primary residence, the wealth taxpayer needs to have lived there continuously over at least three years. An exception applies in case of death of a family member, marriage, divorce, first job, job transfer or any other analogous circumstance (Law 40/1998, Law 35/2006). Updating the fiscal residence for tax purposes can be directly done on the tax form. Despite the legal regulations preventing the immediate change of fiscal residence, taxpayers find it easy to change their fiscal residence either by pretending they live in a rented property, in their secondary residence (approximately 86% of wealth taxpayers had at least one secondary residence in 2010), or in the residence of a relative. Auditing falls to both the central and regional authorities. However, verifying the primary address comes with substantial administrative costs to the tax authorities. Enforcement in a multi-tier setting creates coordination problems.

The decentralization of the wealth tax should be considered in the general context of fiscal decentralization in Spain. The central government also passed provisions that allow the regions to set the tax brackets and tax rates on their half of the personal income tax on *labor*. While this decentralization created incentives for high (labor) income individuals to

move, Spain operates a dual income tax system. Under this system, capital income is taxed at a common schedule. Thus, for high-wealth individuals who obtain a substantial fraction of their income from the return to capital, decentralization of the labor income tax provided little additional incentive to move. Figure A1 shows after linking administrative wealth tax to personal income tax records, approximately 80% of wealthy individuals have labor income below 100,000 Euro. Critically, as shown in Agrawal and Foremny (2019), the incentives to move due to the labor income tax are negligible for incomes below 100,000 Euro in our period of study.<sup>8</sup>

Inheritance taxes have been decentralized to the regions since 1997, but regions did not exercise this right until the mid-2000s. In particular, Madrid adopted a tax credit of 99% on close relatives starting already in 2007, such that there is no additional incentive created by this tax starting in 2011. Moreover, the place of residence for this tax is defined based on the location of the deceased over the last five years before death. Given this long duration of proof, and the fact that we focus on five years following decentralization, we expect little of the mobility we identify to be a result of these taxes.<sup>9</sup>

## 2 Data

We combine two administrative data sets constructed by the Spanish Institute of Fiscal Studies in collaboration with the State Agency of Fiscal Administration. We obtain these confidential records with approval from the Spanish government.

The first data set (Panel de Declarantes del Impuesto sobre la Renta de las Personas Físicas, 1999-2015) is an approximately 4% sample of individual level personal income tax returns from 1999-2015. The data contains all items reported on the annual personal income tax declaration. This includes the amount and source of income, personal characteristics (e.g., age and gender), and, critically, the region of fiscal residence of the tax filer. The panel structure allows us to follow individuals over time. The micro-files are drawn from 15 of the 17 autonomous communities of Spain, in addition to the two autonomous cities, Ceuta and Melilla. Two autonomous regions, Basque Country and Navarre, are excluded, as they do not belong to the Common Fiscal Regime. The second data set (Panel de Declarantes del Impuesto sobre el Patrimonio, 2002-2007) includes administrative wealth tax returns, including detailed information about wealth taxpayers' assets and liabilities. This data is available for individuals included in the income tax panel who were subject to the wealth tax

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<sup>8</sup>To address this possible confounding event, we implement a robustness check where we eliminate all wealth-tax filers that have labor income in excess of 100,000 Euro.

<sup>9</sup>See Appendix A.1 for a more detailed discussion about capital taxes in Spain.

between 2002-2007. No centralized data are available after the wealth tax was suppressed. Nonetheless, as the legal definition of fiscal residence for both wealth and income taxes is the same, we rely on the one reported in the income tax returns.

We have also been granted access to the universe of wealth tax records for Catalonia following decentralization. We use this additional data for some of our robustness checks. Even if we had wealth tax information for all regions, these data would not be sufficient, as national law only requires residents in Madrid to file a wealth tax return if their gross wealth exceeds 2,000,000 Euro.

The income tax dataset is stratified by region, income level and main source of income, and it oversamples the top of the distribution. Given this stratification, the data are meant to be representative of the personal income tax distribution. We reweight the data to be representative of the total population of personal income taxpayers and wealth taxpayers across regions. First, we reweight the sample of wealth taxpayers to match regional totals over the period 2002-2007. We then extrapolate these weights forward by applying region-specific adult-age population growth rates. Finally, we reweight the subsample of personal income taxpayers that do not file wealth taxes so that after reweighting, the full panel matches the total number of personal income taxpayers in each region and year. The reweighting is important for the inequality analysis in Section 6.1, but does not affect our regression results.

## 2.1 Wealth Extrapolation Method

The main variable we use in our the analysis is the fiscal residence, which we directly observe in the tax records on an annual basis. However, we need to estimate wealth for the years for which wealth tax records are not available (2008-2015) to define treatment status and to build the wealth distribution series. We do so by combining national accounts, wealth and personal income tax returns. Following Martínez-Toledano (2020), we map each personal income category from national accounts to a personal wealth category in non-financial and financial accounts.<sup>10</sup> Then, we compute the annual rate of return for each asset category as the ratio of the stock to the flow. Using these returns, we then extrapolate individual wealth from 2008 onward using reported individual wealth in 2007 as an anchor.

Asset categories for which the aggregate rate of return is not available (e.g., jewelry, antiques, rural real estate, industrial and intellectual property rights) are extrapolated forward using the annual growth rate of the average reported values from official aggregate wealth

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<sup>10</sup>For non-financial accounts we rely on the reconstruction done by Artola Blanco et al. (2020) and for financial accounts on the Bank of Spain balance sheets. We can map urban real estate, business assets, life insurance, deposits, debt assets, shares and debts.

tax records published by the Spanish Tax Agency over the period 2011-2015.<sup>11</sup>

To show the robustness of our extrapolation method, we first compare extrapolated average regional wealth to the actual reported average wealth published by the Spanish Tax Agency. Figure A2 shows that the extrapolation matches regional average wealth in both level and trend. We also compare extrapolated versus actual individual reported wealth levels using Catalonia’s administrative wealth tax records after 2011 (Figure A3). The strong correlation between our extrapolated and the direct wealth measures in this region provides evidence supporting our method. In particular, the latter figure suggests the extrapolation is extremely accurate at lower levels of wealth, but underestimates wealth at the very top. Given this extrapolation is mainly used to classify individuals near the 700,000 threshold, the underestimation at the very top is not a major concern. Indeed, we show our results are robust to the use of the direct 2007 wealth data to define treatment status.

## 2.2 Tax Calculator

Research on tax-induced mobility requires knowing the tax liabilities an individual pays in their region of residence and all possible counterfactual regions of residence. As there exists no publicly available wealth tax simulation model for Spain, we have constructed our own tax simulator accounting for all important details of the Spanish wealth tax system.

The wealth tax simulator allows us to calculate wealth tax liabilities for every region and year. To do this, we comb through thousands of pages of tax documents provided by the Spanish Ministry of Finance.<sup>12</sup> In particular, we collect for each year and region, most parameters of the wealth tax code, such as rates, brackets, exemptions (e.g., primary residence, business assets), reductions (e.g., disability), as well as the maximum combined wealth and income tax liability cap.<sup>13</sup>

We use the tax calculator to simulate for each individual the average tax rate in her region of residence and hypothetical tax rates if she lived in any other region. The tax simulator thus provides all counterfactual levels of the wealth tax burden across regions of Spain under both a decentralized and centralized wealth tax system. For the years in which direct individual wealth information is available, results of the tax calculator consistently match the information available in the administrative tax return data.

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<sup>11</sup>For some assets (e.g., taxable business assets, liabilities), we also use this last procedure, as it better matches the evolution of total reported wealth by region. We refine the extrapolation by adjusting reported urban real estate to account for the exemption on main residence, which was raised in 2011.

<sup>12</sup>This information is released each year and summarizes all parameters with examples how to calculate the tax burden of the personal income tax and the wealth tax (*Manual Práctico de Renta y Patrimonio*).

<sup>13</sup>All details about the tax simulator are described in Appendix A.2.

## 2.3 Treatment and Comparison Groups

In this subsection, we define the treated and comparison individuals that we will use in the subsequent analyses. As the treatment status must be defined using data prior to the wealth tax reintroduction, we face a trade-off of using the raw 2007 administrative data (under the centralized regime) versus 2010 extrapolated data (under the wealth tax suppression). For this reason, we will define various treatment and comparison groups.

For defining treatment, in our preferred approach, we rely on the extrapolated data and focus on individuals that are reasonably believed to be paying wealth taxes under the 700,000 Euro filing threshold in place in most regions from 2011-2015. We classify an individual as being in the treatment group if their taxable wealth in 2010 is estimated to be above 700,000 Euro. We refer to this group as the **“2010 wealthy.”** Note that the extrapolation is only done for individuals filing wealth taxes in 2007 because for the rest of filers, we have no baseline wealth information. The advantage of this approach is that the treatment is based on the immediate year prior to the reintroduction of the wealth tax, but with the limitation of using extrapolated rather than observed wealth tax data.<sup>14</sup>

A second approach defines the treatment sample on the basis of the 2007 records, which avoids relying on extrapolated data. We classify an individual as treated by the decentralization if they filed wealth taxes under the centralized regime in 2007 and had a wealth of more than 700,000 Euro in 2007. We refer to this group as the **“2007 filers.”** Using the administrative wealth tax data to determine who has more than 700,000 Euros in 2007 only classifies 4% of individuals differently than using extrapolated 2010 wealth.

For the comparison group, our preferred specification includes anyone who reports positive dividends on their personal income tax form at least once when the wealth tax was suppressed, but did not file wealth taxes in 2007. In 2007, Spain introduced an exemption of up to 1,500 Euro on dividends, so that this group only includes individuals that have more than 1500 Euro of dividend income. We refer to this group as **“High dividend non-filers.”**<sup>15</sup> This is our preferred group because they have a significant amount of savings, but not enough so that they would move in response to expected wealth tax increases.

As a second approach, we use all personal income tax filers that were not wealth tax filers in 2007 as a comparison group. We name this the **“2007 non-filers”** comparison group.

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<sup>14</sup>If wealth taxpayers illegally hide a substantial share of their taxable wealth under the centralized regime, we would not observe this wealth in tax records and could mismeasure their “true” treatment status. Nonetheless, given that there is third party information reporting on nearly 90% of total taxable wealth (i.e. commercial and residential properties, land, and financial assets deposited in domestic banks), misreporting if anything should only have a minimal effect on treatment status.

<sup>15</sup>Here being a non-filer refers to year 2007. While it is unlikely anyone in this group could become a filer in subsequent years, it is not entirely impossible, as individuals might receive a large bequest.

Finally, for regressions using total wealth rather than the total number of filers, we use 2007 wealth tax filers that have a level of wealth that is sufficiently below the new 700,000 Euro threshold as a third comparison group. We assign individuals to the comparison group if their 2010 (or 2007) wealth is between 108,182.18 and 300,000 Euro.<sup>16</sup> Given some of these individuals may expect their wealth to grow and be subject to the tax, we may underestimate the the effect on total wealth as a result. We call this comparison group the “<300,000”.

## 3 Empirical Analysis

### 3.1 Descriptive Evidence

As initial visual evidence, we construct heat maps showing the migration flows of the “2010 wealthy” between regions (Figure 3). Figure 3(a) shows the net migration patters of wealth tax filers to a given destination from a given origin region. To read the heatmap, pick a destination row. If the cell is dark red, then net migration (in-flow from the “origin” region minus out-flow to the “origin” region) is stronger towards that “destination” region. If the cell is blue, the opposite is true. Figure 3(b) shows the change in net migration as the difference of annual net migration in the pre- and post-reform period. We construct this figure by calculating the annual average migration flows separately for the years prior to and after decentralization. We then difference this data such that dark red cells see large increases in net migration following the decentralization of the wealth tax, while blue pairs see net declines to that destination. Madrid is the strongest net recipient of wealth tax filers and its annual migration patterns increase dramatically relative to the period without a wealth tax. Almost every other region is losing high-wealth taxpayers to Madrid.

[Figure 3 about here.]

To initially describe the nature of these changes of fiscal residence,<sup>17</sup> we construct two indicator variables that are equal to one if a person relocated between 2005-2010 (pre-reform) or 2011-2015 (post-reform). We regress this on individual characteristics. Figure 4 shows the

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<sup>16</sup>As in Akcigit et al. (2016), individuals with wealth very close to the threshold are also likely to be affected by the reform and would bias the results.

<sup>17</sup>Table A2 shows the summary statistics for the “2010 wealthy” treatment sample in 2010. Wealthy individuals in Madrid are similar to those in other regions on the basis of demographic characteristics, but Madrid wealth tax filers have higher average wealth and income levels. Such an indication suggests that a higher concentration of wealth and income may be attributed to more political influence (Saez and Zucman, 2019b), which may translate to the zero tax rate adopted by the region. Movers to Madrid are also similar based on demographics to movers to other regions, but movers to Madrid have higher wealth. Regardless of these level differences, as will be shown, our empirical design does not require the level of wealth to be similar in all regions.



average baseline probability to move for wealthy individuals (vertical dashed lines), which is 3.2% before and 3.5% after decentralization, and the differences in the probability to move by age, gender, income source, and position in the wealth tax schedule. We find little group level differences. We find a larger probability to move among those located in higher wealth-tax brackets, where the tax differential to Madrid is largest.

[Figure 4 about here.]

## 3.2 Aggregate Analysis

### 3.2.1 Identification Strategy

To study the effect of Madrid’s status as a tax haven on mobility, we next construct aggregated tabulations from the personal income and wealth tax micro files. We focus on the stock of wealthy *taxpayers* rather than wealth, as we directly observe their fiscal residence across time. However, we rerun the analysis using the stock of wealth as a robustness check. In our preferred specification, we aggregate the counts focusing on individuals that appear in the personal income tax data for all years from 2008 to 2015. Nonetheless, we also present trends for a longer balanced sample covering the period 2005-2015 to show that results are not affected by the onset of the 2008 financial crisis.<sup>18</sup> We total the number of individuals and the amount of wealth by region, year and treatment-comparison group by tracking where each individual reports her fiscal residence.

We rely on the following event-study design to carry out the aggregate empirical analysis. Let  $r$  index the region,  $t$  index time and  $M_r$  be an indicator equal to one for the region of Madrid, which sets no wealth tax rate, and zero for all other regions. In this way, we compare the relative evolution of the number of wealthy individuals,  $N_{rt}$ , in Madrid relative to all regions other than Madrid before and after decentralization. We estimate the following equation:

$$\ln N_{rt} = M_r \cdot \left[ \sum_{y=-5}^{-2} \theta_y \cdot \mathbf{1}(y = t - 2011) + \sum_{y=0}^4 \beta_y \cdot \mathbf{1}(y = t - 2011) \right] + X_{rt}\alpha + \zeta_r + \zeta_t + \nu_{rt}, \quad (1)$$

where the indicators  $\mathbf{1}(y = t - 2011)$  are dummies for each event year  $y$  prior to or after the reinstatement of the wealth tax and the year prior to the reform is omitted. Then,  $\theta_y$  gives

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<sup>18</sup>As the sample of individuals is balanced, regressions using the share or the number of individuals in a region are identical. We do not use an unbalanced sample because when taxpayers are added to the panel, they are meant to be representative of the region-income distribution and not of the region-wealth distribution, so that we end up with a less representative sample of wealth tax filers (e.g., younger, lower wealth).



the evolution of the number of wealthy individuals in Madrid *relative* to other regions in the years prior to 2010, while  $\beta_y$  represents the evolution following the reform. The vector  $X_{r,t}$  contains controls that includes public spending on various programs, regional demographics, amenity and economic controls, while  $\zeta_r$  and  $\zeta_t$  are region and year fixed effects.<sup>19</sup>

As supporting evidence of our identifying assumptions,  $\theta_y$  should be close to zero. In particular, as tax policy is not set randomly across regions, any state-specific unobservable that is correlated with taxes and the mobility of wealth tax filers may confound our results. A positive treatment effect for Madrid would indicate  $\beta_y > 0$  for wealth tax filers. Because the regressions involve the stock of individuals and not the flow, we expect  $\beta_y$  to increase gradually rather than to jump on impact. As in Akcigit et al. (2016), we assume that the tax rate of any one other region only has a negligible impact on the number of wealthy in region  $r$ .

The most relevant threat to identification would come from a shock that makes Madrid relatively more attractive compared to other regions. We thus add an additional layer of differencing via the comparison group in each region year in a triple interaction design. Let  $f = T, C$  index the treatment and comparison groups defined in section 2.3, respectively. We can then define an indicator variable  $W_f$  that equals one for the treatment group and zero for the comparison group. We estimate:

$$\ln N_{rft} = W_f \cdot M_r \cdot \left[ \sum_{y=-5}^{-2} \theta_y \cdot \mathbf{1}(y = t - 2011) + \sum_{y=0}^4 \beta_y \cdot \mathbf{1}(y = t - 2011) \right] \quad (2)$$

$$+ X_{rt}\alpha + \zeta_f + \zeta_r + \zeta_t + \nu_{rft},$$

where  $X_{rft}$  now includes all interactions of  $W_f$ ,  $M_r$ , and year dummies and  $\zeta_f$  are treatment group fixed effects. This added difference removes any common changes that also affect the comparison group, such as other state policies, economic conditions, or amenities that may have made Madrid a more attractive place for high wealth individuals. We cluster the standard errors at the regional level to allow for an arbitrary correlation within region over time. Given Spain has only seventeen regions (clusters), the variance matrix estimate will be downward-biased. We follow Cameron and Miller (2015) and implement the percentile-t wild cluster bootstrap, imposing the null, in order to present accurate p-values.

Given that migration to Madrid is critical, due to its zero tax status, the prior approach using Madrid as a treatment indicator is justified. However, other tax differentials between

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<sup>19</sup>These time-varying regional covariates include unemployment, GDP per capita, long term unemployment, R&D spending, poverty, high school and tertiary education, gender, median age, fraction of elderly, fertility and mortality rate, heating and cooling degree days, and public spending on the most important government services. We show results are robust to the exclusion of controls.

regions may matter and we can more adequately model the tax differential between Madrid and other regions. To obtain an elasticity of the stock, we estimate

$$\ln(N_{rt}) = \epsilon \cdot \ln(1 - \tau_{rt}) + \zeta_r + \zeta_t + X_{rt}\alpha + \nu_{rt}, \quad (3)$$

where  $N_{rt}$  is the number wealth tax filers (or amount of wealth) in region  $r$  in year  $t$ ,  $1 - \tau_{rt}$  is the wealth weighted net-of-average-tax rate, and all other variables remain the same. Because the net-of-tax rate is close to 1, the coefficient  $\epsilon$  can be interpreted as a classical elasticity or alternatively,  $\epsilon$  is (approximately) the semi-elasticity corresponding to a one percentage point change in the net-of-tax rate. In addition, we can augment the design to include region-time data for both the treatment and comparison group. To do so, we add all appropriate interactions with the treatment indicator  $W_f$  and estimate the coefficient on  $W_f \cdot \ln(1 - \tau_{rtf})$ .

As moving is an extensive margin response, the decision to move to Madrid is based off the average tax rate (ATR). We first simulate the ATR for every wealth tax filer in every region and year, using their time-varying wealth and the tax calculator discussed in section 2.2. As we use aggregate data, we then construct the mean ATR as a weighted average across all individuals, where following Smith et al. (2019a) we weight by the amount of 2010 wealth.

To address measurement error concerns and possible endogeneity resulting from taxable wealth changing over time, we instrument for  $\ln(1 - \tau_{rt})$ . We do use by using the mechanical net of average tax rate  $\ln(\overline{1 - \tau_{rt}})$ , that is, the simulated rate holding wealth constant at its 2010 level. This latter tax rate uses only statutory variation in the ATR. As an alternative, we also follow Kleven and Schultz (2014) and instrument with the binary Madrid  $\times$  Post variable. The use of these two instruments provides local average treatment effects (LATE) for two different sub-populations that provides us with some intuition of which regions drive the effects. In the case of Madrid  $\times$  Post, the instrument only induces a change in the tax of Madrid relative to other regions. In this way, we think of the LATE interpretation as identifying the effect of Madrid’s non-adoption of a wealth tax. When we use the simulated  $\overline{1 - \tau_{rt}}$  instrument, matters are more complex because the instrument is continuous. In this case, a change in the instrument induces a change in the tax rates of all regions. Thus, the elasticity using this instrument is with respect to all tax differentials within Spain.

### 3.2.2 Results

Figure 5 shows  $\theta_y$  and  $\beta_y$  from estimation of (1). We present separately estimated coefficients for the treatment and comparison groups, so that the reader can observe the trends in both the treatment and control group. The upper panel uses our preferred comparison group, “High dividend,” while the lower panel uses the “2007 non-filers.” The left and right

panels present results using the balanced 2005-2015 and 2008-2015 samples, respectively.<sup>20</sup>

for the “2010 wealthy,” the number of filers located in Madrid steadily increases following decentralization. The relative stock of wealthy individuals becomes statistically different three years after decentralization and by five years after the reform, Madrid’s relative stock of wealthy individuals increases by 11%. Although the relative stock of wealthy individuals in Madrid increases in the two years after the reform, these result are not statistically significant for two main reasons. First, although migration *flows* may jump on impact, the *stock* is a slower moving variable. Second, the first two years of decentralization were characterized by a large amount of uncertainty and a retroactive application of the tax, which may have hindered any type of tax reoptimization via a change of residence. In subsequent analysis, we focus on the shorter balanced sample, which as we have already mentioned, is more representative of the wealthy population.<sup>21</sup>

In support of our identifying assumptions, find little pretrends in the relative attractiveness of Madrid to other regions. Critically,  $\theta_y$  being close to zero shows that mobility effects follow tax changes and do not predate them such that there are no pretrends in the periods prior to the reform. Moreover, the common pretrend of the comparison group allows us to add another layer of differencing.

[Figure 5 about here.]

Although the comparison group shows a minor upward trend following the reform, this increase is statistically insignificant and will only result in slightly smaller estimates using (2). Moreover, this suggests that it is unlikely there are unobservable factors making Madrid a relatively more attractive region to wealth tax filers. In Table 1 (Panel I), we present a simple design that uses  $W_f \times M_r \times \text{Post}$  rather than the generalized (dynamic) design above. This simpler specification identifies an average effect across all post-reform periods, which given the dynamic effects noted above, will understate the cumulative effect. For this reason, in Panel II, we also present the cumulative effect given by the coefficient on the interaction with the Madrid dummy and the year dummy for 2015 from the estimation of (2). Consistent with the event study figures above, estimating (2) using the “High dividend” or the “2007 non-filers” comparison groups only lowers the effects by a small amount.

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<sup>20</sup>Figure A4, Table A3, and Table A4 show the results are robust to the use of the “2007 filers” treatment group. As expected, because this latter group is only different for individuals near the filing threshold, the results are almost identical.

<sup>21</sup>Figure A5 shows the same results apply when using instead the (log) amount of wealth as the dependent variable. Unlike the number of individuals, which is directly observed in the administrative data, these results make use of extrapolated data. Results are robust to using (observed) 2007 rather than (extrapolated) 2010 wealth, as seen in Figure A5.

[Table 1 about here.]

Table 2 presents the elasticity estimates for the number of filers and the amount of wealth.<sup>22</sup> Models (a/e) are estimated using OLS, while models (b/f) and (c/g) present IV estimates using the simulated net-of-tax rate and the Madrid  $\times$  Post interaction, respectively. With respect to the number of filers, the first instrument yields an elasticity of 5.3. In other words, a one percent increase in the net-of-tax rate, which corresponds to an (approximately) 1 percentage point decline in the average tax rate, increases the number of filers in the region by 5.3%. Critically, when using the Madrid  $\times$  Post instrument, the elasticity increases to 7.9. Given the wealth weighted average tax rate across regions is approximately 0.97 percent, these results are similar to our prior estimates from the event study design. Consistent with the LATE intuition above, this specification identifies tax-induced mobility using only the relative differential with Madrid and not the much smaller ATR differences between other regions. The increase in the coefficient from the binary instrument suggests Madrid is critical. When dropping Madrid (d/h) and exploiting only smaller tax differentials, the elasticity decreases substantially and is insignificant. Overall, we conclude that Madrid’s zero tax rate plays a special role and other tax differentials do not matter as much.

[Table 2 about here.]

### 3.2.3 Comparison to Income Tax Elasticities

How do these results compare to the literature on income-tax-induced migration? Wealth taxes are a tax on the stock of wealth, while capital income taxes are a tax on the flow. Given the still scarce literature on the wealth tax, we convert our estimates to an equivalent capital income tax to allow for comparison with the larger literature on income tax elasticities. Following Kopczuk (2019), suppose that an individual with wealth  $W$  and a rate of return  $R$  in a given year can either be taxed next year on the accumulated stock  $(1 + R)W$  or on the return,  $RW$ . Then, a wealth tax rate  $\tau$  will raise an equivalent amount of revenues as a capital income tax rate of  $T$  where the relationship is given by

$$T = \frac{(1 + R)\tau}{R}. \quad (4)$$

We can then convert our wealth tax elasticity,  $\epsilon_{1-\tau}$ , with respect to the wealth weighed

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<sup>22</sup>Figure A6 depicts a binned scatter plot for the number of individuals for our preferred treatment and comparison groups using the wealth weighted average tax rate.

net-of-tax rate,  $1 - \tau \approx 0.97$ , using

$$\epsilon_{1-T} = \epsilon_{1-\tau} \frac{d\ln(1 - \tau)}{d\ln(1 - T)}, \quad (5)$$

where  $\epsilon_{1-T}$  is the elasticity with respect to the net-of-tax rate on capital income given by (4).

Figure 6 indicates that the magnitude is remarkably similar to the literature on the mobility of top income earners. Using the average rate of return for the top 1% wealth group, we estimate an income tax elasticity of approximately 0.34. When excluding Madrid to rely on only smaller tax differentials between states, this elasticity falls to 0.1. Critically, our estimates represent short-term to medium-term responses, and when available, we compare this to estimates for the same time horizons of income tax studies in the figure.<sup>23</sup>

[Figure 6 about here.]

### 3.3 Individual Choice Model

#### 3.3.1 Identification Strategy

We complement the aggregate results with an analysis at the individual level by means of a location choice model. This allows us to control for individual-specific factors that may influence the probability of moving to – or residing in – a specific region, to account for region by year fixed effects, and analyze if the effects are heterogeneous across groups of individuals. We use again the “2010 wealthy” sample as our preferred treatment group, but we show that the results are robust to the use of the “2007 filers” sample. Unlike the aggregate analysis, we do not need to balance our sample, which allows us to test if results are sensitive to doing so.

For our purpose, a “move” or “stay” (we refer to these as a *case*) is an individual time-specific event that is indexed by  $i$  and  $t$  and the regions in the choice set are indexed by  $j$ . We will focus on two samples: the full and the movers sample. The full sample is the same we use in the aggregate analysis and includes both, movers and stayers. The movers sample includes all individuals that relocated across regions between period  $t$  and  $t - 1$ .<sup>24</sup> If

<sup>23</sup>One exception is Young et al. (2016) who estimate a long-term response. The elasticity reported for Moretti and Wilson (2019) is a short-run elasticity; however, these authors also estimate the effect of a permanent one percent increase in the net-of-tax rate between year  $t$  and  $t + 5$  would lead to a 6.0 percent increase in the stock of scientists by the end of year  $t + 10$ . Under strong assumptions, Kleven et al. (2013) report long-run elasticities that are only slightly larger than those in the figure. Akcigit et al. (2016) show that domestic [foreign] inventors long-term mobility is slightly less [more] sensitive to tax rates.

<sup>24</sup>Given movers are only a fraction of the stock, focusing on the movers sub-sample reduces endogeneity concerns *if* governments were to set tax rates based on the stock of wealthy rather than on the number of movers (Schmidheiny, 2006; Brülhart et al., 2015).

an individual moves more than once, each move represents a case.

The dependent variable  $d_{itj}$  is equal to one for the chosen region of fiscal residence in year  $t$  and zero for all other regions. In other words, it equals one for the destination region if the person moved or for the region of residence if the person stays. In its simplest form, we estimate the following linear probability model:

$$d_{itj} = \beta M_j \times Post_t + \zeta_j \mathbf{z}_{it} + X_{tj} \alpha + \iota_j + \omega_{it} + \varepsilon_{itj}, \quad (6)$$

where  $M_j$  is an indicator equal to one for Madrid and zero for the other regions;  $Post_t$  is another indicator equal to one for the years following decentralization and zero otherwise;  $\beta$  captures the effect of the zero-tax regime of Madrid from 2011 onward;  $\zeta_j \mathbf{z}_{it}$  are interactions of region dummies with characteristics of the taxpayer (i.e., gender, age, age squared, gender by age, and labor income),<sup>25</sup> which makes it possible to estimate a region-specific return for each covariate and to flexibly allow for wealth accumulation to differ across regions between men and women and by age;  $X_{tj}$  are the same controls used in the aggregate analysis at the region-year level, and  $\omega_{it}$  are fixed effects at the case level. The inclusion of  $\omega_{it}$  is crucial because it forces identification of our parameter of interest based on within-case variation across alternative regions for a specific taxpayer in a given year. Thus, identification follows from the fact that, for each case, Madrid has a tax differential with all other choice regions. The specification allows for alternative fixed effects  $\iota_j$ , that control for all time-constant characteristics of a specific region. The Madrid dummy  $M_j$  is one of these fixed effects.

We use a linear probability model.<sup>26</sup> This is based on our desire to include many binary covariates for which logit models are ill-suited, along with our desire in future specifications to instrument for the tax rate. Although the probability of any one region is not bounded in the linear model, the  $\omega_{it}$  forces the predicted probabilities over all regions to sum up to one for each individual in a given year.<sup>27</sup> For this reason, an increase in the predicted probability of one region must necessarily decrease the probability of choosing other regions.

The specification of (6) results in a difference-in-differences interpretation embedded in a location choice model, which can be generalized by interacting the set of alternative-fixed

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<sup>25</sup>Note that all variables are individual specific, but do not vary across alternatives. The interaction of characteristics with region dummies allows for a different coefficient for each potential region of choice.

<sup>26</sup>The specification of (6) is the linear equivalent to an alternative-specific conditional logit.

<sup>27</sup>The fact that the linear probability is not bounded between 0 and 1 is not a problem given we care about the partial effect of taxes on the dependent variable, and not the fitted probability per se. The advantage of a nonlinear framework is the ability to relax the IIA assumption. Given most mobility is driven by Madrid, the odds of choosing Madrid over Catalonia, for example, are unlikely to differ when the alternatives include or exclude different regions. In a theoretical model below, we show this is true or any bias is likely minimal, so that the linear probability approach is suitable and comes with many advantages for our setting.

effects  $\iota_j$  with year dummies. This specification allows us to integrate an event-study approach into the location-choice environment by replacing the *Post* dummy with year-indicators in order to estimate dynamic treatment effects. We estimate:

$$d_{itj} = \left[ \sum_{y=-5}^{-2} \theta_{yj} \cdot \iota_{j \neq \hat{j}} \cdot \mathbf{1}(y = t - 2011) + \sum_{y=0}^4 \beta_{yj} \cdot \iota_{j \neq \hat{j}} \cdot \mathbf{1}(y = t - 2011) \right] + \iota_j + \omega_{it} + \zeta_j \mathbf{z}_{it} + X_{tj} \alpha + \varepsilon_{itj}, \quad (7)$$

where  $y$  stands for “event time”. Such a specification requires omitting a given region  $\hat{j}$  and a given year, which is the year immediately prior to the reform. This more general specification reveals the location choice pattern for each of the regions relative to the omitted region and year immediately prior to the reform. Coefficients  $\beta_{yj}$  for  $j = \text{Madrid}$  capture the difference in the probability of choosing Madrid after the reform relative to a baseline region and the year prior the reform. The coefficients  $\theta_{yj}$  for  $j = \text{Madrid}$  show that same relative evolution, but for a period where taxes do not differ. The specification is more flexible than a simple interaction with only a Madrid indicator because it allows us to estimate the effect of smaller tax differentials between any of the other regions.

We complement these results with estimations using the net-of-average-tax rate, which we simulate using person-specific wealth in every year  $t$  for each taxpayer and all alternative regions  $j$ , as described in Section 2.2. We then estimate the location choice model using the net-of-average-tax rate as the main independent variable:

$$d_{itj} = \beta \cdot \ln(1 - \tau_{itj}) + \omega_{it} + \rho_{tj} + \zeta_j \mathbf{z}_{it} + X_{tj} \alpha + \varepsilon_{itj}. \quad (8)$$

The coefficient on the (log) net-of-tax rate represents the change in the probability of moving to (or staying in) a region for a one-percent – approximately a one percentage point – change in the net-of-average-tax rate. We complement the OLS regressions with IV estimates where we follow the approach of the aggregate analysis and use the net-of-tax rate based on an individual’s 2010 pre-reform tax base as an instrument.

The specification based on tax rates comes with an added advantage: because the tax system is progressive, we have variation of tax rates across individuals within a region-year. Thus, we can include region by year fixed effects, which account for other contemporaneous policy choices that a region may make. These region-year fixed effects,  $\rho_{tj}$ , also account for any unobserved time-varying economic shocks or amenities that influence the relative attractiveness of a given region. However, inclusion of these  $\rho_{tj}$  comes with a cost. If Madrid’s status as a tax haven plays a special role, then some of this effect will be absorbed in the region-year fixed effects and may result in an underestimation of the true effect. For



this reason, we also present results excluding region-year fixed effects.

We cluster standard errors at the origin-tax-bracket and alternative-tax-bracket level, following previous studies (Akcigit et al., 2016; Moretti and Wilson, 2019), which cluster at the origin/destination-ability level. In our setting, the wealth tax brackets form analogous partitions to the ability partitions. Using the region of origin to calculate standard errors implies that we cannot use the first year of the sample, 2005. Thus, the sample used here is the same as in the aggregate analysis, but the event studies start in 2006.

### 3.3.2 Baseline Results

Table 3 shows the results from the estimation of (6), adding controls sequentially. Panel I presents estimates of the model for the full sample between 2006 and 2015, for all individuals in the “2010 wealthy” treatment group, including movers and stayers. The magnitude of the effect of Madrid is 0.016 in our preferred specification with alternative-region controls and alternative fixed effects, as well as individual controls, but results vary little across specifications. Given the baseline probability of residing in Madrid in the pre-reform period was 22.3%, our model suggests that following decentralization, this is equivalent to an approximately 7.2% increase in the share of wealthy individuals in Madrid. This effect is statistically similar to Panel I of Table 1 estimating the average post-reform effect. For a wealth weighted average tax rate, the resulting elasticity would be similar to previously.

[Table 3 about here.]

Panel II of Table 3 presents the results from the same estimation as in Panel I, but for the sample of movers. As expected, the magnitude of the coefficient conditional on moving increases substantially compared to the full sample. Across all specifications, the results indicate that the probability of changing the fiscal residence to Madrid from any other region in Spain increased after decentralization by about 23 percentage points. To benchmark this number, conditional on moving, the baseline probability of moving to Madrid in the pre-reform period was 46.2%. This estimate represents the effect of the mean tax rate differential between Madrid and other locations, which for movers, is approximately 0.44%.

The use of individual data allows us to perform robustness checks that rule out potential confounders, as discussed previously. In particular, results are robust to alternative treatment samples and to dropping individuals who may be influenced by labor income taxes.<sup>28</sup>

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<sup>28</sup>Table A5 in the appendix estimates the model using the “2007 wealthy” treatment sample and excluding individuals with labor income above 100,000 Euro – the threshold above which income tax differentials become important after 2010. Results in both cases are almost identical to those in Table 3 for the full and the movers sample, suggesting that the effect is driven by changes in the regional wealth tax design and not my measurement error due to extrapolation or changes in personal income taxes.



Figure 7 shows the annual estimates from (7) for the full sample and the movers sample, but interacting the event year dummies with the Madrid dummy,  $M_j$ , instead of with region specific indicators,  $\iota_{j \neq \hat{j}}$ . The interpretation of the coefficients is thus the difference over time (relative to 2010) of choosing Madrid relative to all other regions. We find no major differences prior to the reform, which confirms that the effect is indeed driven by the decentralization of the tax.<sup>29</sup> Moreover, the event study demonstrates a clear trend break following the reform, which would persist if adjusted for the minor trends in the pre-period. The cumulative effect of the reform is obtained by looking at the final event dummy coefficient of the full sample, which represents a 0.024 percentage point change in the probability of choosing Madrid as the fiscal residence. Given the baseline probability of selecting Madrid is 23.7% in 2010, the probability rises to 26.1% five years after decentralization. This represents an 10% change in the stock of filers, comparable to the prior aggregate analysis.

The unbalanced and balanced sample are nearly identical, which suggests that non-random attrition, perhaps due to death, non-filing, or out-of-country migration, does not threaten our results. All further results are based on the unbalanced sample, but are robust to using the balanced data. Even though our data do not allow for entry of new wealth tax filers from abroad, we find based on aggregated data provided to us by the tax authority, that the number of wealth tax filers that entered Spain from abroad is small relative to the within country flows.

[Figure 7 about here.]

As an alternative source of identification, we also exploit the *individual-specific* tax rates from our calculator by estimating (8). Table 4 presents the results from this estimation for the full sample using OLS and IV models, using the simulated mechanical tax rate,  $\overline{1 - atr_{itj}}$  as an instrument (Panel I and II, respectively), and the same estimations for the sample of movers (Panels III and IV).

Column (a) includes alternative fixed effects only, while column (b) includes the same controls as in the full specification of Table 3. Given variation of average tax rates within regions across the wealth distribution, we can additionally include a dummy variable for each alternative  $j$  in each year  $t$ . Column (c) presents results with alternative region-year fixed effects, forcing thus identification from the variation of relative differences of average tax rates within region-year pairs. This specification is useful to address concerns about time

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<sup>29</sup>One might be concerned that the results are sensitive to the use of the Madrid dummy relative to all other regions. In an exercise similar to a jackknife procedure, Figure A7 in the appendix estimates (7) sixteen times for each possibly omitted region. It shows that results are not sensitive to the omitted region or to grouping all regions into a single counterfactual category.

varying region specific shocks or changes in amenities, as well as any other fiscal instrument which might change in a single region and affects all taxpayers in that same region. Column (d) adds individual controls. Column (e) drops individuals selecting Madrid.

[Table 4 about here.]

For the full sample and using OLS, a one-percent increase in the net-of-average-tax-rate increases the probability of residing Madrid by 8.2 percentage points. Both OLS and IV estimates are similar, suggesting that most identifying variation comes from statutory tax rate variation.<sup>30</sup> For movers, a one-percent increase in the net-of-average-tax-rate increases the probability of declaring Madrid by 6.5 percentage points. While point estimates are not substantially different to the full sample, the average net-of-average tax rate in the full sample is only 0.24% and almost twice as large for the sample of movers. This relates to our previous findings that individuals in higher tax brackets have a higher probability of being a mover. Furthermore, the probability of choosing Madrid in the full sample (23.3%) is different to the one in the movers sample (59.7%).

To show more formally the special role of Madrid, column (e) drops movers to and stayers in Madrid from the analysis such that the effects are only identified based on the smaller tax differentials between regions other than Madrid. The estimated coefficient is approximately one-tenth the size of the prior results for the full sample and falls even more for the movers. All estimates turn insignificant, suggesting that the differential of any region relative to Madrid’s zero tax rate is critical for the mobility effect.

### 3.3.3 Heterogeneity

To analyze heterogeneous responses, we exploit characteristics of individuals, such as age and gender, and construct categories related to their their financial situation before 2011. We differentiate between individuals that filed non-incorporated business income, dividend income, effective rents from tenant occupied housing, and imputed rents from owner-occupied housing in any year from 2008-2010 in her income tax declaration. Interacting indicators for these variables with our Madrid  $\times$  Post-term allows us to see if Madrid’s status as a tax haven prompts heterogeneous responses by individual characteristics.

[Figure 8 about here.]

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<sup>30</sup>Table A6 shows results are robust to the use of the simulated tax rate based on the “2007 wealthy” treatment sample and the Madrid  $\times$  post interaction as an instrument. IV estimates using the binary instrument increase for the sample of movers consistent with the complier intuition discussed in the aggregate analysis.

Results regarding personal characteristics are shown in Figure 8(a) for the full sample and 8(b) for the movers sample. We do not find substantial heterogeneity in the effects. Results suggest that age and gender do not matter for the magnitude of coefficients.<sup>31</sup> With respect to life-cycle effects, the lack of timing moves before/after retirement suggests a lack of forward-looking (forecasting) behavior by households. Furthermore, we provide estimates based on the composition of asset portfolios. Again, no significant difference emerges between dividend and business owners. Movers with real estate are slightly more responsive, however, most individuals in the sample own some real estate. The result for owner occupied real estate is driven by the fact that 88% of our sample declare income from that asset type.

To analyze how effects vary over the distribution of wealth, panels 8(c) and 8(d) show results by the individual’s top bracket of the tax schedule. For the full sample, panel 8(c) shows substantial variation with the largest effects in higher brackets. Panel 8(d) shows little variation across movers.<sup>32</sup> This confirms that the overall effect is driven by more wealthy individuals moving to and staying in Madrid. Apart from these effects, the lack of heterogeneity in the sample of movers is explained by the fact that high wealth individuals are relatively homogeneous in their tax avoidance preferences. Instead, the heterogeneity arises over whether to move or not (Figure 4) rather than the probability of choosing Madrid.

### 3.3.4 Additional Evidence on the Special Role of Madrid

Tables 2 and 4 already provide some initial evidence that most of the mobility is due to the tax differential with one region: Madrid. However, there also exist smaller tax differentials between other regions that may potentially lead to wealth tax filers changing their fiscal residence from one region to another. To trace out pairwise effects, we estimate (7) seventeen times, omitting a different region each time. This flexible specification allows us to plot similar graphs of the mobility responses for all region pairs to a baseline region different than Madrid. As an example, Figure A8 shows the mobility effect of all regions relative to Castile-La Mancha. Only the region of Madrid shows a significant pattern, while all other regions so no pairwise effect. This confirms that all mobility responses are indeed driven by moves between Madrid and other regions, but not between them.

We repeat this exercise for every region in Spain to show that the null results for non-Madrid regions generalize to every possible omitted region, and thus all region pairs in Spain.

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<sup>31</sup>The fact that the effect does not increase in age (the point estimate for individuals above 80 is even lower compared to younger individuals) reassures us that moves are not motivated by other tax instruments, such as inheritance taxes, although as noted previously the inheritance tax provides no additional incentive to move starting in 2011. Only 9% of movers are 80 or older in this sample.

<sup>32</sup>The small effect of the top bracket might be driven by the fact that only 2.81% of movers are in this bracket.

Figure 9(a) shows the aggregated post-reform effect for the sample of movers (the population relevant for the theory discussed subsequently) that results are driven by pairs involving Madrid. All regions see a decline in the probability of moving there relative to Madrid (red diamonds). Only pairs involving Madrid as a destination see an increase in the probability of moving (blue circles). Almost all other pairs not involving Madrid show insignificant effects.

[Figure 9 about here.]

Although informative, a concern is that even if all other region pairs have small effects, the difference in taxes between Madrid and the other places is so large that the effect scaled by the tax change is actually homogeneous. To address this, in Figure 9(b), we re-estimate (8) excluding movers to single destination region at a time. Critically, when we exclude movers to Madrid (red diamond) as we did in Table 2 and 4 previously, the effect of the tax differential between regions becomes zero. However, this is not the case when we drop movers to any region other than Madrid, and none of those estimates is statistically different from the baseline estimate as indicated by the red dashed line.

Overall, these exercises reveal that the zero tax in Madrid is critical. In other words, inter-jurisdictional wealth tax differentials, when small, appear not to matter in the location choice decisions. However, the fiscal residency is intensely affected by the presence of a tax haven that facilitates dramatic tax evasion. These results are critical to the subsequent theoretical model we will develop.

## 4 Evasion vs. Migration: Theory and More Evidence

The moves we see in the data may be tax avoidance (real migration that reduces tax liability) or tax evasion (fraudulently declaring fiscal residence).<sup>33</sup> Although it is not possible to causally disentangle whether these responses are real or not, the fact that Madrid is driving the results is quite revealing in terms of the underlying model of mobility that can be used to rationalize our findings. The basic intuition is that in a standard mobility model, even a small decrease from a positive tax rate will attract some marginal individuals. That is not the case in our results: taxpayers appear to be aiming for the lowest possible tax rate. Hence, this evidence alone suggests that our findings reflect reporting/shifting responses and

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<sup>33</sup>An example of real migration could be if a wealth taxpayer living in any other region but Madrid would buy an apartment in the capital (or already have a second home) and move there to avoid the wealth tax. An example of evasion could be if instead this same person would buy the apartment (or would already have a secondary residence) and pretend that she lives there but stay in the same region. This latter effect could occur by simply falsely misreporting the number of days spent in the primary/secondary residence or even declaring their primary residence as the address of a relative.

not real migration. We formalize this in a simple model and provide additional empirical evidence using regional variation in audit rates supporting the evasion channel.

## 4.1 A Model of Migration and Evasion

An individual  $i$  endowed with wealth  $W^i$  lives for two periods: prior to decentralization ( $t = 1$ ) and after decentralization ( $t = 2$ ). Prior to wealth tax decentralization, the individual chooses to reside in, without loss of generality, region  $h$ . After decentralization, the individual makes a new choice. Let  $j$  index the regions of Spain:  $j = h$  is the home region,  $j = m$  is Madrid, and  $j = 1, \dots, J$  are the alternatives other than Madrid. Taxpayers make a decision on where to live and which region to declare as the fiscal residence.

Consistent with the data, we assume this high-wealth individual is a *rentier* and consumes only her capital income. Given a global market for capital and thus a world rate of return,  $R_t$ , this implies pre-tax consumption  $c_t^i = R_t W^i$ . As noted previously, an annual wealth tax  $\tau_{jt}^i$  is equivalent to a capital tax  $T_{jt}^i$  given by (4). Thus, we use this tax to solve the model. Absent moving costs, the utility from individual  $i$  choosing region  $j$  in time  $t$  is given by  $u(c_t^i(1 - T_{jt}^i), z_{jt}^i) = c_t^i(1 - T_{jt}^i) + g(z_{jt}^i)$ , where  $z$  are amenities in the region of residence.<sup>34</sup>

Starting from the standard model of tax evasion (Allingham and Sandmo, 1972) and a traditional model of migration (Akcigit et al., 2016), we make two theoretical contributions. First, we modify the standard tax evasion model, which traditionally involves the taxpayer selecting the amount of income to hide from the authority, to allow for the taxpayer to make a discrete all-or-nothing decision. In making this decision, the taxpayer must choose among multiple taxing jurisdictions when deciding where to shelter her wealth. Second, we combine the standard mobility and evasion models, such that the taxpayer has the choice over evading versus migrating, along with which region to evade or migrate. In other words, the taxpayer can shelter (via evasion) all of her income in a lower-tax region at some expected cost but maintain the amenities of her home region or can migrate (via a real move) to the region at some cost that also results in giving up the home region amenities. In order to build intuition, we first consider the cases with only real migration or only evasion.

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<sup>34</sup>We assume a quasi-linear utility function, which implies that the taxpayer is risk neutral and moving costs do not incur income effects. As will become clear, a small perturbation making the taxpayer risk averse will not change results. Evasion results will hold if the coefficient of risk aversion is sufficiently small.

### 4.1.1 Migration Only

Let us first consider the standard model of migration where an individual can only move. In this case, region  $j$  will be chosen after decentralization from the set  $j' = \{m, h, 1, \dots, J\}$  if

$$u(c_t^i(1 - T_{jt}^i) - \phi_{hjt}^i c_t^i, z_{jt}^i) = \arg \max_{j'} \{u(c_t^i(1 - T_{j't}^i) - \phi_{hjt}^i c_t^i, z_{j't}^i)\}, \quad (9)$$

where moving costs are given by  $\phi_{hjt}^i c_t^i$  with  $\phi_{hjt} < 1$  and  $\phi_{hht} = 0$ .<sup>35</sup> The model makes it clear that the probability that an individual located in a given region depends on the full vector of taxes in all regions. Thus, a marginal decrease in the tax rate of any one region, for example region  $J$ , relative to the home region will induce added migration to that region for individuals if  $u(c_t^i(1 - T_{ht}^i), z_{ht}^i) - u(c_t^i(1 - T_{Jt}^i) - \phi_{hJt}^i c_t^i, z_{Jt}^i)$  was small prior to the tax decrease and region  $J$  was the next best alternative. Hence, because the migration decision depends not only on the tax differential but also on the amenities and the moving costs to the destination region, the model predicts that not all migration is to Madrid.

### 4.1.2 Evasion Only

Next, we modify the Allingham and Sandmo (1972) and Yitzhaki (1974) model of tax evasion such that the taxpayer makes-an-all or nothing decision to shelter their wealth and must select which region to shelter it. In our model, an individual chooses a region  $j$  to declare taxes, so  $T_{jt}$  depends on the region of choice. However, with evasion, the individual can stay living in the home region  $h$  and so local amenities are given by the home region,  $z_{ht}^i$ . Moreover, tax evasion is risky and the individual faces a probability of being caught of  $p^i \in [0, 1]$  and a fine  $f^i$ .<sup>36</sup> As in Dharmapala (2016), the individual incurs idiosyncratic costs,  $\kappa_t^i c_t^i$ ,  $\kappa_t^i < 1$ , of evasion because individuals have internalized norms of tax compliance to varying degrees. Then, the utility of declaring one's home region as the fiscal residence is  $c_t^i(1 - T_{ht}^i) + g(z_{ht}^i)$  and the utility declaring any other region  $j \neq h$  is  $(1 - p^i)c_t^i(1 - T_{jt}^i) + p^i [c_t^i(1 - T_{ht}^i) - f^i(T_{ht}^i - T_{jt}^i)c_t^i] - \kappa_t^i c_t^i + g(z_{ht}^i)$ , where if an individual is caught, they must pay all taxes due and a fine that is proportional to the amount of income evaded. With all derivations in Appendix A.3, evading in Madrid is preferred to truthfully reporting the home region if

$$\frac{T_{ht}^i(1 - p^i - p^i f^i)}{1 - p^i} > \kappa_t^i. \quad (10)$$

<sup>35</sup>The moving cost (and the idiosyncratic evasion cost introduced later) are modeled as a share of the pre-tax capital income flow. Given they are person-specific, they can also be written in dollars, but the percent formulation facilitates comparison to standard tax evasion models.

<sup>36</sup>By 305 Código Penal and 192 Ley General Tributaria (LGT), the fine is a percent of taxes hidden (Yitzhaki, 1974). The Allingham and Sandmo (1972) penalty function would lead to even starker results.

Note that if the idiosyncratic costs are zero, as in the standard evasion model, this expression is always true if  $p^i < 1/(1 + f^i)$  and implies Madrid is preferable if the audit probability is sufficiently small. Under Spanish law, the fine is approximately 100% for most individuals in our sample, but higher at the top, which implies  $p^i < 0.50$ .

Then, if  $p^i$  is sufficiently small, unlike the migration model, then Madrid will always be chosen for tax evasion. The intuition can easily be seen in the limiting case where  $p^i \rightarrow 0$ . As the audit probability approaches zero, the form of the fine is irrelevant, and the individual will simply evade in the region that affords them the largest benefit from tax savings.

### 4.1.3 Evasion and Migration

Finally, we consider the most realistic scenario in which the taxpayer has choice over migrating or evading.<sup>37</sup> Focusing on evasion, evading in Madrid will be preferable to moving to Madrid if

$$-T_{ht}^i p^i c_t^i - p^i f^i T_{ht}^i c_t^i > g(z_{mt}^i) - g(z_{ht}^i) + \kappa_t^i c_t^i - \phi_{hmt}^i c_t^i. \quad (11)$$

If  $p^i \rightarrow 0$ , only the differences in the valuation of amenities and evasion/moving costs matter.

By revealed preference, in the pre-decentralization period, the home region was chosen over Madrid, which means that  $g(z_{mt}^i) - g(z_{ht}^i) - \phi_{hmt}^i c_t^i < 0$  for  $t = 1$ . Consider the case where  $\kappa_t^i = 0$ . If amenities and moving costs are time invariant (approximately similar) in both periods, the right side of (11) is negative and evading via Madrid is always optimal as  $p^i \rightarrow 0$ . Moreover, if the valuation of amenities in both regions is the same, but changing over time, this term is also negative and evading is the better option if  $\kappa_t^i$  is sufficiently small. More generally, the sufficient condition for evasion via Madrid to dominate moving is that the audit probability and idiosyncratic evasion costs are sufficiently small. If this condition does not hold, no evasion will occur and individuals may move to Madrid or any other region.

**Proposition 1.** *If the probability of detection and idiosyncratic evasion costs are sufficiently low, all fraudulent changes of fiscal residence will be to the tax haven and any increase in the stock of taxpayers in non-havens must be due to real moves.*

The proposition sheds light on our empirical results. Given in Figures 9(a) and 9(b) we find the stock of taxpayers only increases in Madrid and not in other regions with (positive) low tax rates, taxpayer migration is likely limited. Our theoretical model suggests such a

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<sup>37</sup>It is also possible that an individual moves from their home region to a region other than Madrid, but simultaneously falsely declares Madrid. If the person simultaneously evades, then taxes between the home region and new residential region are irrelevant for the real move and so a real move would only arise if amenities change dramatically over time. Such dramatic change is unlikely, and even if it did arise, it would simply mean a minor modification to the necessary audit probability threshold.



*corner* solution is consistent with a reporting/shifting response than a real relocation. As audit probabilities and costs of evasion are person-specific, both tax evasion and real moves may exist simultaneously. Nonetheless, given the very small audit probabilities we find in the next section, evasion is likely the dominant mechanism.

## 4.2 Audit Rates and the Evasion Channel

Standard tax evasion models assume that the aggregate audit rate,  $p$ , increase with evasion,  $e$ , so that  $p'(e) > 0$  (Slemrod, 2019). In our context, if evasion is mainly due to moves to Madrid and not to other regions, we should expect audit rates to increase with the number of movers to Madrid,  $m$ , but not with the number of movers to other regions,  $n$ , so that the analog assumption the the standard model is  $p'(m) > 0$  and  $p'(n) = 0$ .<sup>38</sup>

To test this commonly believed assumption and shed further light on the mechanisms of mobility, we digitize tabulations on wealth audit records for each region in Spain from 2005-2015 published by the General Inspection Department of the Spanish Ministry of Finance. An audit can be conducted due to the misreporting of fiscal residence or any other misreporting activity. These statistics are an upper-bound of the audit rate for fiscal residence.

Figure 10(a) shows the average annual audit rates by region before and after the decentralization of the wealth tax. We define the audit rate as the number audited returns divided by the total number of wealth tax returns filed. Prior to decentralization, despite the regions administering and receiving wealth tax revenue, there was little regional variation in audit rates and they were less than 0.1% for nearly all regions. However, after decentralization audit rates increased in most regions but not in an uniform manner, ranging from 0.01% in Aragon to 1.5% in Castile-La Mancha.

[Figure 10 about here.]

We analyze whether the non-uniform change in audit rates are related to evasion via declaration of a fraudulent residences by regressing the pre/post-reform change in audit rates on the change in the share of movers to Madrid and, separately, the change in the share of movers to all other regions. Figure 10(b) reveals that audit rates increase more in regions with a larger increase in the share of movers to Madrid after decentralization. In contrast, changes in audit rates are not correlated with a larger share of movers to other regions after decentralization. Hence, these results provide evidence that the tax authority believes that

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<sup>38</sup>The decision to move is an all or nothing decision. Thus, the standard assumption of  $p'(e) > 0$  requires that the audit probability conditional on declaring Madrid is greater than the audit probability of declaring the home region, but the audit probability conditional on declaring any other region is equal to the audit probability of declaring the home region.



most fiscal residence evasion is conducted via the zero-tax region of Madrid and not other regions. In line with our theoretical model, these results combined with our prior empirical analyses suggest that tax evasion is the dominant mechanism for residential changes.

## 5 Implications for Tax Revenue

In this section, we study the implications of our tax-induced mobility results for the revenue maximizing wealth tax rate and regional wealth and personal income tax revenues.

### 5.1 Revenue Maximizing Tax Rate

Traditionally, it is argued that mobility in a federal setting threatens local capital taxation. At the same time, our elasticities suggest that subnational governments are not past the Laffer tax rate for wealth taxes. To see this, let  $B_r$  denote the wealth tax base, which is a function of the tax rate. Totally differentiating tax revenue for region  $r$  implies:

$$\frac{d(\tau_r B_r)}{d\tau_r} \propto 1 - \frac{\tau_r}{1 - \tau_r} \epsilon_{1-\tau_r}. \quad (12)$$

Using the wealth weighted average tax rate of 0.97% in our sample, this implies that if mobility was the only behavioral response, tax revenue would increase so long as the mobility elasticity is less than 103. Given that our elasticities in Table 2 are substantially smaller, we conclude that if governments are Leviathan, a local capital tax rate greater than zero is the optimal decentralized Nash equilibrium strategy — even in the presence of tax havens.

Obviously, the Laffer interpretation is a partial equilibrium analysis. We will study the fiscal externalities on local income taxes in the next section. What other (local) economic spillovers would justify over-turning this result? Two other possibilities include capital reallocation and talent/innovation due to labor market reallocation. Reallocating mobile capital facing a world rate of return is not likely, except for investments in real estate. Given, as discussed in Section 4, our theoretical results can be better rationalized with evasion and thus, capital and labor allocation are unlikely to change due to the decentralized schedule.

### 5.2 Revenue Simulations

The documented mobility responses after the decentralization of the wealth tax might have important consequences for tax revenue (Saez and Zucman, 2019a). We analyze how this reform affects wealth and income tax revenue by means of counterfactual simulations. To do this, we simulate the evolution of wealth and income tax revenue using the decentralized

tax schedules, but closing down any tax-induced mobility. To identify the population of tax-induced movers, we use the annual coefficients from estimating (2). We apportion the increase in Madrid using the annual shares of net migration that each region contributes to Madrid relative to the pre-reform period and then draw taxpayers randomly from the set of movers involving Madrid.<sup>39</sup> This is a partial equilibrium analysis that abstracts from any other behavioral response to changes in the wealth tax; spillovers due to the presence of top wealth holders; any other fiscal externalities other than the wealth and personal income tax; and from other tax competition.<sup>40</sup> We thus identify only the direct effect of tax-induced mobility on wealth and income tax revenue. Nonetheless, given that we have shown that results seem to be mostly driven by evasion, we expect the partial equilibrium analysis to be close to the general equilibrium analysis. It is only with real responses that spillovers and economic externalities would become more salient.

[Figure 11 about here.]

Figure 11 shows the percent change of wealth (solid line) and income (dashed line) tax revenue from eliminating tax-induced mobility to Madrid relative to the observed baseline with tax-induced mobility. Conditional on implementing a decentralized system, Spain foregoes 5% of total wealth tax revenue in 2015 due to tax-induced mobility; this arises as the tax base shifts to the zero-tax region of Madrid. The revenue losses rise over time, consistent with the stock of movers to Madrid increasing between 2011-2015. However, the revenue effects are heterogeneous across regions. Whereas Castile-La Mancha, Castile and León, and Asturias lose on average more than 10% of their revenue due to tax-induced mobility over the period 2011-2015, Catalonia and Cantabria lose on average less than 1% of revenue (see Figure A9). The two Castiles are within a short distance to Madrid, suggesting that proximity may be important at lowering the cost of tax evasion, perhaps due to a higher ownership of a second residence in Madrid that one can use for evasion.

Unlike the wealth tax, Madrid levies a positive personal income tax, so national income tax revenues barely change due to mobility, but there are heterogeneous fiscal externalities from tax-induced mobility on the other regions. The correlation between foregone wealth and income tax revenue is higher in regions with low tax-induced mobility, meaning that many of the movers in the regions with the largest wealth tax revenue effects are *rentiers* with

<sup>39</sup>See Appendix A.4 for a detailed explanation of the methodology used to carry the simulations.

<sup>40</sup>We focus on the personal income tax, because it is the most important tax in terms of regional revenue. For instance, in 2015, it represents approximately 39% of total regional direct and indirect tax revenue. Spain also has a property tax that it is collected by local governments on an annual basis. However, housing only accounts on average for 15% of total net wealth for the top 1% in Spain over the period 2011-2015 (Martínez-Toledano, 2020), so that we do not expect this tax to overturn our results.

little taxable income (Figure A9). Madrid foregoes income tax revenue from closing down mobility, losing on average 4% of income tax revenue (Figure 11).

We also provide novel evidence on whether a harmonized tax rate exists and how close that tax rate needs be to the minimum or maximum tax rate. This is a policy-relevant question about which the theoretical literature has not yet reached a consensus. Keen (1987) and Keen (1989) show that harmonizing to a weighted average of existing tax rates can be Pareto improving. However, Kanbur and Keen (1993) show, using the simple case of tax revenue maximization, that the opposite may be true: harmonization may harm *all* jurisdictions' tax revenue if the harmonized rate is low. This stands in contrast to the consensus in the literature that introducing minimum tax rates – eliminating tax havens – is Pareto improving for all jurisdictions (Kanbur and Keen, 1993). Despite the theoretical ambiguity of whether harmonization is good or bad, no direct empirical evidence exists on whether harmonization is Pareto improving, and if so, what tax rate is necessary to achieve this.

To study how tax coordination might shape wealth tax revenue in the Spanish context, we compare the baseline wealth tax revenue across Spanish regions to the simulated wealth tax revenue under different scenarios: a scenario with a minimum tax rate in which tax-induced mobility is also eliminated<sup>41</sup> and a harmonized scenario in which we apply the default (centralized) wealth tax schedule to all regions, which eliminates tax-induced mobility. Finally, we gradually increase the harmonized tax schedule until we find a coordinated tax system that makes all regions better-off in terms of wealth tax revenue relative to the baseline.

[Figure 12 about here.]

Figure 12 depicts the percent change of wealth tax revenue between each of the three counterfactual scenarios and the observed baseline over the period 2011-2015. We confirm the result in the theoretical literature that setting a minimum positive tax rate is Pareto improving with respect to revenues. However, harmonizing the wealth tax schedule by applying the national default to all regions is not Pareto-improving, as some regions that have higher decentralized wealth tax schedules (i.e., Andalusia, Catalonia, Extremadura, Galicia, Murcia) lose revenue. The minimum coordinated wealth tax schedule that is Pareto-improving is one in which the wealth tax schedule is 48% higher than the default in 2012-2015 (see Figure A10).<sup>42</sup> The maximum wealth tax schedule in 2012-2015 is the one of Extremadura (i.e, 50% higher than the default). The centralized schedule that increases tax revenues in

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<sup>41</sup>In this scenario, we keep the baseline wealth tax schedule in each region unchanged except for the zero-tax regions, to which we assign the default schedule, that is, a minimum positive wealth tax schedule. As we find all mobility is due to zero tax havens, we assume this scenario eliminates tax-induced mobility.

<sup>42</sup>We never allow the harmonized schedule to be greater than or equal to the maximum tax rate, so this schedule is different in 2011 as the maximum tax rate was lower.

all regions must place an extreme amount of weight on the highest tax jurisdiction’s rate – a political conundrum that makes decentralization the prevailing strategy. Figure A10 also shows that the coordinated schedule makes all regions other than Extremadura better off is a 24% markup, which is relatively close to the next highest region’s (Aragon) tax schedule.

The coordinated tax necessary to improve tax revenues in all jurisdictions is very close to the maximum jurisdiction’s tax rate. This is a striking result that contains a spirit of the intuition from Kanbur and Keen (1993): lowering the tax rate of high-tax jurisdictions lowers tax revenues if the harmonized rate is too far away from the equilibrium rate. From a simply tax revenue perspective, we show that a Pareto-improving (tax revenue) reform exists, but it requires all jurisdictions other than the highest to raise their tax rates.

## 6 Implications for Wealth Inequality

In this section, we analyze how Spain’s decentralized system affects regional wealth inequalities using the stock elasticities. Understanding the interplay between wealth taxes and inequality dynamics is relevant from a policy standpoint, as wealth taxes may be introduced as a means of raising tax revenue to fund public services, but also to limit the growth of inequality and political concentration. Even if this is due to tax evasion and no real relocation of wealth, increases in wealth inequality are highly correlated with political influence, as economic elites have been found to shape policies (Gilens and Page, 2014).

### 6.1 Wealth Inequality Analysis

To analyze whether Spain’s decentralization contributed to increasing regional wealth inequalities at the subnational level, we construct new top national and regional wealth distribution series using the personal income and wealth tax panel from 2005-2015. We calculate the national shares of wealth by dividing the wealth amounts accruing to each fractile from wealth tax records by an estimate of total net personal wealth, which is fully consistent with national accounts aggregates. The series are comparable to Saez and Zucman (2016) for the U.S. and Garbinti et al. (2019) for France.<sup>43</sup> The progressive wealth tax has high exemption levels and less than the top 5% of adults filed wealth tax returns before 2007. Thus, we limit our analysis of wealth concentration to the top 1 percent and above. Taxable wealth from 2008-2015 is based on the extrapolation method from section 2.1.<sup>44</sup>

The new series show an increase in wealth concentration since 2007 and are similar to

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<sup>43</sup>Net personal wealth is the sum of financial assets (e.g., deposits, debt assets, stocks, etc.) and non-financial assets (e.g., real estate, business assets, collectibles, consumer durables) minus liabilities.

<sup>44</sup>Appendix A.5 explains in detail the methodology used to construct all wealth distribution series.

Martínez-Toledano (2020)’s wealth distribution series using the mixed capitalization-survey method (Figure A11). Our top wealth shares are slightly lower in level, most likely because we do not account for pension funds (more prevalent at the top of the wealth distribution), as they are exempted from the wealth tax. We are not the first to construct national wealth shares with Spanish wealth tax records. Alvaredo and Saez (2009) already built distribution series with wealth tax tabulations over the period 1982-2005. Our estimated series are broadly similar, but we extend them until 2015.<sup>45</sup> Overall, the consistency of our series with existing methods and sources suggests that the extrapolation method we use captures very well the recent evolution of wealth concentration in Spain.

We then proceed with a novel decomposition of the wealth shares at the regional level. Tax-induced migration might exacerbate the spatial extent of wealth concentration. The regional decomposition of wealth inequalities is a step forward in the analysis of economic inequalities, as most regional studies have focus on income inequality, equality of opportunity or poverty and not on wealth. The Spanish setting is excellent for regional wealth inequality analysis, as the wealth tax panel we use includes the region of residence and we can use as the regional wealth denominator, the decomposed national wealth total of Martínez-Toledano (2020) that also relies on tax records that include the region of residence. The methods used to construct these subnational measures of wealth inequality, discussed in Appendix A.5, could be applied to federalist countries around the world.

Figure 13 depicts the evolution of top 1% regional wealth shares in Spain from 2005-2015. Regions have significant differences in both levels and trends in wealth concentration. Madrid has the highest wealth concentration throughout the whole period followed by Catalonia, Valencian Community and La Rioja. Extremadure is the region with the lowest wealth concentration, followed by the two Castiles and Asturias. The differences in regional wealth disparities at the top have increased since the onset of the financial crisis, as wealth concentration has increased in regions with, a priori, high levels of wealth concentration and decreased or stagnated in regions with low levels of wealth concentration. These patterns are consistent with the fact that income inequality is higher in urbanized areas and that spatial concentration of inequality has risen since the financial crisis (OECD, 2015; OECD, 2018).

[Figure 13 about here.]

We then use the new regional wealth distribution series to run counterfactual simulations and analyze how tax-induced mobility shapes subnational wealth inequality. To do this, we simulate the evolution of top 1% regional wealth shares absent tax-induced mobility following

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<sup>45</sup>The differences mainly come from our refined wealth denominator including the new non-financial series from Artola Blanco et al. (2020) and the additional adjustment of reported real assets (see Appendix A.5).

the same procedure as for the revenue analysis. We update annually – for all tax-induced movers – their region of residence and the wealth and personal income tax liabilities payed. As in the revenue analysis, the fact that this is also a partial equilibrium analysis does not constitute an important limitation given that financial assets form the lion’s share of the total return of wealth taxpayers and this is largely set at the global level. Housing prices could be altered if movers to Madrid would acquire new properties in the region. However, we have shown that this is not likely to be the case as the mobility responses seem to be due fraudulent and not real changes of fiscal residence.

[Figure 14 about here.]

Figure 14 compares the evolution of top 1% wealth concentration in Madrid versus the rest of Spain under the baseline scenario with tax-induced mobility and the counterfactual absent tax-induced mobility. As expected, the movement of wealth taxpayers to Madrid has led to a rise in wealth concentration in the region and a drop in wealth concentration in other regions. In particular, between 2010 and 2015 the growth of the top 1% wealth share in Madrid (16%) was almost double the growth under our counterfactual without mobility (8.7%). Differences between the benchmark and the counterfactual series only appear in 2012. As shown previously, mobility in 2011 was low. The figure indicates that the gap between both scenarios is larger for Madrid than for the rest of Spain, as total wealth grew faster in Madrid than in the rest of Spain over the period 2010-2015. What about heterogeneity by regions? Figure A12 compares the evolution of top 1% wealth shares and its counterfactuals for all individual Spanish regions. In line with the revenue analysis, most of the drop in wealth concentration comes from the migration out of the two Castiles, Asturias and Andalusia.

Overall, our findings show that tax-induced mobility contributes to the concentration of wealth within tax havens. Given Madrid is also the capital of Spain, the increase in wealth concentration may have important political implications.

## 7 Conclusion

This paper estimates mobility responses to wealth taxes and their resulting effect on wealth tax revenues and wealth inequality. We exploit regional variation in tax rates following the Spanish decentralization of the wealth tax system using linked administrative wealth and personal income tax records. In particular, we focus on the role played by Madrid as an internal tax haven with a zero effective tax rate on wealth. Our findings highlight that in the presence of *paraísos fiscales*, wealthy individuals have a propensity to change their fiscal residence to escape wealth taxation. Internal tax havens, such as Madrid, thus allow the

wealthy to reduce taxes paid even without offshoring wealth. Although decentralized wealth taxes allow governments to raise revenue in the short-run, the existence of tax havens reduces the effectiveness of wealth taxes to achieve their ultimate policy goals: raise revenues and reduce wealth inequalities.

We rationalize our findings with a theoretical model of evasion and migration. The model suggests that these responses are most likely due to evasion, as we find the mobility response is driven entirely by the tax haven and not smaller interjurisdictional tax differentials. Thus, mobility is partially a function of the design of the tax system and how taxing rights are assigned to regions. Conditional on decentralizing, the choice of a purely resident-based wealth tax amplifies mobility. Our paper stands in contrast to the standard view that source-based taxes on capital are most inefficient (Mongrain and Wilson, 2018; Wildasin, 2011) by showing that people may be more mobile than *certain* types of capital when evasion is possible. If a goal of the wealth tax is to reduced wealth concentration, then our simulations indicate that a decentralized residence-based wealth tax concentrates more high-wealth taxpayers in Madrid. Instead, if the source-principle prevailed, wealth would be allocated to the region where the wealth is located. Thus, if offshoring were not possible, for example, because all wealth were held in (relatively) immobile capital or land, then based on our results, the source-principle would dampen competition relative to the residence-based system. Such a view, although resting on the assumption of some wealth being immobile, would challenge the conventional wisdom that tax competition is usually stronger under the source-principle.

Our results have important implications for the current academic and policy discussions on whether or not to introduce wealth taxes (e.g., California’s wealth tax proposal, the Warren and Sanders wealth taxes, the European wealth tax proposal to fund the COVID-19 response, etc.) and if so, how to design the tax and improve enforcement. In the standard mobility model, migration out of a country is more costly than within a country (e.g, language barriers, distance, etc.), which would imply our estimates are an upper bound for international migration elasticities. However, given most of the response in our setting is not consistent with a real move, our results may have external validity to the international context. In the presence of fraudulent changes of residence, as we document, the costs of evasion between internal and external tax havens are arguably similar conditional on owning property there. Regardless of internal or external mobility, without appropriate enforcement and thoughtful design, the wealth tax will not realize its full potential at raising revenue and reducing wealth concentration.

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# Figures

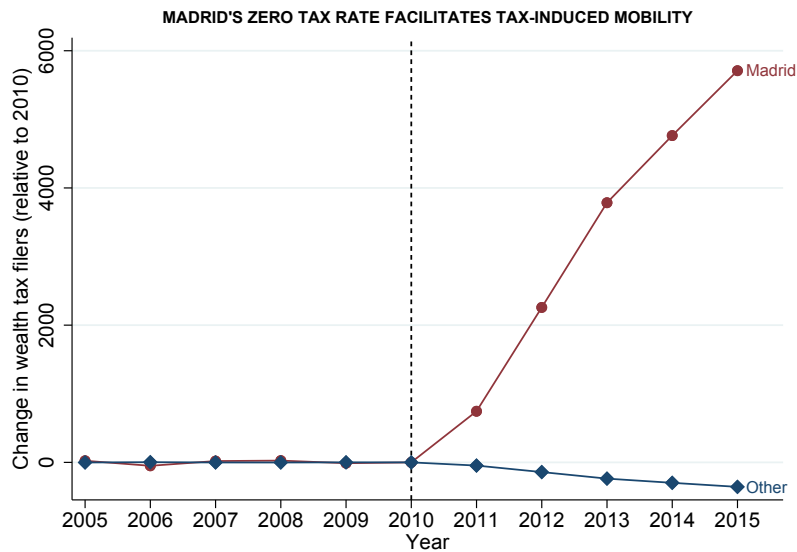
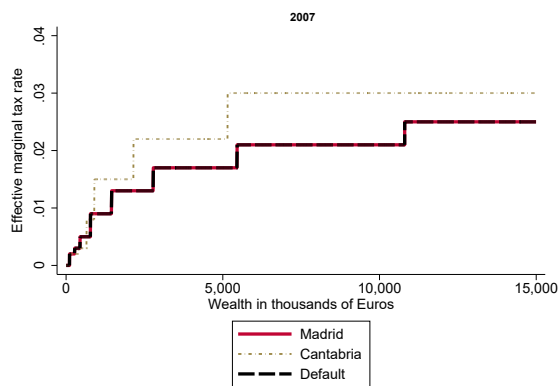
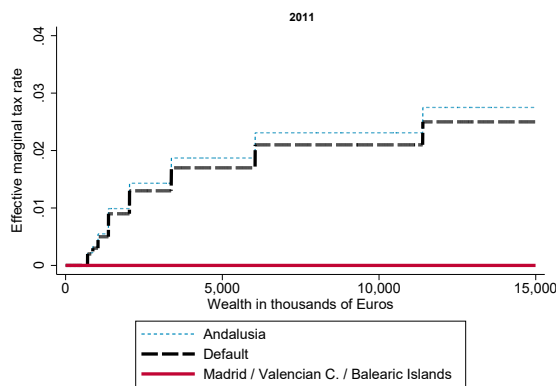


FIGURE 1: Madrid's Zero Tax Rate Facilitates Tax-induced Mobility

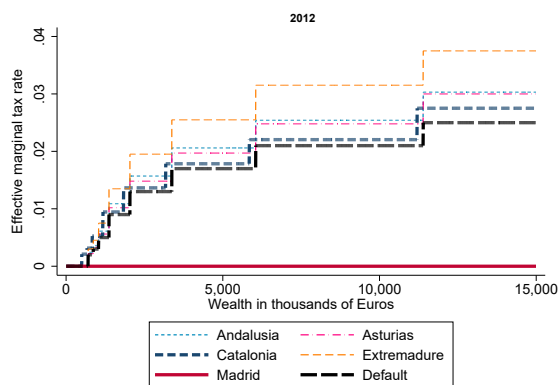
Notes: This figure shows the number of wealth tax filers in Madrid and the average number of wealth tax filers among the other sixteen regions of Spain. A wealth tax filer is an individual that has wealth in excess of 700,000 Euro in 2010 and who filed wealth taxes in 2007. The locations of filers are obtained by matching their 2007 administrative wealth tax records to personal income tax records. We can thus follow a re-weighted balanced sample of filers during the pre-reform (2005-2010) and post-reform period (2011-2015). We normalize each series to zero in 2010 and use the pre-decentralization data to remove group-specific trends, such that the figure shows the change in filers that is in excess of any pre-reform trends. The latter adjustment only changes the orientation of the lines.



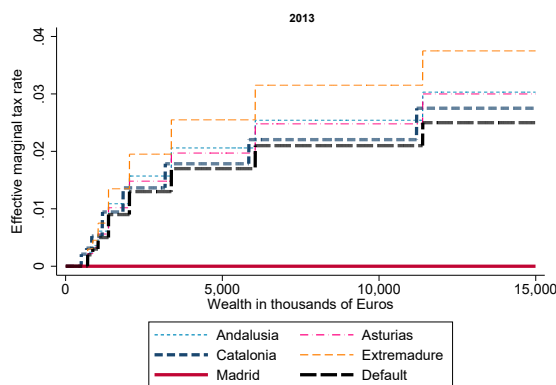
(a) 2007 (centralized)



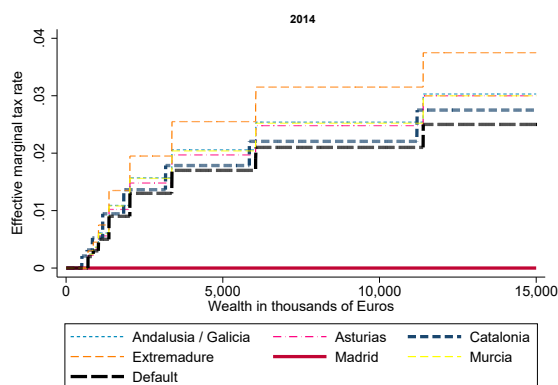
(b) 2011



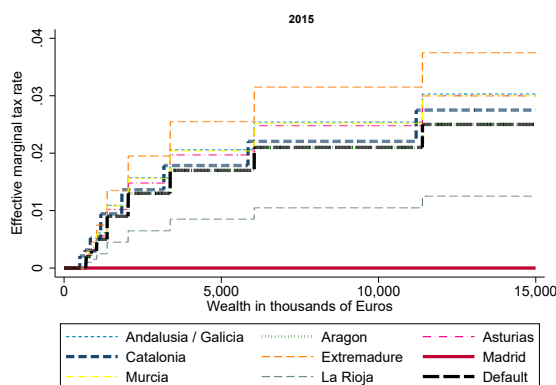
(c) 2012



(d) 2013



(e) 2014



(f) 2015

FIGURE 2: Marginal Tax Rates across Regions

Notes: This figure depicts marginal tax rates and brackets across Spanish regions in 2007 and over the period 2011-2015. The figures have been constructed after digitizing the regional tax books (*Libros de tributación autónoma*) published by the Spanish Ministry of Finance. Note that in 2007, only the region of Cantabria had a slightly different tax schedule and it is only after 2011 when the large differences in the wealth tax schedule across regions emerge. We also show the central (default) schedule that would go into effect if the regions passed no legal modifications. Note that the wealth tax schedule for Madrid (2011-2015) and La Rioja (2015) correspond to the effective marginal tax rates taxpayers would be pay after receiving a tax credit of 100% in Madrid and of 50% in La Rioja.

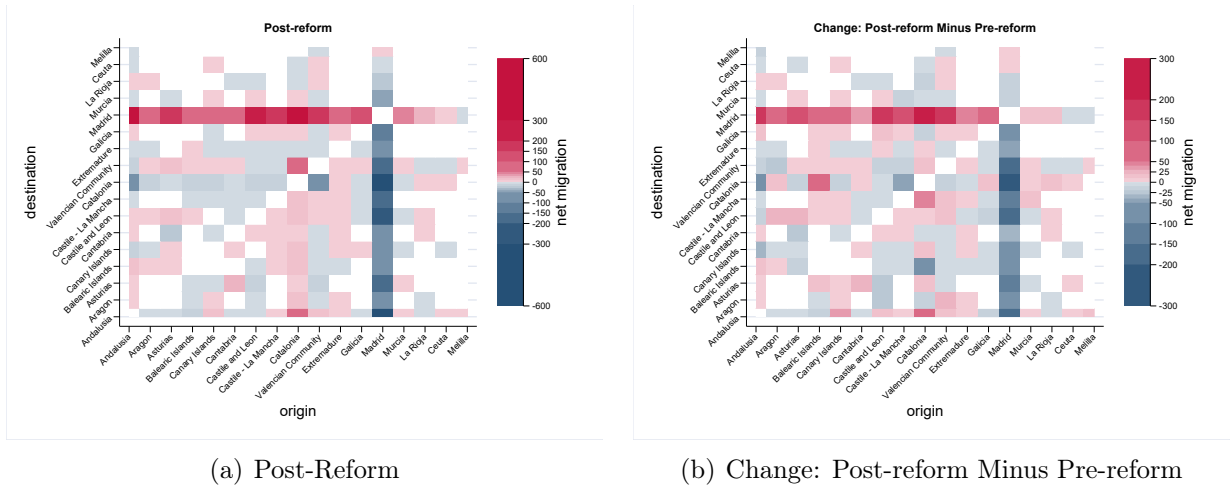


FIGURE 3: Net Flows Between All Region Pairs

Notes: This figure depicts net mobility patterns. Panel (a) shows the (annual average) net flow of wealth tax filers to a destination region following the wealth tax decentralization (2011-2015). Panel (b) shows the change in the (annual average) net flow of wealth tax filers in the five years following decentralization relative to the (annual average) net migration of wealth tax filers in the years prior to decentralization (2008-2010). Values in red indicate a net in-migration from the origin region while blue indicate a net out-migration to the origin region. Folding the graph along the 45 degree line yields the same values in absolute value, but with opposite signs.

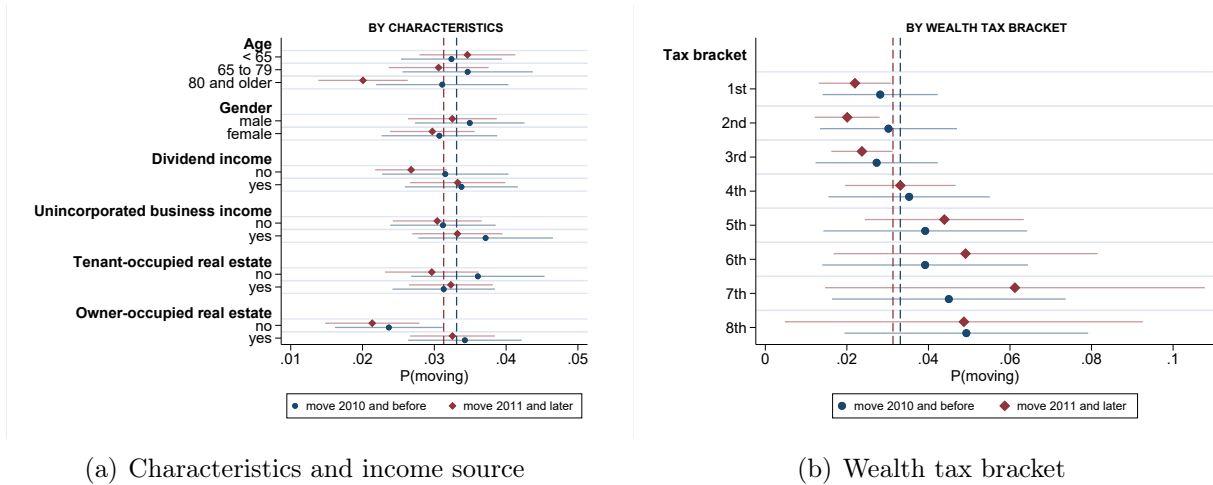
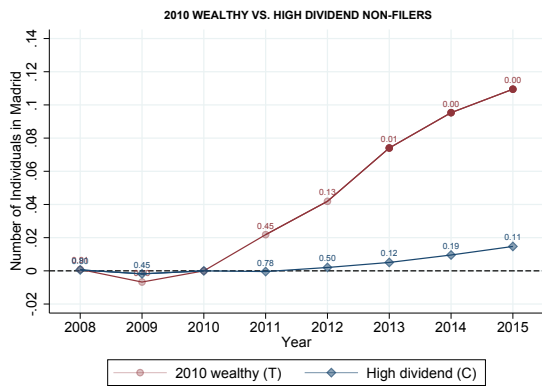
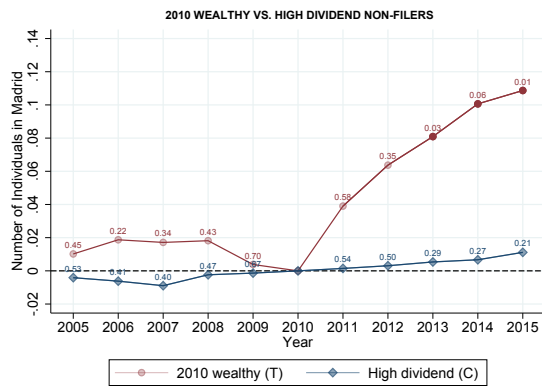


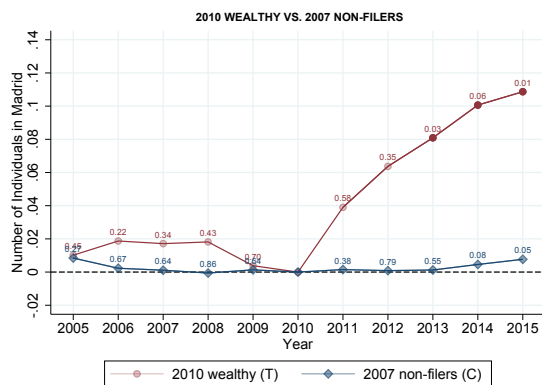
FIGURE 4: Probability of Moving

Notes: We use a linear probability model to explain the probability of changing fiscal residence, which equals one if the person has changed fiscal residence at least once between 2005 and 2010 (blue/circles) or afterwards (red/diamonds), with each of the variables in the figure. Each set of coefficients is obtained from a separate regression. Panel (a) focuses on individual characteristics in 2010, while panel (b) focuses on the tax bracket based on wealth in 2010. The top tax bracket is the 8th quantile. The dashed vertical lines represent the baseline effect in the full population.



(a) 2010 Wealthy vs. High dividend non-filers, long panel

(b) 2010 Wealthy vs. High dividend non-filers



(c) 2010 Wealthy vs. 2007 non-filers, long panel

(d) 2010 Wealthy vs. 2007 non-filers

### FIGURE 5: Event Study of the Number of Individuals in Madrid, 2010 Wealthy

Notes: This figure shows the coefficients from (1), estimated separately for various treatment and comparison groups. Furthermore, different panels balance the data in various ways. In panel (a/c), individuals must appear in the data for every year during the period 2005 to 2015. In panel (b/d), individuals must appear in the data for every year from 2008 to 2015. In panel (a/b), the series in red (circles) shows results for the specification where  $N_{r,t}$  is the number of individuals in Madrid among the “2010 wealthy” treatment group while the series in blue (diamonds) shows the results where  $N_{r,t}$  is the number of individuals in Madrid within the “High dividend” comparison group. In panel (c/d), the treatment group is the same, but the comparison group is the “2007 non-filers.” All regressions are weighted by population and the totals match 2010 taxpayers’ totals in each region. We cluster standard errors at the regional level. Because we have a small number of clusters, we implement the percentile-t wild cluster bootstrap, imposing the null hypothesis, and report p-values above the series on the graphs. Statistically significant coefficients are in dark colors and the numbers on the graph are the p-values.

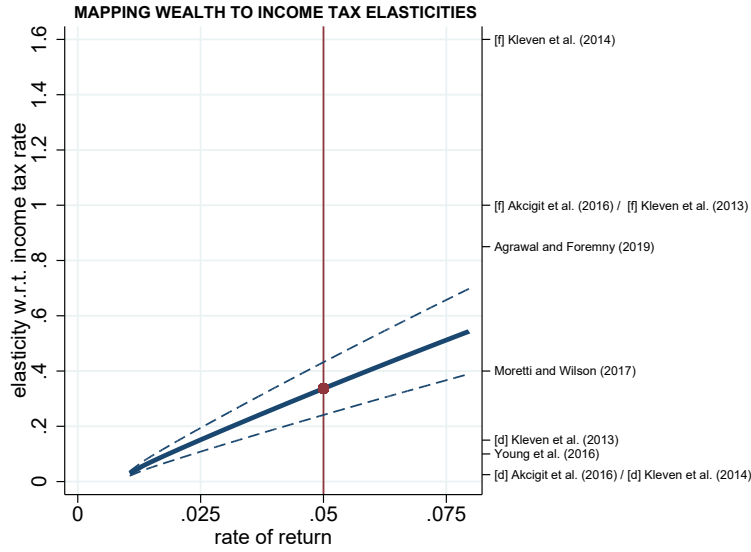
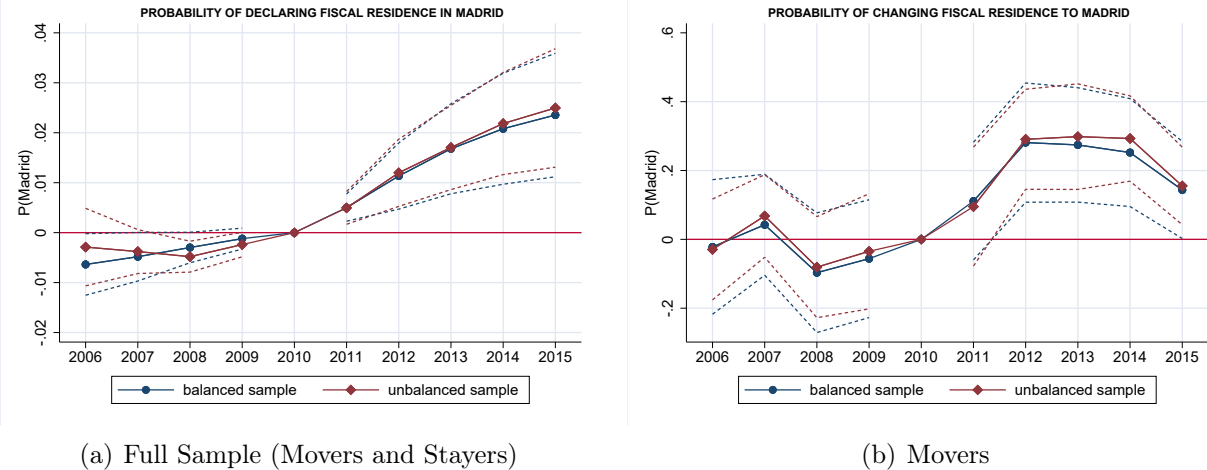


FIGURE 6: Mapping of Wealth to Income Tax Elasticity

Notes: This figure translates the elasticity with respect to the net-of-tax rate on wealth to an elasticity with respect to the net-of-tax rate for capital income as a function of various rates of returns. To construct this, we use our empirical estimates from Table 2 column (2c). The vertical line gives the average annual rate of return for the top 1% wealth group in Spain in the post-reform period (5%). The rate of return has been taken from the distribution of flow rates of return provided by Martínez-Toledano (2020) for Spain. Elasticities are translated using (5) and using the wealth weighted average tax rate across all regions in the post-reform period (0.97%). The figure compares this estimate with stock elasticities from the income tax literature. When papers report separate elasticities for foreign and domestic individuals separately, we denote that with [f] and [d] respectively. When studies estimate short-run and long-run responses, we report the time horizon most comparable to our short-run/medium-run estimates. One exception is Young et al. (2016), who estimate a long-run elasticity.



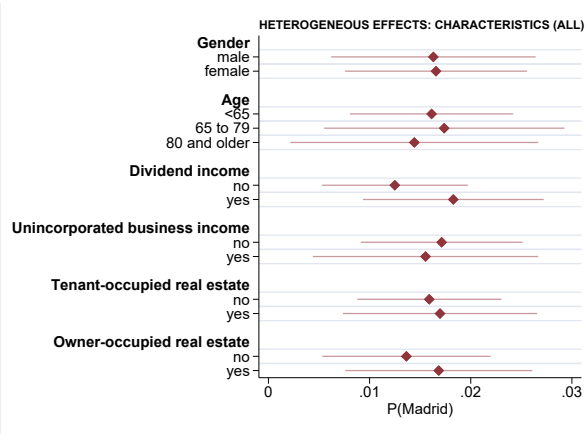
(a) Full Sample (Movers and Stayers)

(b) Movers

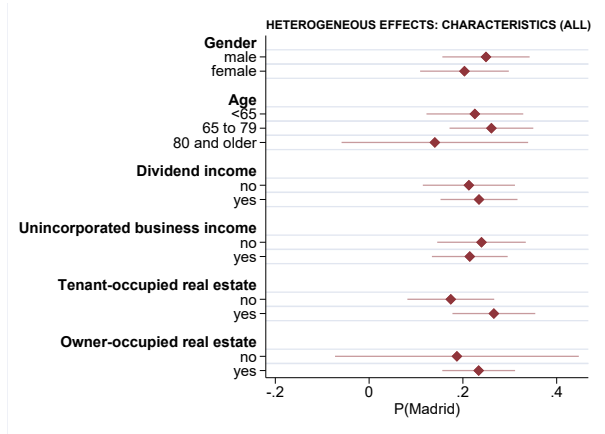
FIGURE 7: Choice Event Study

Notes: These figures show the change in the probability of declaring fiscal residence in (panel a) or changing fiscal residence to (panel b) Madrid relative to all other regions using a simple variant of (7) with event time dummies interacted with a Madrid indicator. Panel (a) use the full sample of movers and stayers while panel (b) only uses movers. The specifications include alternative region and case fixed effects, as well as individual and alternative region controls. We present results for a balanced sample (blue/circle) and an unbalanced sample (red/diamond) that allows for attrition from the sample. The treatment group is the 2010 wealthy. Standard errors are clustered at the origin-bracket and alternative-bracket level. Dashed lines indicate 95% confidence intervals. The models start in 2006 as we need lagged information for the construction of the clusters and the “move” variable.

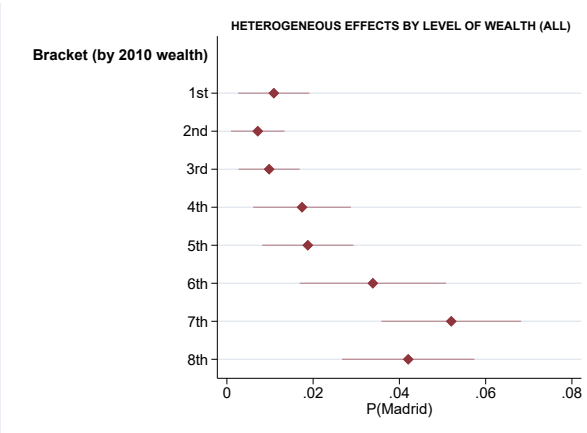




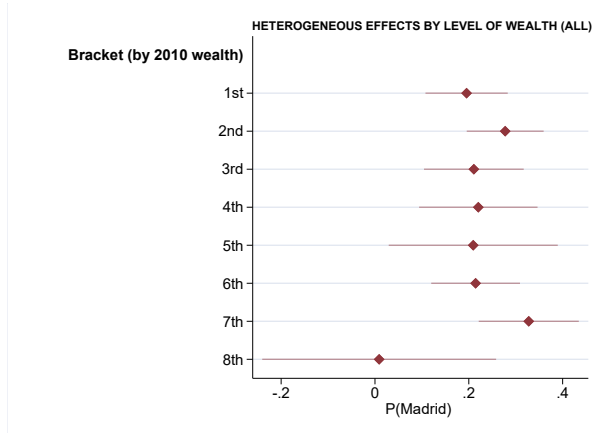
(a) Full sample - Characteristics



(b) Movers - Characteristics



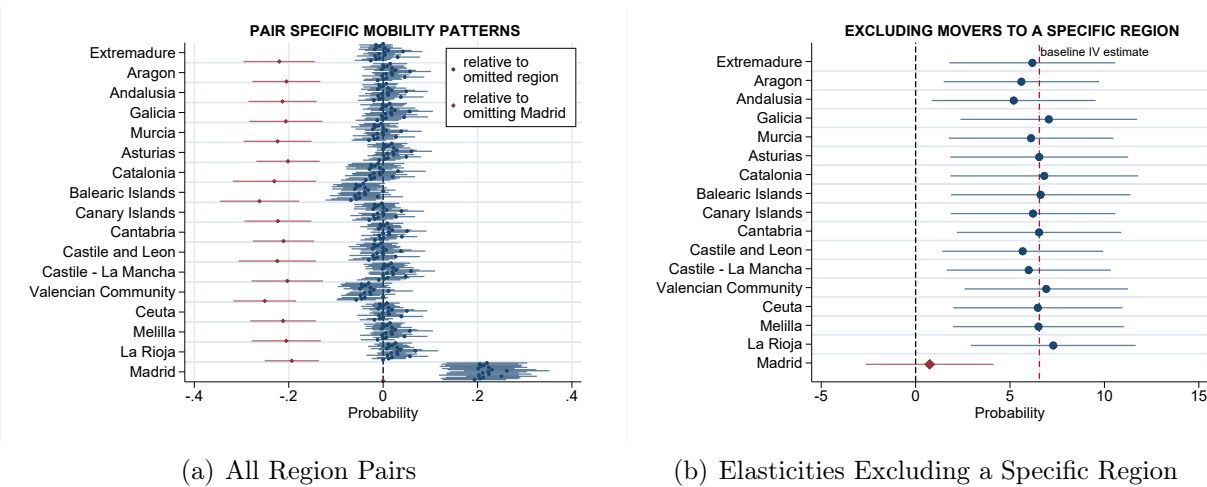
(c) Full sample - Level of wealth



(d) Movers - Level of wealth

FIGURE 8: Heterogeneous Effects

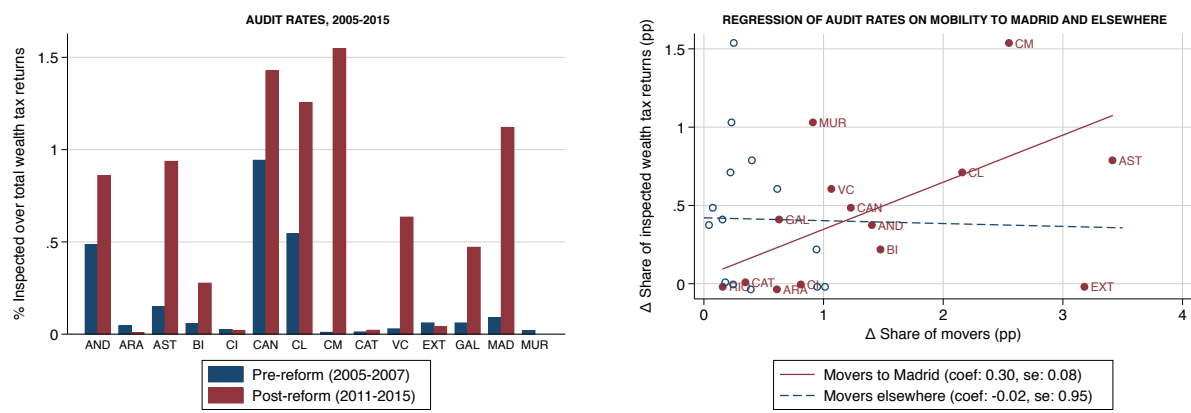
Notes: This figure shows the marginal effects from (6) appropriately interacted with an indicator variable for the respective category. Each grouping (gender, age, capital income characteristics) is estimated in a separate equation. Estimates based on the full sample of movers and stayers are presented in panel (a) and (c) and estimates for the movers only sample are presented in panel (b) and (d). The treatment is the 2010 wealth. All other specifications remain unchanged. We show 95% confidence intervals around point estimates, with standard errors are clustered at the origin-bracket and alternative-bracket level.



(a) All Region Pairs (b) Elasticities Excluding a Specific Region

FIGURE 9: The Effect of Tax Differentials Between Region Pairs

Notes: These figures depict the effect of tax differentials between specific region pairs using the sample of movers. Panel (a) shows estimates from a modified version of equation (7). We estimate that equation including a dummy for each region interacted with an indicator for the post-period. We estimate this equation once for each region (17 times), omitting a different region relative to each possible alternative (omitted region). Hence, each region pair appears twice. The coefficients for Madrid as the omitted region are plotted in red. Regions are ordered by their 2015 top-tax differential. Panel (b) estimates equation (8), but excludes movers to one destination region at a time. The dashed red line indicates the baseline IV point estimate. The treatment group is the “2010 wealthy.” Standard errors are clustered at the origin-bracket and alternative-bracket level with 95% confidence intervals around point estimates.



(a) Wealth Tax Audit Rates, 2005-2015 (b) Audit Rates and Mobility

FIGURE 10: Audit Rates and Evasion

Notes: These figures depict the results from our analysis on the relationship between audit rates and mobility to Madrid and elsewhere. To calculate audit rates, we have digitized statistics on wealth tax audit records for all regions in Spain over the period 2005-2015 published by the General Inspection Department within the Spanish Ministry of Finance. Panel (a) shows the audit rates across regions in Spain before and after decentralization. Panel (b) presents the results from regressing the change in audit rates shown in the prior panel on the change in the share of movers to Madrid (solid red) or the change in the share of movers to other regions (dashed blue). Regression results weight by regional population.

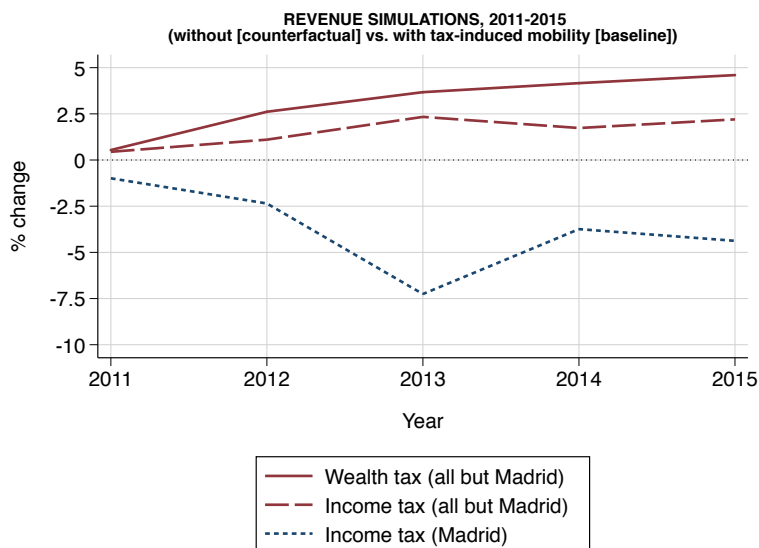


FIGURE 11: Revenue Simulations, 2011-2015

Notes: This figure depicts for all regions excluding Madrid, the percent change of wealth tax revenue (solid red line) and income tax revenue (long dashed red line). Moreover, the figure also shows, for the region of Madrid, the percentage change of income (short dashed blue line) tax revenue between the same counterfactual and baseline scenario. The change is the difference in revenue between the decentralized scenario absent tax-induced mobility to Madrid relative to the baseline decentralized scenario with tax-induced mobility to Madrid over the period 2011-2015. We then convert this to a percent by dividing by the baseline revenue. Appendix A.4 explains in detail the methodology used to carry the counterfactual revenue simulations.

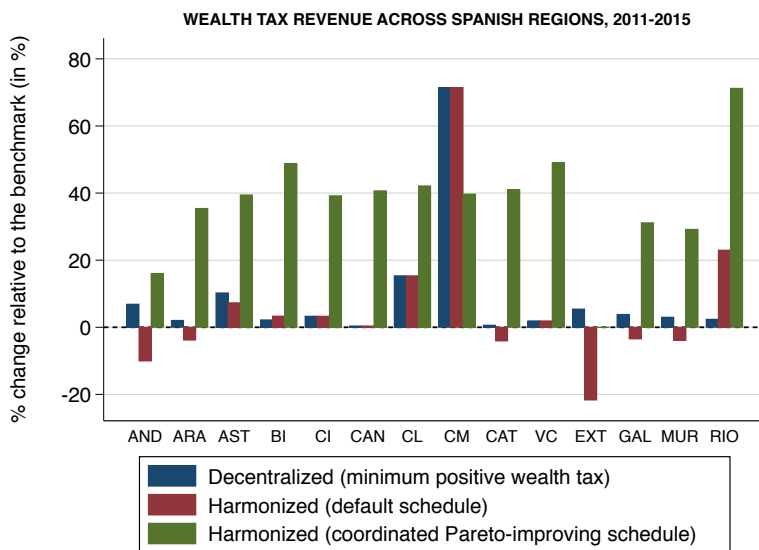


FIGURE 12: Wealth Tax Revenue Across Spanish Regions, 2011-2015

Notes: This figure depicts the percent change of wealth tax revenue absent tax-induced mobility to Madrid relative to the baseline decentralized scenario with tax-induced mobility to Madrid over the period 2011-2015 under three different counterfactual scenarios. The three different counterfactual scenarios are: a decentralized scenario with a minimum tax rate at the default schedule, a harmonized scenario where all regions adopt the default schedule and a harmonized scenario that results a Pareto-improvement for all regions on the basis of tax revenue. The regions of Ceuta and Melilla are excluded from the figure as they are very small. Appendix A.4 explains in detail the methodology used to carry the counterfactual revenue simulations.

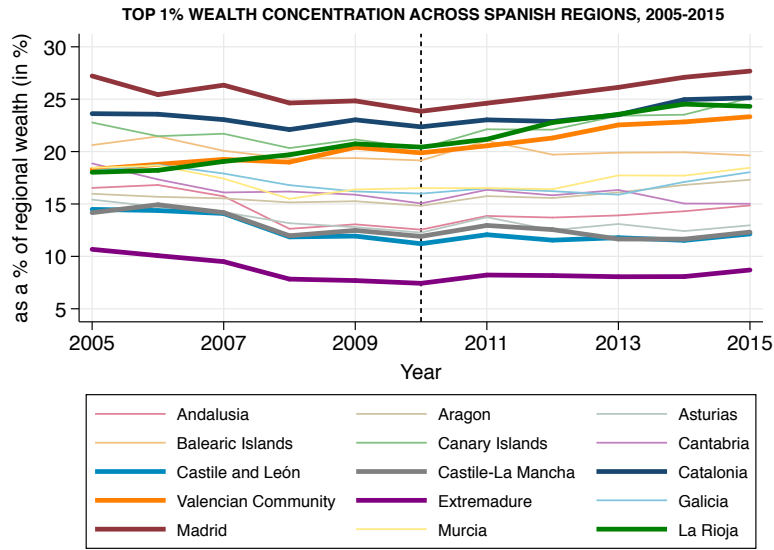


FIGURE 13: Top 1% Wealth Concentration Across Spanish Regions, 2005-2015

Notes: This figure depicts top 1% wealth shares across Spanish regions over the period 2005-2015. Our series are consistent with national accounts and 2008-2015 taxable wealth is based on our extrapolation method. Wealth groups are defined relative to the total number of adults in each region (aged 20 and above from the Spanish Census). The regions of Ceuta and Melilla are excluded from the figure as they are very small and hence, they count on a very small sample of wealth taxpayers. See Appendix A.5 for a detailed explanation of the construction of the wealth distribution series.

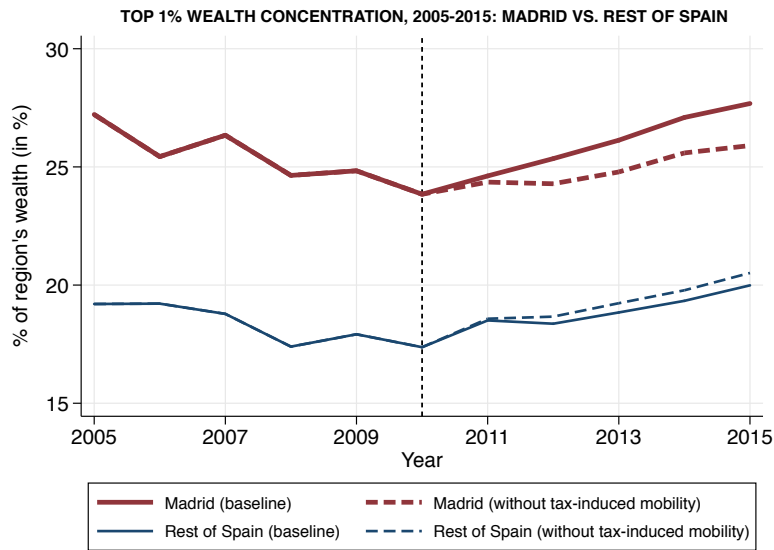


FIGURE 14: Top 1% Wealth Concentration, 2005-2015: Madrid vs. Rest of Spain

Notes: This figure compares the evolution of top 1% wealth concentration in Madrid versus the rest of the regions in Spain under the baseline scenario with tax-induced mobility (solid) and the counterfactual scenario absent tax-induced mobility (dashed). Appendix A.4 explains in detail the methodology used to select the sample of tax-induced movers and Appendix A.5 describes the methodology used to construct the baseline and counterfactual wealth shares.

# Tables

## EVIDENCE FROM MODEL WITH TREATMENT AND COMPARISON GROUP

	Comparison: High Dividends			Comparison: All Non-filers		
<b>Panel I: Average Effect</b>						
	(1a)	(1b)	(1c)	(1d)	(1e)	(1f)
Madrid x Post x $W_f$	0.090	0.074	0.060	0.096	0.080	0.062
Uncorrected SEs	(0.008)	(0.008)	(0.012)	(0.008)	(0.008)	(0.012)
Bootstrap p-values	0.114	0.000***	0.000***	0.074*	0.000***	0.000***
<b>Panel II: Cumulative Effect</b>						
	(2a)	(2b)	(2c)	(2d)	(2e)	(2f)
Madrid x 2015 x $W_f$	0.119	0.104	0.100	0.127	0.115	0.107
Uncorrected SEs	(0.008)	(0.011)	(0.009)	(0.008)	(0.012)	(0.009)
Bootstrap p-values	0.068*	0.002***	0.000***	0.028**	0.004***	0.004***
# obs	272	272	272	272	272	272
Spending Controls	no	yes	yes	no	yes	yes
Economic Controls	no	no	yes	no	no	yes
Amenity Controls	no	no	yes	no	no	yes
Demographic Controls	no	no	yes	no	no	yes

TABLE 1: Effect of Madrid’s Tax Haven Status: Aggregate Analysis

Notes: Panel I presents coefficients from a simplified version of (2) that only uses Madrid  $\times$  post  $\times$  filer rather than the event study specification. Panel II shows the coefficient on the final Madrid  $\times$  filer  $\times$  event year dummy from regression (2). In all specifications,  $N_{rt}$  is the number of wealth tax filers based on the “2010 wealthy” treatment group. The first three columns use the “High dividend” as the comparison group, while the last three columns use “2007 non-filers” as the comparison group. All regressions use weights so as to match 2010 taxpayers’ totals in each region. We cluster standard errors at the regional level. Because the number of clusters is small, we implement the percentile-t wild cluster bootstrap, imposing the null hypothesis, and report p-values, \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

## ELASTICITIES OF THE STOCKS WITH RESPECT TO THE NET-OF-TAX RATE

	Number of Wealthy Filers				Total Wealth			
	All		w/o Mad.		All		w/o Mad.	
	<b>Panel I: Panel Data with Only Filers</b>							
	(1a)	(1b)	(1c)	(1d)	(1e)	(1f)	(1g)	(1h)
$\ln(1 - atr_{rt})$	4.128	3.949	5.736	2.083	3.356	3.047	4.123	1.701
Uncorrected SEs	(0.808)	(0.788)	(1.398)	(0.603)	(1.192)	(1.204)	(2.352)	(1.296)
Bootstrap p-values	0.006***	0.008***	0.022**	0.110	0.046**	0.074*	0.238	0.242
# obs	136	136	136	128	136	136	136	128
F-stat	-	>1000	71	>1000	-	>1000	71	>1000
	<b>Panel II: Panel Data with Filers and Non-filers</b>							
	(2a)	(2b)	(2c)	(2d)	(2e)	(2f)	(2g)	(2h)
$W_f \times \ln(1 - atr_{rtf})$	5.595	5.326	7.866	2.341	6.137	5.821	8.595	2.428
Uncorrected SEs	(1.144)	(1.115)	(1.139)	(0.957)	1.411	1.379	(1.148)	(1.419)
Bootstrap p-values	0.006***	0.006***	0.000***	0.108	0.020**	0.000***	0.000***	0.130
# obs	272	272	272	256	272	272	272	256
F-Stat	-	>1000	51	>1000	-	>1000	51	>1000
Controls	yes	yes	yes	yes	yes	yes	yes	yes
OLS	yes	no	no	no	no	no	no	no
Simulated IV w/ Fixed Wealth	no	yes	no	yes	no	no	no	yes
Madrid x Post IV	no	no	yes	no	no	no	no	no

TABLE 2: Elasticities of the Stocks with Respect to the Net-of-Tax Rate

Notes: Panel I shows the coefficients from the estimation of (3). Panel II shows the coefficients when this equation is augmented to include data on the comparison group. For the number of filers, the comparison group is the “High dividend”, while for the total wealth specifications, the comparison group is the “< 300,000”. For the first four columns,  $N_{rt}$  is the number of “2010 wealthy” filers, while in the second panel  $N_{rtf}$  is the number of “2010 wealthy” filers and comparison group non-filers. For the last four columns,  $N_{rt}$  is the amount of wealth. Columns (d) and (h) drop Madrid from the regression to test whether smaller tax differentials between regions matter. All regressions are weighted to match 2010 taxpayers’ totals in each region. We cluster standard errors at the regional level. Because the number of clusters is small, we implement the percentile-t wild cluster bootstrap, imposing the null hypothesis, and report p-values, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

<b>INDIVIDUAL CHOICE MODEL</b>				
<b>Panel I - Full Sample</b>				
	(1a)	(1b)	(1c)	(1d)
Madrid <sub><i>j</i></sub> × Post <sub><i>t</i></sub>	0.018*** (0.003)	0.016*** (0.004)	0.017*** (0.004)	0.016*** (0.005)
R <sup>2</sup>	0.097	0.101	0.097	0.101
# obs	5,136,040			
<b>Panel II - Movers</b>				
	(2a)	(2b)	(2c)	(2d)
Madrid <sub><i>j</i></sub> × Post <sub><i>t</i></sub>	0.223*** (0.015)	0.217*** (0.034)	0.235*** (0.026)	0.230*** (0.039)
R <sup>2</sup>	0.303	0.308	0.304	0.309
# obs	38,675			
alternative FE	yes	yes	yes	yes
individual controls	no	yes	no	yes
alternative region controls	no	no	yes	yes

TABLE 3: Individual Choice Model

Notes: This table presents the results from the individual choice model in (6) for the “2010 wealthy”. Panel I focuses on the full sample of movers and stayers, while Panel II used only movers. All models include a full set of case fixed effects and the other controls indicated in the table. Individual controls include age, age squared, gender, gender by age, and labor income and allow for a separate coefficient for each alternative  $j$ . Regional controls vary across  $j$  and over time. Standard errors clustered at the origin-tax-bracket and alternative-tax-bracket level, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**INDIVIDUAL CHOICE MODEL  
(TAX RATE DIFFERENTIAL)**

	All				w/o Mad.
<b>Panel I - FULL SAMPLE (OLS)</b>					
	(1a)	(1b)	(1c)	(1d)	(1e)
$\ln(1 - \tau_{i,t,j})$	6.654*** (0.895)	6.987*** (1.783)	8.084*** (1.327)	8.201*** (2.625)	0.899 (0.784)
<b>Panel II - FULL SAMPLE (IV)</b>					
	(2a)	(2b)	(2c)	(2d)	(2e)
$\ln(1 - \tau_{i,t,j})$	6.307*** (0.926)	6.631*** (1.101)	7.658*** (1.328)	7.795*** (1.388)	0.879 (0.553)
mean ATR (std.)	0.237 (.364)				0.310 (0.387)
# obs	5,136,040				3,935,534
<b>Panel III - MOVERS (OLS)</b>					
	(3a)	(3b)	(3c)	(3d)	(3e)
$\ln(1 - \tau_{i,t,j})$	11.844*** (2.988)	10.140*** (2.794)	5.927*** (2.241)	5.855** (2.722)	0.294 (2.041)
<b>Panel IV - MOVERS (IV)</b>					
	(4a)	(4b)	(4c)	(4d)	(4e)
$\ln(1 - \tau_{i,t,j})$	12.399*** (3.088)	10.722*** (2.650)	6.592*** (2.247)	6.513*** (2.290)	0.746 (1.707)
mean ATR (std.)	0.446 (.488)				0.289 (.401)
# obs	38,675				15,606
alternative FE	yes	yes	no	no	no
alternative-year FE	no	no	yes	yes	yes
individual controls	no	yes	no	yes	yes
alternative region controls	no	yes	no	no	no

TABLE 4: Individual Choice Model

Notes: This table presents the results from the individual choice model given by 8 for the 2010 wealthy. Panel I and II focus on the full sample of movers and stayers, while Panel III and IV use only movers. All models include a full set of case fixed effects and other controls as indicated in the table. Individual controls include age, age squared, gender, gender by age, and labor income and allow for a separate coefficient for each alternative  $j$ . Regional controls vary across  $j$  and time and are the same as in the aggregate analysis. Panel I and III are estimated using OLS. IV estimates (Panel II and IV) use simulated tax rates computed using the 2010 constant tax base as an instrument. The reported mean ATR is the average across individuals during the treatment period measured at the region of origin or residence. Columns labeled (e) estimate the same model as in columns (d), excluding stayers in or moves to Madrid. Standard errors clustered at the origin-tax-bracket and alternative-tax-bracket level, \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$



# A Appendix

## A.1 A Brief Recount on Taxation in Spain

In this section we thoroughly detail the history of the wealth tax in Spain. Then, we briefly discuss other regional or local taxing instruments.

### A.1.1 The wealth tax

The Spanish wealth tax was adopted in 1978 (Law 50/1977) aimed at complementing the personal income tax (Law 44/1977), but with an extraordinary character. As it is common for standard wealth taxes, it is a progressive annual tax on the sum of all individual wealth components net of debts. Wealth must be recorded as of December 31st of every year. The tax was filed jointly in the case of marriage. The joint assets must be declared by the one administering them under a regime of community property or declared by the man (unless disabled) under a regime of separate ownership. The only exempted assets were historical and artistic monuments, as well as some artworks of particular cultural importance. It was not until 1978 (RD 1382/1978) when it was clearly specified when these monuments and artworks could be exempted.

The wealth tax was centrally administered and all regions were required to implement this tax, including Basque Country and Navarre, which have never been part of the Common Fiscal Regime (*Régimen Fiscal Común*) and manage their taxes independently. Both residents (under personal obligation) and non-residents (under real obligation) are required to file if they have a positive net taxable base. The wealth tax is residence-based and non-residents only have to file the assets held in Spanish territory. Individuals are resident in Spain for tax purposes if they spend more than 183 days in Spain during a calendar year or if they have Spain as their main base or centre for activities or economic interests. It is presumed, unless proven otherwise, that a taxpayer's habitual place of residence is Spain when, on the basis of the foregoing criteria, the spouse (not legally separated) and underage dependent children permanently reside in Spain.

Initially, its main purpose was not to raise revenue, as the tax had a high exemption threshold (4,000,000 pesetas or 24,040.5 Euro for non-married residents and 6,000,000 pesetas or 36,060.7 Euro for married residents), where all legal thresholds are given in nominal terms, other large exemptions (500,000 pesetas or 3,000.06 Euro for each child under 25 and 1,000,000 pesetas or 6,000.12 Euro for every disabled child) and the maximum tax rate was 2%. In 1979 a cap was introduced on the personal income and wealth tax liability payed (RD 2615/1979). In particular, the sum of the personal income and wealth tax liability could not be larger than 55% of the personal income tax base. If the sum was larger, the wealth tax liability was

reduced until satisfying the limit, so that some filers ended up paying no wealth tax. For the calculation of the limit, the wealth tax liability only included assets whose generated income was subject to the personal income tax.

The first important reform was introduced in 1982 (Royal Decree Law 23/1982 and Law 5/1983). The exemption threshold was increased to 6,000,000 pesetas or 36,060.73 Euro for non-married residents, 9,000,000 pesetas or 54,091.09 Euro for married residents, 750,000 pesetas or 4,507.59 Euro for each child under 25 subject to personal income tax relief and 1,500,000 pesetas or 9,015.18 Euro for every disabled child subject to personal income tax relief. The 74/1980 Law allowed individuals to report the value of non-listed shares as the capitalized profits (dividends and reserves) generated in the last three years at the rate of 8%. The 9/1983 Law raised the limit of the sum of personal income and wealth tax liability from 55% to 65%. In 1988, the exemptions were further increased (Royal-Decree Law 6/1988). The exemption threshold was raised up to 9,000,000 pesetas or 54,091.09 Euro for non-married residents, 18,000,000 pesetas or 108,182.18 Euro for married residents, 1,500,000 pesetas or 9,015.18 for each child under 25 subject to a personal income tax relief and 3,000,000 pesetas or 18,030.36 Euro for every disabled child subject to a personal income tax relief.

In 1989, another reform was introduced which allowed individual filing among married couples. Each member of a married couple had to declare half of their joint assets under a regime of community property or the legal ownership share of each asset under a regime of separate of ownership (Law 20/1989). Nonetheless, in cases in which the couple was filing the personal income tax jointly, the Ministry could ask filers to also file the wealth tax jointly. The exemptions for having children under 25 or disabled children subject to a personal income tax relief were reduced for parents living together (750,000 pesetas or 4,507.59 for each child under 25 and 1,500,000 pesetas or 9,015.18 Euro for every disabled child). The Law 20/1989 also specified that in case married couples were filing the personal income tax jointly, the limit to the personal income and wealth tax liability had to be calculated by adding up both the personal income and wealth tax liabilities of each member of the couple. The wealth tax liability reduction was then split proportionally to the wealth tax liability of each member of the couple. All these changes in the law were in place until the new wealth tax law was introduced in 1991 (Law 19/1991).

With the new 1991 law (still in place at present), the wealth tax ceased to have the initial transitory and extraordinary characteristics, asset valuation rules were improved, and many changes were introduced to the former wealth tax system (Law 19/1991). Collectibles and consumer durables (excluding mainly vehicles, boats, planes, jewelry and antiques) started to be exempted, as well as pension and property rights in the individual's ownership. In addition, all individuals filing under personal obligation and having gross wealth over 100,000,000

pesetas (601,012.1 Euro) were required to file even though their taxable base was below the new minimum exempted of 15,000,000 pesetas or 90,151.82 Euro. Filers under real obligation were required to file whatever net wealth they had, as it was stated in the 1977 law. The exemptions for having children under 25 or disabled children disappeared from the wealth tax and the maximum tax rate was raised up to 2.5%. A reduction of 50% of the wealth tax liability was introduced on the reported assets located in Ceuta or Melilla. Finally, the 1991 law also modified the personal income and wealth tax liability cap by raising the limit of the sum of the personal income and wealth tax liability from 65% to 70% of the personal income tax base and introducing a reduction limit of 80% of the wealth tax liability.

The first important reform after the new 1991 law was the introduction of the exemption on business assets and company shares (except from shares in property investment companies) in 1993 (Law 22/1993, RD 2481/1994). For the assets to qualify as business assets, the activity had to be the taxpayer's main source of income (at least 50% of its total taxable income) and be carried out by the taxpayer on his own account and on a habitual basis. For company shares to be exempted, the ownership share had to be at least 20% of the capital of the entity and the individual had to lead it, receiving at least 50% of their total business and labor income from this company. In 1995, the minimum exemption was increased up to 17,000,000 pesetas (102,172.1 Euro) and the brackets were slightly increased (Law 41/1994). Moreover, for company shares to be exempted, the ownership share condition for the taxpayer was modified to be at least 15% of the capital of the company. The brackets were further increased in 1995 (Law 12/1995).

Since 1996 the rights to modify the minimum exempted and the tax rates were ceded to the regions under the condition of keeping the same minimum bracket and marginal tax rate as the national one (Law 14/1996). In 1997, the exemption on business assets was modified for married couples. All assets belonging to both members of the couple and used for the business activity could be exempted under the same old conditions. For company shares, the ownership share condition was modified to be at least 15% of the capital of the company for the individual or 20% together with a family member. In 1998, the exemption threshold was increased up to 17,300,000 pesetas (103,975.1 Euro), the brackets were slightly raised and the valuation rules for undertakings for collective investment in transferable securities (*Instituciones de inversion colectiva*) were modified (Law 49/1998). In 1999, the exemption threshold was further raised up to 18,000,000 pesetas (108,182.2 Euro) and the brackets were also slightly increased (Law 54/1999).

The first important reform of the wealth tax of the 2000s was the introduction of an exemption in primary residence of 25,000,000 pesetas or 150,253.03 Euro in 2000 (Royal Decree Law 3/2000). For a property to be qualified as the primary residence, the wealth

taxpayer needs to have lived continuously there over at least three years or in case not, the taxpayer could benefit from the exemption in case of death, marriage, divorce, first job, job transfer or any other analogous circumstance (Law 40/1998, Law 35/2006). Wealth taxpayers are obliged to report their primary residence and any other urban real estate property using the highest of the following three values: the assessed value, the purchasing value or any other administrative value (e.g., value reported in estate taxes). According to the Spanish Tax Agency of Fiscal Administration, most wealth taxpayers report assessed values as this is the value the Tax Agency has and can be directly filled in the tax form without self-reporting.

In 2001, the regions were ceded the right to change or include deductions in the wealth tax and the condition of keeping the same minimum bracket and minimum marginal tax rate as the national one was suppressed (Law 21/2001). Nonetheless, all regions kept the national wealth tax schedule (0.2-2.5%) during the late 1990's and beginning of the 2000's (only a few regions changed the minimum exemption and Cantabria changed the wealth tax schedule in 2006). In 2002, the personal income and wealth tax liability cap was reduced from 70 to 60% of the personal income tax base (Law 46/2002), the ownership share condition for the exemption of company shares was modified to be at least 5% of the capital of the company for the individual (Law 51/2002) and the reduction on the wealth tax liabilities for assets located in Ceuta or Melilla was raised up to 75% (Law 53/2002). In 2003, the exemption of company shares was also extended to those owning them under life usufruct (Law 62/2003).

In 2008, the wealth tax was suppressed (Law 4/2008) and reintroduced with a temporary character with the aim of reducing the public deficit for years 2011 and 2012 (Royal Decree Law 13/2011). Even though the central government had approved its reintroduction, regional governments had the legislative power to implement it or not and regional differences in the wealth tax schedule became significant. For instance, Madrid decided to keep the suppression of the wealth tax after 2011, contrary to regions such as Catalonia and Extremadura who have raised the top marginal tax rates (up to 2.75% and 3.75%, respectively) above the national tax rate (2.5%). With the reintroduction some of the main features of the wealth tax system were modified. The exemption on primary residence was raised up to 300,000 Euro, all individuals under personal obligation having gross wealth over 2,000,000 Euro were obliged to file and the new minimum exemption was raised up to 700,000 Euro. Hence, since 2011, the number of wealth taxpayers was considerably reduced (from 981,498—2.7% of the adult population over age 20—in 2007 to 130,216—0.3% of the adult population over 20—in 2011). With Law 16/2012 the wealth tax was extended until 2013 and with Laws 22/2013, 36/2014, 48/2015, 6/2018 and RD-Law 3/2016, the wealth tax was extended for an indefinite number of years, so that it is still currently in place. Note that after the decentralization, the regions of Basque Country and Navarre kept having a wealth tax similar to the default

schedule proposed by the central government.

### **A.1.2 Wealth Tax Compliance and Enforcement**

Wealth tax filers are required to annually self-report end-of-year taxable financial assets (e.g. cash, bank deposits, stocks, bonds, financial assets held abroad, etc.), taxable non-financial assets (e.g. real estate, land, consumer durables, non-corporate business assets, non-financial assets held abroad), and taxable debt (e.g. mortgages, inter-personal debts). They are also obliged to report non-taxable business assets and stocks and the full value of their primary residence.

While income is largely covered by third-party reporting in Spain, there is only partial third-party reporting of wealth, namely dwellings (whenever they have an assessed value) and financial assets and liabilities held in bank accounts (checking accounts, deposits, mortgage debt). All the rest of wealth categories, such as consumer durables, business assets, unlisted stocks, inter-personal debts, etc. have virtually no third-party reporting. Despite technological improvements in third-party reporting in recent years, enforcement capacity in the case of wealth taxes is still limited, mainly because of no third-party reporting wealth categories and because available resources and tax technology are not enough to systematically cross-check all items reported in the wealth tax return using third-party reported information. Audits can be made by central or regional tax authorities. The central government makes wealth tax audits whenever the reported information in the personal income tax form does not match with what is reported in the wealth tax form. The central government also shares information with regional authorities for auditing purposes. However, verifying the primary address comes with substantial difficulty to both tax authorities. They tend to make the audits based on utility bills, bank transaction information and other expenses. The incentives to audit are higher for regional than central authorities as all wealth tax revenue goes to the regional authority. The number of wealth tax audits made by regional governments has increased since the reintroduction of the wealth tax in 2011 (from less than 1% of total files until 2007 to 2-3% in 2013-2014), but they are still very low. Partial self-reporting coupled with imperfect enforcement capacity offers scope for tax evasion and avoidance.

Note that individuals have their fiscal residence in Spain if they spend more than 183 days in the country during a calendar year or if they have Spain as their main base or centre of activities or economic interests. The wealth tax is payable by both residents and non-residents (if they own property in Spain), although non-residents are only liable on net assets within Spain but miss out most of the exemptions.

Non-compliance, including fraudulent moves and misreporting of wealth can be penalized according to Spanish fiscal legislation *Ley General Tributaria (LGT)*. The penalty is propor-

tional to the amount evaded and the rate varies between 50 and 150% depending on both the amount evaded and if there was hiding. Only if this amount exceeds 120,000 Euros this is considered to be a crime (Article 305 *Código Penal*). In this case, penalties are a larger multiple of the amount evaded, which has to be determined by a judge.

### **A.1.3 Other taxes on capital**

Wealth transfer taxes are also decentralized to the regions. Spain operates an inheritance tax (not an estate tax). Inheritance taxes have been decentralized to the regions since 1997, but regions did not exercise this right until the mid-2000s. In particular, Madrid operates a tax credit of 99% on close relatives since 2007, so that there is no additional incentive to relocate to Madrid created by this tax starting in 2011. Moreover, the place of residence for this tax is defined based on the location of the deceased over the last *five* years before death. Given this long duration of proof, and the fact that we focus on five years following decentralization, we expect little of this new mobility to be a result of these taxes.

As most countries, Spain also has a property tax that it is collected by local governments on an annual basis. The tax rate is set at the municipal level and the tax base is the assessed value of the property. However, because they are entirely administered by local authorities and their average effective tax rates are similar across municipalities, they should not interfere with the incentives to move generated by the decentralization of the wealth tax.

Finally, the capital income tax falls under a common tax schedule across all regions.

## **A.2 Wealth Tax Calculator**

This section describes the wealth tax calculator we have built to compute marginal and average tax rates for all individuals in the seventeen Spanish regions from 2005-2007 and 2011-2015, as the wealth tax was suppressed between 2008 and 2010.

The tax calculator takes into account regional variation in marginal tax rates, tax bracket thresholds and the basic deductions included in the input data table. Information about marginal tax rates, deductions and tax brackets are taken from the annual *Manual Práctico de Renta y Patrimonio* published by the Spanish Ministry of Finance.

### **A.2.1 Structure of input data**

The tax calculator consists of a STATA program file (`spatax.ado`) which runs over a data-set which contains the input variables needed. The command is

```
taxbase, y() pers_handicap() tb_general()
```

```

tb_capital() tb_cgains() tl_cg() tl_rg() div_nont()
sample_type() taxl_wt_lim() taxl_wt() tl_saving()
id_houhold() out()

```

where the variables are defined as in Table A1.

These input variables allow us to construct an average and marginal tax rate for each person for all years and regions in the data set. The option `out` specifies the prefix which will be added to each variable (see output data). Tax rates and bracket thresholds are not inputs in the data set because they are coded directly into the program which feeds in wealth, income and characteristics for each individual.

### A.2.2 Output data

The output variables are given by a set of marginal and average tax rates. These variables are labeled *mtr\_out-prefix\_region* & *atr\_out-prefix\_region* where region is the official region identifier according to the National Institute of Statistics and the prefix is added as specified by the `out()` option.

## A.3 Theory Appendix

### A.3.1 Evasion Only

This section shows formal derivations of the theoretical model of tax evasion. For the case of evasion only, the utility of declaring one's home region as the region of residence is

$$c_t^i(1 - T_{ht}^i) + g(z_{ht}^i). \quad (\text{A1})$$

The expected utility of declaring any other region  $j \neq h$  is

$$(1 - p^i)c_t^i(1 - T_{jt}^i) + p^i [c_t^i(1 - T_{ht}^i) - f^i(T_{ht}^i - T_{jt}^i)c_t^i] - \kappa_t^i c_t^i + g(z_{ht}^i). \quad (\text{A2})$$

As in the data, assume that the tax rate in Madrid,  $T_{mt}^i$ , is zero, but is positive in all other regions. Madrid is preferred to the home region if its expected utility is greater than the utility from declaring one's home region. Given that in the presence of evasion, the consumer

remains in their home region and consumes the home region amenities, this implies:

$$(1 - p^i)c_t^i + p^i [c_t^i(1 - T_{ht}^i) - f^i T_{ht}^i c_t^i] - \kappa_t^i c_t^i + g(z_{ht}^i) > c_t^i(1 - T_{ht}^i) + g(z_{ht}^i) \quad (\text{A3})$$

$$-\frac{p^i}{(1 - p^i)} f^i T_{ht}^i - \kappa_t^i > -T_{ht} \quad (\text{A4})$$

$$\frac{T_{ht}^i(1 - p^i - p^i f^i)}{1 - p^i} > \kappa_t^i, \quad (\text{A5})$$

which yields the equation in the text. In the standard evasion model, there are no idiosyncratic evasion costs and so this implies that

$$p^i < \frac{1}{1 + f^i}. \quad (\text{A6})$$

Consider a resident of region  $h$ . This individual will never choose to declare taxes in a region other than their home region or Madrid. In order to do so, the expected utility of that region must be greater than the home region *and* Madrid. Comparing such a region to Madrid, it is easy to show that the expected utility of Madrid is always greater if (A6) holds:

$$(1 - p^i)c_t^i + p^i [c_t^i(1 - T_{ht}^i) - f^i T_{ht}^i c_t^i] - \kappa_t^i c_t^i + g(z_{ht}^i) > (1 - p^i)c_t^i(1 - T_{jt}^i) + p^i [c_t^i(1 - T_{ht}^i) - f^i(T_{ht}^i - T_{jt}^i)c_t^i] - \kappa_t^i c_t^i + g(z_{ht}^i) \quad (\text{A7})$$

$$0 > -T_{jt}^i + p^i T_{jt}^i + p^i f^i T_{jt}^i \quad (\text{A8})$$

$$\frac{1}{1 + f^i} > p^i. \quad (\text{A9})$$

Note that the prior expression is identical to (A6). Thus, if the idiosyncratic costs are sufficiently small and the audit probability sufficiently small, the individual will only evade to Madrid, if at all.

### A.3.2 Evasion vs. Migration

Recall from the migration model in the text, Madrid will be the chosen region of residence if it is preferred to the home region:

$$c_t^i + g(z_{mt}^i) - \phi_{hmt}^i c_t^i > c_t^i(1 - T_{ht}^i) + g(z_{ht}^i) \quad (\text{A10})$$

$$g(z_{mt}^i) - g(z_{ht}^i) - \phi_{hmt}^i c_t^i > -T_{ht}^i c_t^i, \quad (\text{A11})$$

and is preferred to all other regions:

$$c_t^i + g(z_{mt}^i) - \phi_{hmt}^i c_t^i > c_t^i(1 - T_{j't}^i) + g(z_{j't}^i) - \phi_{hj't}^i c_t^i. \quad (\text{A12})$$



In the evasion only model, Madrid is chosen if:

$$(1 - p^i)c_t^i + p^i [c_t^i(1 - T_{ht}^i) - f^i c_t^i] - \kappa_t^i c_t^i + g(z_{ht}^i) > c_t^i(1 - T_{ht}^i) + g(z_{ht}^i). \quad (\text{A13})$$

Now consider an individual that has the choice of evading or moving to Madrid. When will evasion be chosen? Assuming  $p^i < 1/(1 + f^i)$  holds, this requires

$$(1 - p^i)c_t^i + p^i [c_t^i(1 - T_{ht}^i) - f^i T_{ht}^i c_t^i] - \kappa_t^i c_t^i + g(z_{ht}^i) > c_t^i + g(z_{mt}^i) - \phi_{hmt}^i c_t^i \quad (\text{A14})$$

$$-T_{ht}^i p^i c_t^i - p^i f^i T_{ht}^i c_t^i > g(z_{mt}^i) - g(z_{ht}^i) + (\kappa_t^i - \phi_{hmt}^i) c_t^i. \quad (\text{A15})$$

Given region  $h$  was selected prior to decentralization in period  $t - 1$ , this implied, that when there were no tax differences:

$$c_{t-1}^i + g(z_{m,t-1}^i) - \phi_{hmt-1}^i c_{t-1}^i < c_{t-1}^i + g(z_{h,t-1}^i). \quad (\text{A16})$$

Then if there are no idiosyncratic evasion costs and both amenities and moving costs are time invariant ( $z_{mt}^i \approx z_{m,t-1}^i, z_{ht}^i \approx z_{h,t-1}^i, \phi_{hmt}^i \approx \phi_{hm,t-1}^i$ ), we have

$$g(z_{mt}^i) - g(z_{ht}^i) - \phi_{hmt}^i < 0. \quad (\text{A17})$$

Then, the right hand side of (A15) continues to be negative if  $\kappa_t^i$  is sufficiently small. Then from (A15) we can consider two cases:

1. If  $p^i \rightarrow 0$ , what matters is only the differences in amenities valuation and the other costs:  $g(z_{mt}^i) - g(z_{ht}^i) + (\kappa_t^i - \phi_{hmt}^i) c_t^i$ . If this term is negative [positive], then evading [moving] is the better option. However, as noted previously, the implications of the chosen region in (A17) suggest this term is likely negative, such that evading is almost always optimal if all the previously derived conditions hold. Moreover, note that if the valuation of amenities in both regions is the same, this term is also always negative if  $\kappa_t^i < \phi_{hmt}^i$  and evading is always the better option.
1. If the audit probability approach its upper bound,  $p^i \rightarrow 1/(f^i + 1)$ , then this implies  $-T_{ht}^i p^i c_t^i > g(z_{mt}^i) - g(z_{ht}^i) + (\kappa_t^i - \phi_{hmt}^i) c_t^i$ . Note that if the right had side is very negative, then evasion will still be selected, but otherwise migration is selected.

## A.4 Methodology for Revenue Analysis

This section describes the methodology used to analyze how tax-induced mobility responses affect wealth and income tax revenues by means of counterfactual simulations. We then use the counterfactual simulations to make comparisons with respect to the baseline scenario, that is, the observed (realized) revenues. To construct the counterfactuals, we simulate the evolution of wealth and income tax revenue absent tax-induced mobility. Consistent with our empirical analysis, tax-induced migration is defined as mobility to Madrid, as the small tax differentials between other regions have no noticeable effect on the stock of wealthy taxpayers. To identify the number of tax-induced movers, we use the annual coefficients of the relative change in the stock of movers to Madrid from estimation of (2).

We apportion the change in Madrid’s stock back to each of the other regions of Spain using the annual shares of net migration that each region contributes to Madrid relative to the pre-reform period. By making the apportionment factors based off the change in net-migration relative to 2010, these factors are consistent with the econometric specification. As we do not know who moved for tax or non-tax reasons, we then draw taxpayers randomly from the set of movers involving Madrid that are subject to the wealth tax (i.e., they have taxable wealth above 700,000€). Given that tax-induced migration involves movement to Madrid and inducing some people who would move from Madrid, to stay, whenever the selected number of movers in each region does not add up to the total net migration share, we draw taxpayers (i.e., subject to the wealth tax) randomly from the set of stayers in Madrid over the 2011-2015 period. We assign them to each region so as to match each region’s net migration share to Madrid. Because the distribution of taxpayers in Madrid is more skewed than in the rest of regions, we censor the wealth drawing so as to never pick the richest 1% of stayers. This also helps deal with the fact that we have a stratified sample, rather than the full universe of taxpayers.<sup>46</sup> In terms of weights, we fix the regional distribution of wealth tax filers to its pre-reform level (i.e., year 2010) and only allow the weights to change over time through the change in the total number of wealth tax filers.

We simulate four different scenarios eliminating any tax-induced mobility:

1. **Decentralization without tax-induced mobility:** We keep the baseline wealth and income tax schedule in each region unchanged but close down tax-induced mobility. Note that this is the only scenario for which we also simulate the personal income tax. We do so by keeping fixed the baseline personal income tax liability for both capital and

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<sup>46</sup>For movers from Castile and León to Madrid we also censor the personal income tax liability for the largest top 1%, as some of the movers in this region are ultra rich individuals and they would not receive so much weight if we had the full universe of taxpayers.

labor income (i.e., we assume there are no differences in the personal labor income tax schedule between Madrid and the rest of regions), so that the only thing that changes is the region of residence.

2. **Decentralization with a positive minimum wealth tax:** We keep the baseline wealth tax schedule in each region unchanged except for the zero-tax regions (i.e., Balearic Islands and Valencian Community in 2011, Madrid between 2011-2015). For these regions, we assign the default schedule, which is the lowest positive schedule observed. This scenario could arise if the central government only allowed regions to deviate upward from the default schedule. As all migration we observe in the data is to tax havens, this scenario closes down tax-induced mobility according to the procedure described above.
3. **Harmonization with default schedule:** We apply the default (centralized) wealth tax schedule to each region, including Madrid. As all regions levy the same tax rate, this closes down tax-induced mobility according to the procedure described above.
4. **Harmonization with a Pareto-improving schedule:** We find the coordinated harmonized wealth tax schedule over the period 2011-2015 such that all regions are better-off (according to tax revenue) after harmonization than in the observed baseline with decentralization. To do this, we scale the marginal tax rate in each bracket upward by 1% increments (relative to the default schedule).<sup>47</sup> We then conduct a search, which iterates until we find a wealth tax schedule that generates a Pareto improvement in terms of tax revenue for all regions. In each year, we never let the harmonized tax rate rise above the maximum regional tax rate in that year.<sup>48</sup>

This is a partial equilibrium analysis that abstracts from spillovers from the presence of top wealth holders; it ignores any other fiscal externalities via other taxing instruments other than the wealth and personal income tax; and it assumes no tax competition. Moreover, except for mobility, this analysis also abstracts from any other behavioral response to changes in the wealth tax. In this way, we identify only the direct effect of tax-induced mobility on wealth and income tax revenue.

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<sup>47</sup>This matches the regional practice whereby jurisdictions deviate from the default schedule mostly by setting their tax rate as a multiple of the default schedule (e.g., Extremadura used a multiple of 50% since 2012).

<sup>48</sup>Note that the maximum wealth tax schedules are the ones of Andalusia in 2011 (i.e., 10% higher than the default) and Extremadura in 2012-2015 (i.e., 50% higher than the default).

## A.5 Methodology for Inequality Analysis

We now describe the methodology used to construct the national and regional top wealth shares used to analyze how the tax-induced mobility responses shape the wealth distribution.

To calculate the national shares of wealth, we divide the wealth amounts accruing to each fractile by an estimate of total personal wealth. Had everyone been required to file a wealth tax return, the wealth denominator is ideally defined as total personal wealth reported on wealth tax returns. As only a fraction of individuals file a wealth tax return, we cannot estimate the denominator using wealth tax statistics. We rely on the non-financial accounts reconstructed by Artola Blanco et al. (2020) and financial accounts from the Bank of Spain. Artola Blanco et al. (2020) only reconstruct the series of business assets and urban and rural real estate. Hence, for other non-financial assets such as consumer durables (e.g., cars, boats, etc.) and collectibles (e.g., jewelry, antiques, etc.), we rely on the reported totals in the last four waves (2005, 2008, 2011, 2015) of the Spanish Survey of Household Finances (SHF) provided by Bank of Spain. We correct our estimate of total personal wealth assuming that total wealth in the excluded regions of Navarre and Basque Country is roughly proportional to GDP. These two regions combined represent about 6-7% and 8% of Spain in terms of population and gross domestic product, respectively (Martínez-Toledano, 2020). Our wealth distribution series are thus fully consistent with national accounts aggregates and comparable to Saez and Zucman (2016) for the U.S. and Garbinti et al. (2019) for France.

The numerator, that is, total reported wealth in tax files, must be adjusted to reflect market prices to be consistent with the denominator.<sup>49</sup> For example, real estate wealth is not taxed according to its market value, but according to its tax-assessed value. We apply as a correction factor to each individual's annual reported real estate wealth. This factor is defined as the ratio of aggregate real estate wealth at market prices estimated in Artola Blanco et al. (2020) divided by aggregate tax-assessed real estate wealth reported by the Spanish Cadastre. Market prices are about three times as high as tax-assessed values on average. Moreover, other real assets such as consumer durables, antiques and business assets tend to be underestimated in wealth tax records, as contrary to most financial assets, they are self-reported. We adjust them using the reported shares of these assets among the top 1% richest individuals in the SHF.<sup>50</sup> Whenever a taxpayer's share out of total taxable assets lies below the average share observed in the survey, we assign the survey share.

Our top wealth shares are defined relative to the total number of adults (age  $\geq 20$ ) from the Spanish Census. The progressive wealth tax has high exemption levels and less than the

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<sup>49</sup>Financial assets are reported at market values, so only real assets need to be adjusted.

<sup>50</sup>Note that these assets are also self-reported in the SHF. However, we expect the reported values to be more accurate as the incentives to underreport are not as evident as when filing taxes.

top 5% of adults filed wealth tax returns prior to 2007 and less than 1% after 2011. Thus, we limit our analysis of wealth concentration to the top 1% of the population and above. Taxable wealth from 2008-2015 is based on the extrapolation method from section 2.1.

To calculate the regional shares of wealth, we construct the numerator for each region by simply decomposing the adjusted total reported taxable wealth by region, as the administrative records include the region of residence. For the denominator, we decompose the national total used in Martínez-Toledano (2020), which also relies on tax records that include the region of residence and cover the full distribution.

We then analyze how tax-induced mobility shapes the wealth distribution using the same simulation method as for the revenue analysis (see Appendix A.4), that is, after determining the number of tax-induced movers for each region, we calculate the counterfactual national and regional wealth shares using each individual’s wealth had they not moved. For that, we update – for all tax-induced movers – the region of residence and the wealth and personal income tax liabilities paid. As with the revenue effects, this is a partial equilibrium analysis that abstracts from spillovers from the presence of top wealth holders to the wealth of lower taxpayers and from any other behavioral response to changes in the wealth tax.

## A.6 Additional Results

This online appendix presents additional robustness checks. Each figure or table is discussed in the text. Please see the text for detailed descriptions.

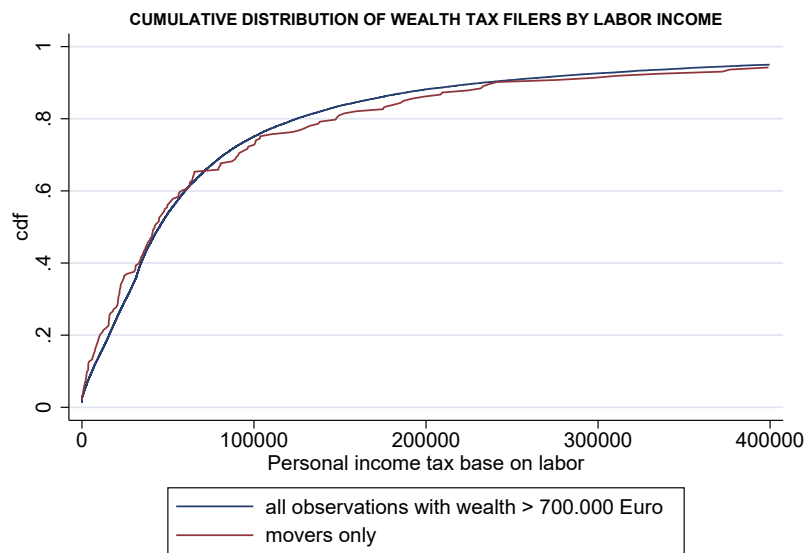


FIGURE A1: Cumulative Distribution of Wealth Tax Filers by Labor Income

Notes: This figure shows the cumulative distribution of taxable labor income for the 2010 wealthy treatment group (i.e., wealthy individuals with taxable wealth above 700,000 Euro in 2010) and for the movers within this treatment group. This figure is constructed by linking the personal income and wealth tax panel.

### AVERAGE TAXABLE WEALTH ACROSS SPANISH REGIONS, 2011-2015

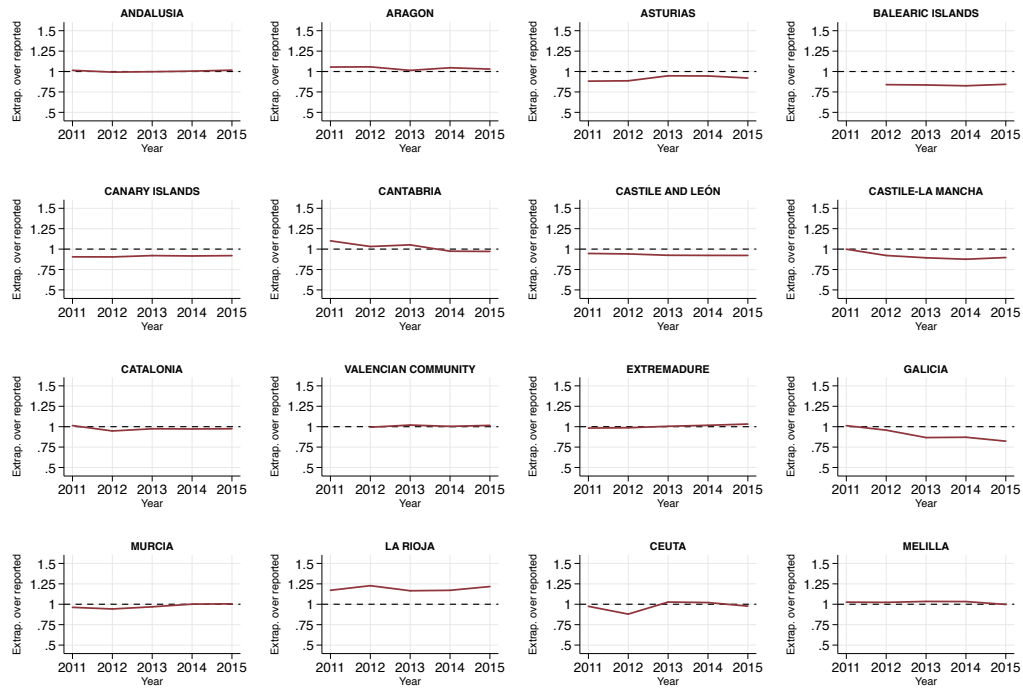


FIGURE A2: Average Taxable Wealth Across Spanish Regions, 2011-2015

Notes: This figure compares extrapolated versus actual reported average wealth across Spanish regions over the period 2011-2015. Reported average wealth figures across regions have been calculated after digitizing the official wealth tax statistics published by the Spanish Tax Agency. Note that the region of Madrid is missing, as it has a 0% wealth tax rate over the whole period 2011-2015.

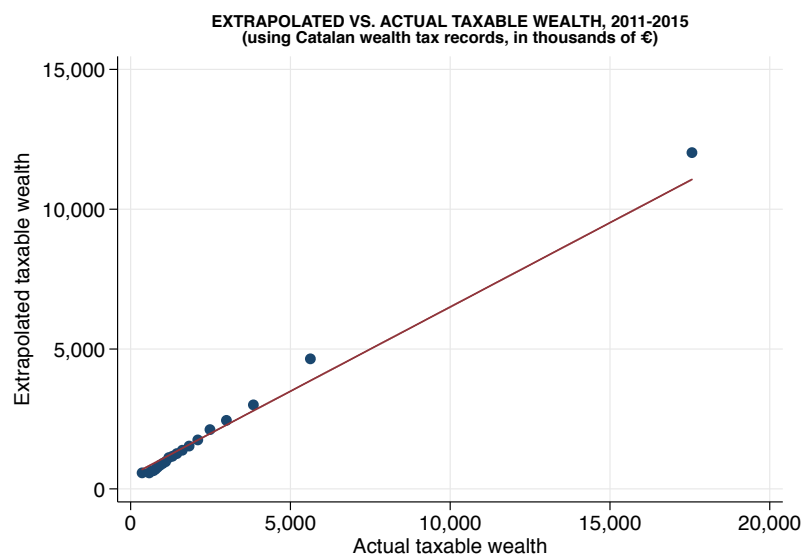


FIGURE A3: Extrapolated vs. Actual Taxable Wealth, 2011-2015 (Using Catalan Wealth Tax Records)

Notes: This figure compares extrapolated versus actual individual reported wealth levels for Catalonia’s wealth taxpayers pooling years 2011-2015. The Catalan wealth tax records have been kindly shared by the Catalan Tax Agency. The comparison is made for the subsample of Catalan wealth taxpayers we are able to match across the two data sources (approximately 40% of our sample).



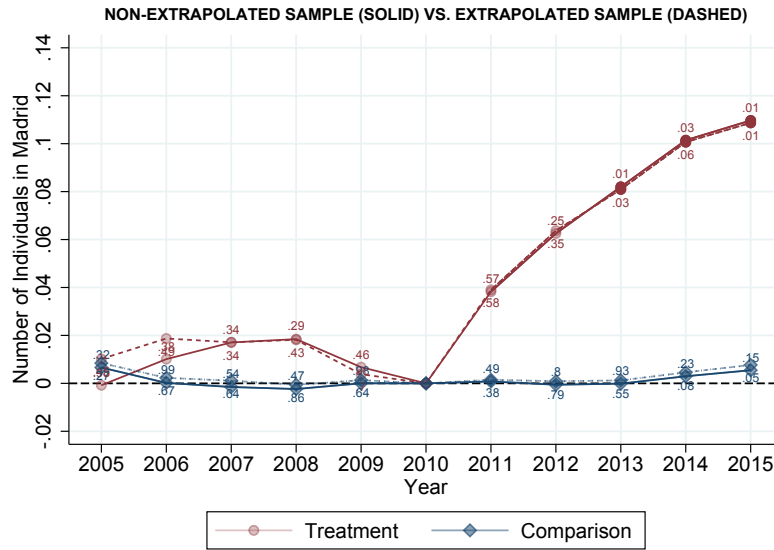


FIGURE A4: Event Study of the Share of Individuals in Madrid Using 2007 Tax Data

Notes: This figure shows the coefficients from (1) estimated separately for the treatment and comparison group. The results using the 2010 wealthy treatment/comparison sample from the main text are shown in dashed lines. In the solid lines, we instead define a wealthy tax as any person that filed wealth taxes in 2007 and had more than 700,000 Euro of wealth in 2007. Thus, this latter sample does not use extrapolated data to define the treatment group. Note that because we reweight the data to be representative of 2007 rather than 2010, the comparison group changes slightly as well. The series in red (circles) shows results for the specification where  $N_{rt}$  is the number of wealth tax filers, while the series in blue (diamonds) shows the results where  $N_{rt}$  is the number of non-filers as measured by individuals that received greater than 1,500 Euro of dividends in at least one year over the period 2011-2015. All regressions are weighted by population. We cluster standard errors at the regional level. Because we have a small number of clusters, we implement the percentile-t wild cluster bootstrap, imposing the null hypothesis, and report p-values above the series on the graphs. Statistically significant coefficients are in dark colors and the numbers on the graph are the p-values. P-values for the dashed series are below the lines, while p-values for the solid series are above the lines.

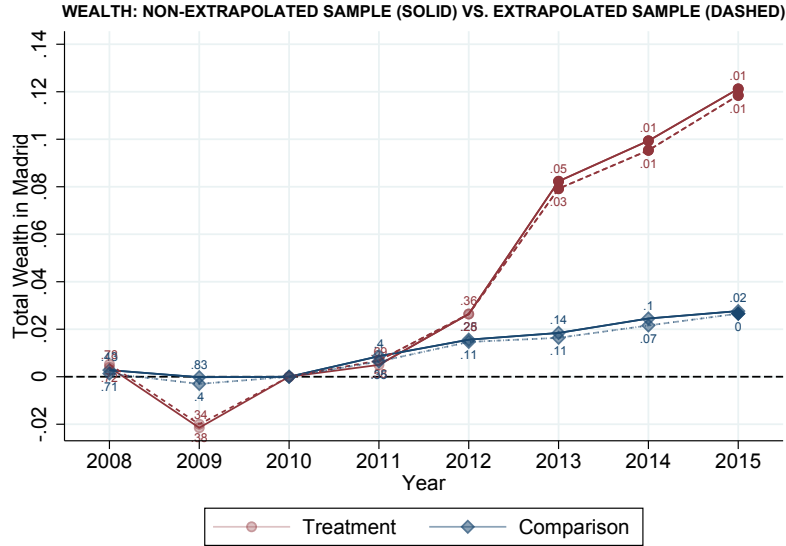
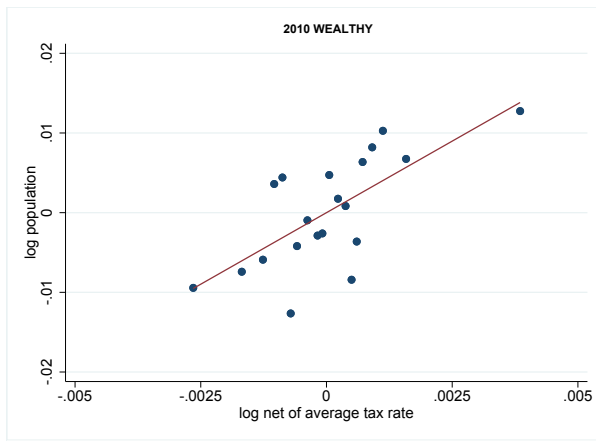
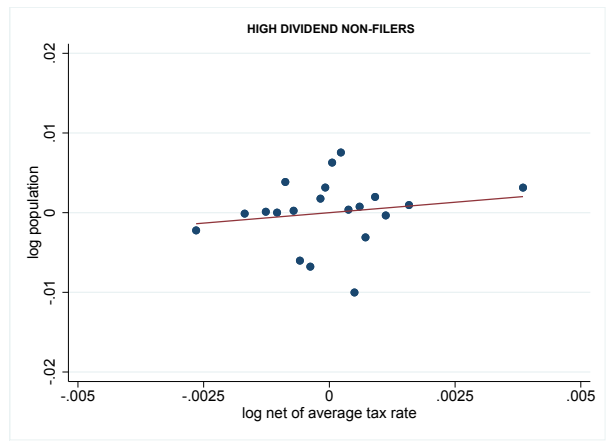


FIGURE A5: Event Study of the Amount of Wealth in Madrid (2010 vs. 2007 filers)

Notes: This figure shows the coefficients from (1) estimated separately for the treatment and comparison group. As in the prior figure, we show the results using the 2010 wealthy (dashed lines) and the 2007 wealthy (solid lines) treatment groups. Note that because we reweight the data to be representative of 2007 rather than 2010, the comparison group changes slightly as well. The series in red (circles) shows results for the specification where  $N_{rt}$  is the amount of wealth in Madrid among the 2007 wealthy treatment group while the series in blue (diamonds) shows the results where  $N_{rt}$  is the amount of wealth in Madrid among 2007 wealth tax filers with less than 300,000 Euro. Because wealth is only observed for 2007 wealth tax filers, the only available comparison group is 2007 wealth tax filers that have sufficiently low wealth that they are not expected to file after 2010. All regressions are weighted by population. We cluster standard errors at the regional level. Because we have a small number of clusters, we implement the percentile-t wild cluster bootstrap, imposing the null hypothesis, and report p-values above the series on the graphs. Statistically significant coefficients are in dark colors and the numbers on the graph are the p-values. P-values for the dashed series are below the lines, while p-values for the solid series are above the lines.



(a) 2010 wealthy

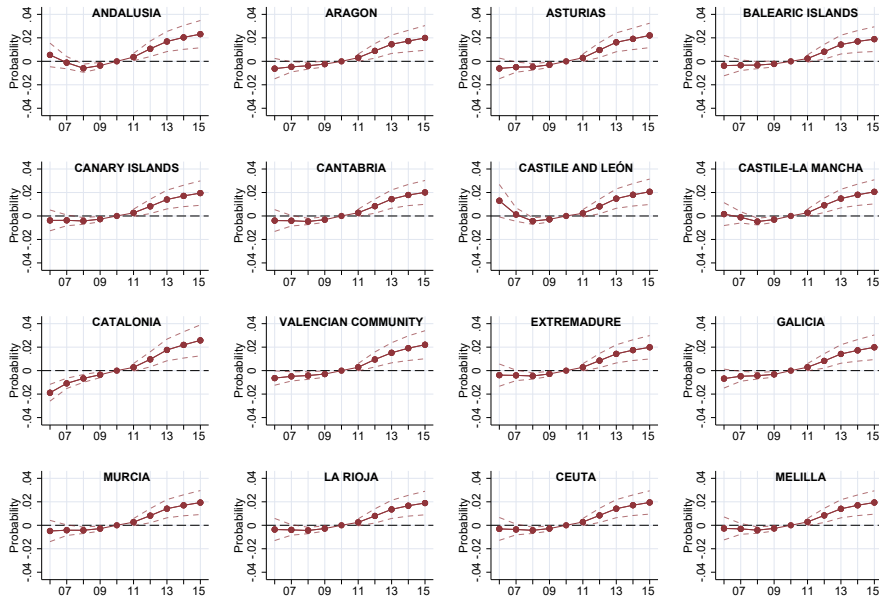


(b) High dividend non-filers

FIGURE A6: Elasticity of Number of Individuals

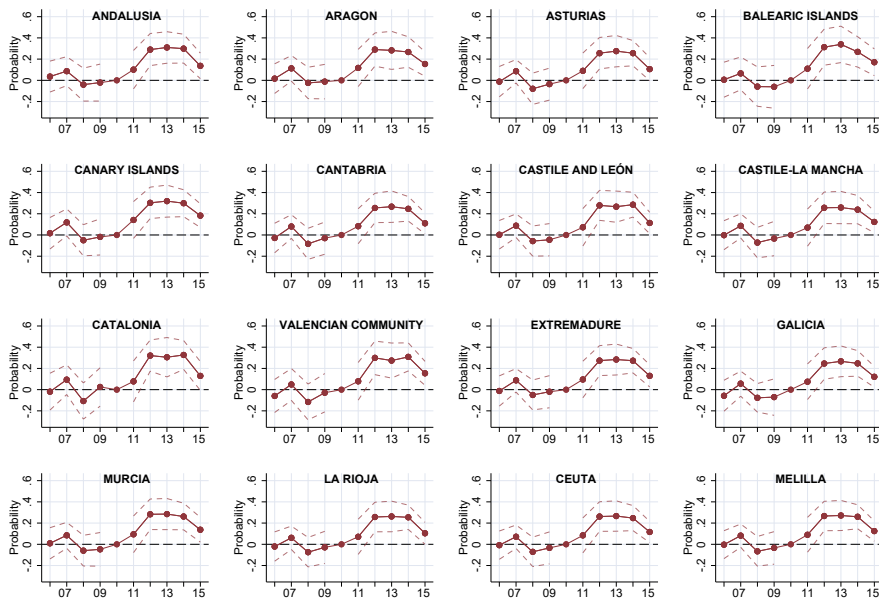
Notes: This figure depicts the elasticity for the number of individuals for our preferred treatment and comparison groups. In particular, Panels (a) and (b) show a visualization of the regression of the (log) number of the 2010 wealthy and high-dividend non-filers, respectively, in a given region year on the (log) wealth-weighted net-of-average tax rate. All regressions include region and year fixed effects, and the same controls as in the regressions. To construct this figure, we regress the dependent variable on the fixed effects and controls and obtain the residuals. We do the same for the independent variable. We then bin the residuals and plot a line of best-fit-through the data. The slope of this line is the coefficient from the standard panel data regression.

PROBABILITY DECLARING IN MADRID RELATIVE TO EACH REGION



(a) Full sample

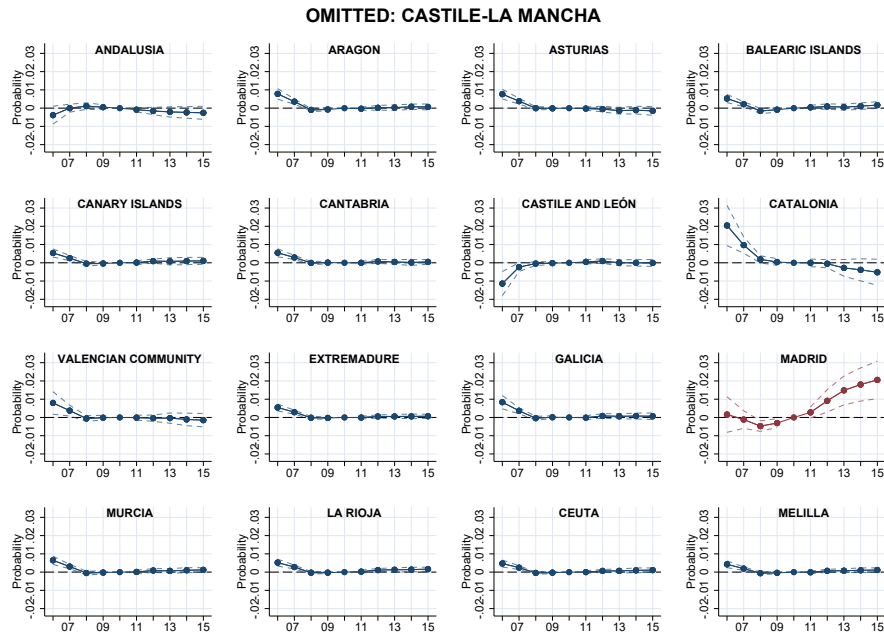
PROBABILITY DECLARING IN MADRID RELATIVE TO EACH REGION



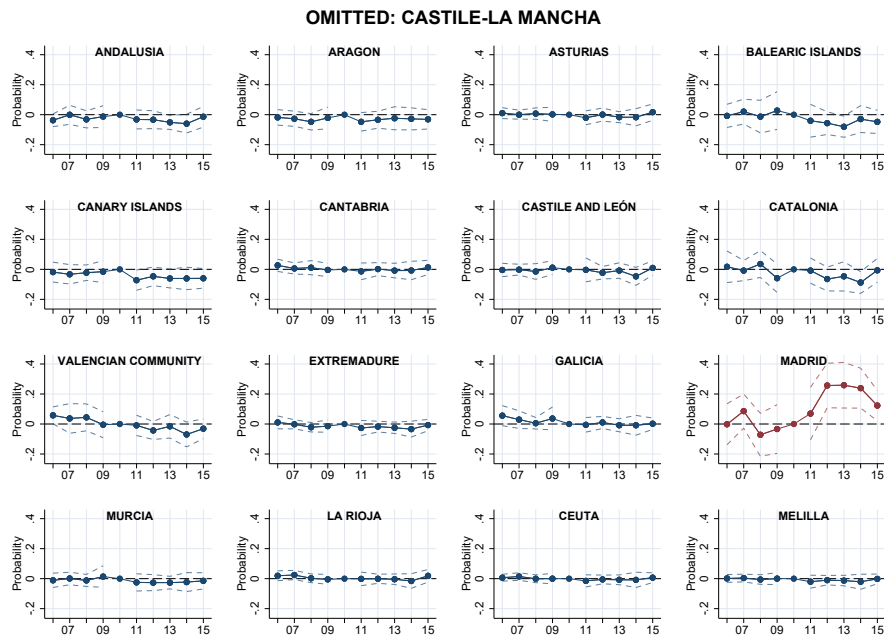
(b) Movers

FIGURE A7: Probability of Moving to Madrid Relative to Each Region

Notes: This figure shows an event study similar to figure 7, except rather than showing the effect of Madrid relative to all other regions, it shows the effect of Madrid relative to each region separately. To construct this figure, we re-estimate (7) sixteen times. Each time we omit a different region  $j$  and plot the Madrid coefficients. The treatment group is the 2010 wealthy. Standard errors are clustered at the origin-bracket and alternative-bracket level. Dashed lines indicate 95% confidence intervals. The models start in 2006 as we need lagged information for the construction of the clusters and the “move” variable.



(a) Full sample



(b) Movers

FIGURE A8: Probability of Moving to a Region Relative to Castile-La Mancha

Notes: This figure shows an event study similar to Figure 7 for the 2010 wealthy, but interacting each region indicator with event dummies. To construct this figure, we estimate (7) using Castile-La Mancha as the omitted region,  $j$ . This single regression yields a coefficient for every year-region, which we plot in this figure. Results are similar if we omit a different non-haven region. The treatment group is the “2010 wealthy.” Standard errors are clustered at the origin-bracket and alternative-bracket level. Dashed lines indicate 95% confidence intervals. The models start in 2006 as we need lagged information for the construction of the clusters and the “move” variable.

**WEALTH AND INCOME TAX REVENUE ACROSS SPANISH REGIONS, 2011-2015**  
 (without [counterfactual] vs. with tax-induced mobility [baseline])

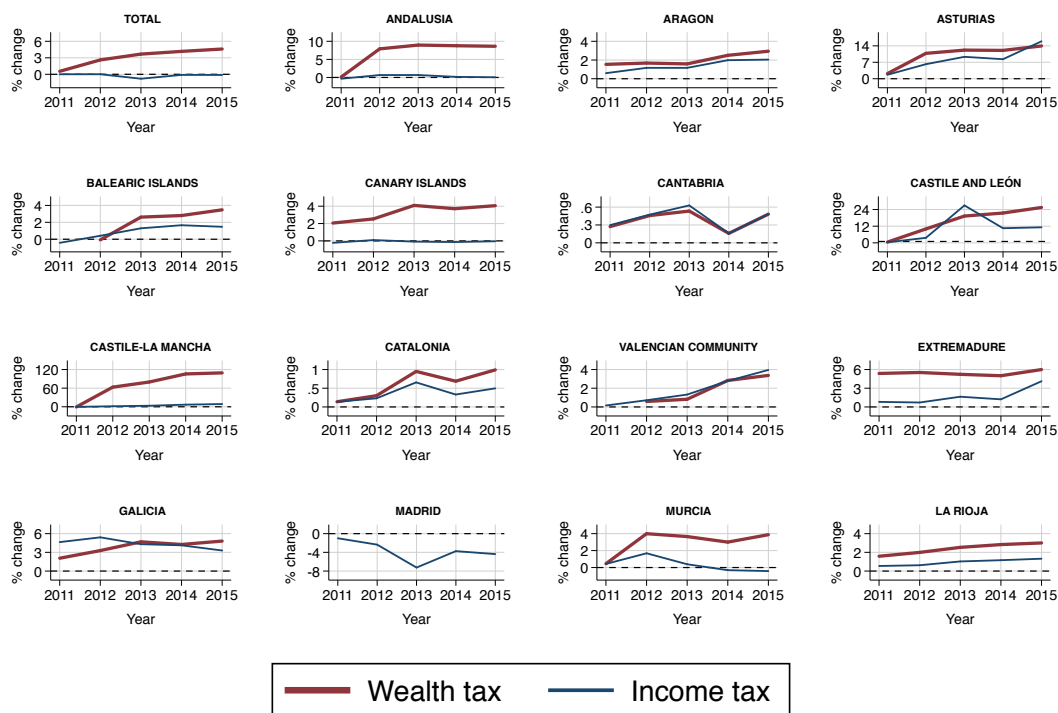
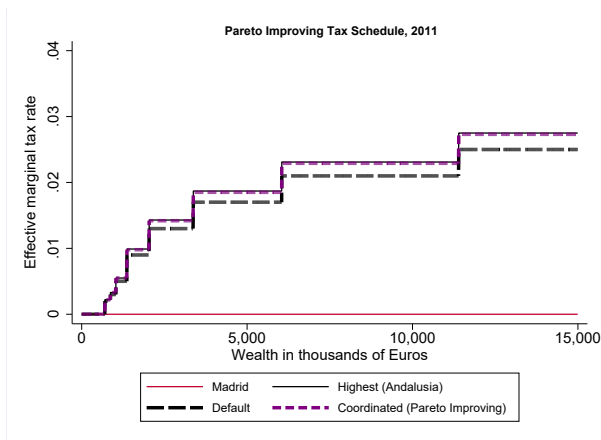
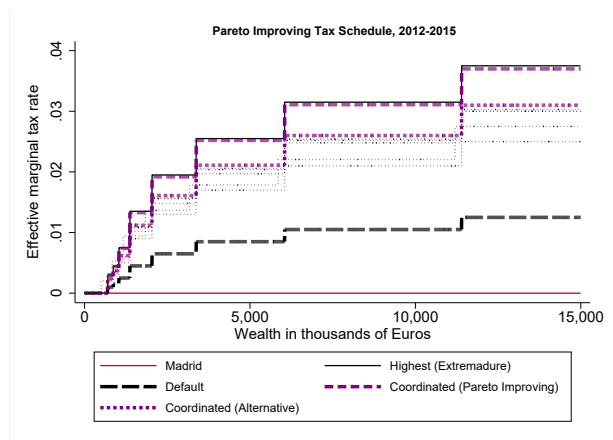


FIGURE A9: Wealth and Income Tax Revenue Across Spanish Regions, 2011-2015

Notes: This figure depicts the percent change of wealth and income tax revenue under the decentralized scenario absent tax-induced mobility to Madrid relative to the baseline decentralized scenario with tax-induced mobility to Madrid across Spanish regions over the period 2011-2015. Note that we exclude the regions of Ceuta and Melilla from the figure, as they count on a very small sample of wealth taxpayers and thus have a very low share of movers. Appendix A.4 explains in detail the methodology used to carry the counterfactual revenue simulations.



(a) Pareto-Improving Tax Schedule, 2011



(b) Pareto-Improving Tax Schedule, 2012-2015

### FIGURE A10: Baseline vs. Coordinated Wealth Tax Schedules, 2011-2015

Notes: This figure compares the coordinated harmonized wealth tax schedules that are Pareto-improving for all regions to the baseline wealth tax schedules over the period 2011-2015. Panel (a) shows the wealth tax schedule for 2011 and panel (b) for 2012-2015. On panel (b) we also depict a lower alternative coordinated harmonized wealth tax schedule that is Pareto-improving for all regions but Extremadure, which is the region with the highest wealth tax schedule between 2012-2015. This alternative schedule in 2011 is the same as the depicted coordinated schedule. Although the highest tax rate and default tax rate were always the same from 2012-2015, other regions changed taxes in this period; the light dotted lines show other regional tax rates in 2015. We consider a different schedule for 2011 as we require the Pareto improving schedule be below the maximum tax rate in each year.

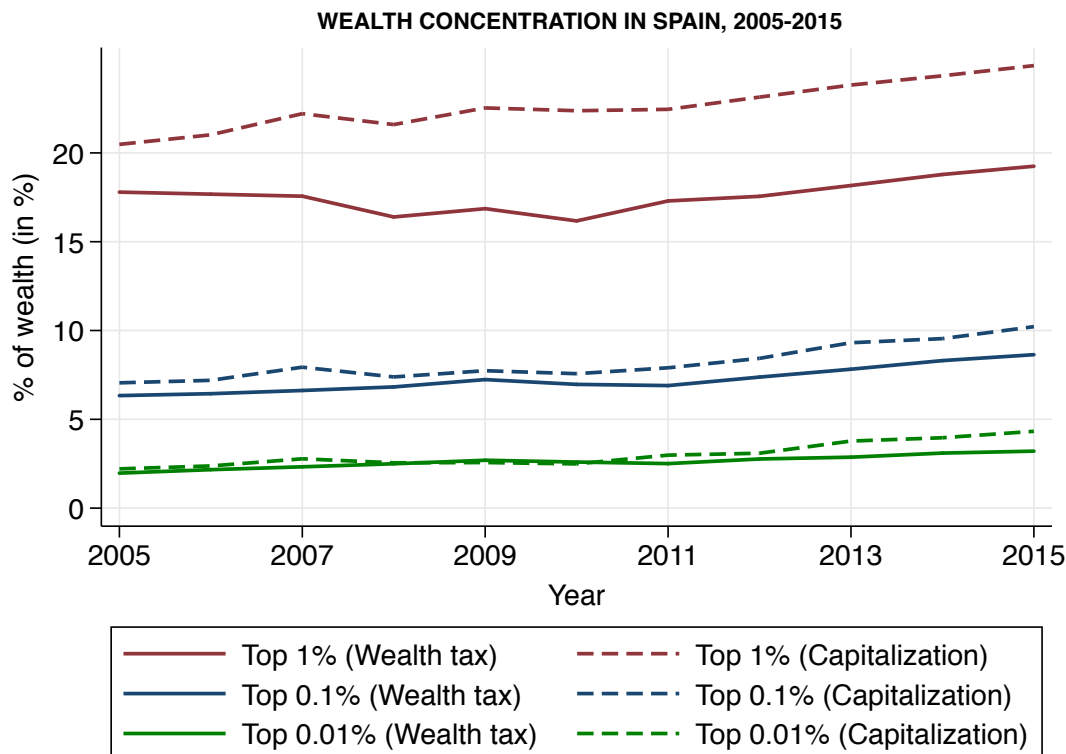


FIGURE A11: Wealth Concentration in Spain, 2005-2015

Notes: This figure compares our top wealth distribution series using wealth tax records (solid lines) with Martínez-Toledano (2020)'s series (dashed lines) using the mixed-survey capitalization method over the period 2005-2015. Our series are consistent with national accounts and have been constructed using as the denominator, the non-financial aggregates reconstructed by Artola Blanco et al. (2020) and the financial aggregates as reported by the Bank of Spain. Artola Blanco et al. (2020) only reconstruct urban, rural estate and business assets. Thus, for other non-financial assets such as consumer durables (e.g., cars, boats, etc.) and collectibles (e.g., jewelry, antiques, etc.), we rely on the reported totals in the last four waves (2005, 2008, 2011, 2014) of the Spanish Survey of Household Finances (SHF) elaborated by Bank of Spain. Wealth tax information excludes the regions of Navarre and Basque Country because they do not belong to the Common Fiscal Regime. We follow Alvaredo and Saez (2009) and Martínez-Toledano (2020) and correct our denominator assuming that total wealth in those regions is roughly proportional to GDP. Combined, they represent about 6-7% and 8% of Spanish population and gross domestic product over our period of analysis. For the numerator, we use total reported wealth in tax files and adjust real assets to reflect market prices and actual totals. Real estate wealth is commonly taxed according to its tax-assessed value and market prices are about three times as high as tax-assessed values on average. We correct each individual's annual reported real estate wealth using the ratio of aggregate real estate wealth at market prices elaborated in Artola Blanco et al. (2020) and aggregate tax-assessed real estate wealth reported by the Spanish Cadastre. We finally adjust consumer durables, antiques and business assets that tend to be underestimated, as they are self-reported. We do so by using the reported shares of these assets among the top 1% richest individuals in the SHF. Note that 2008-2015 taxable wealth is based on our extrapolation method. Wealth groups are defined relative to the total number of adults (age 20 and above from the Spanish Census).



**TOP 1% WEALTH CONCENTRATION ACROSS SPANISH REGIONS, 2005-2015**

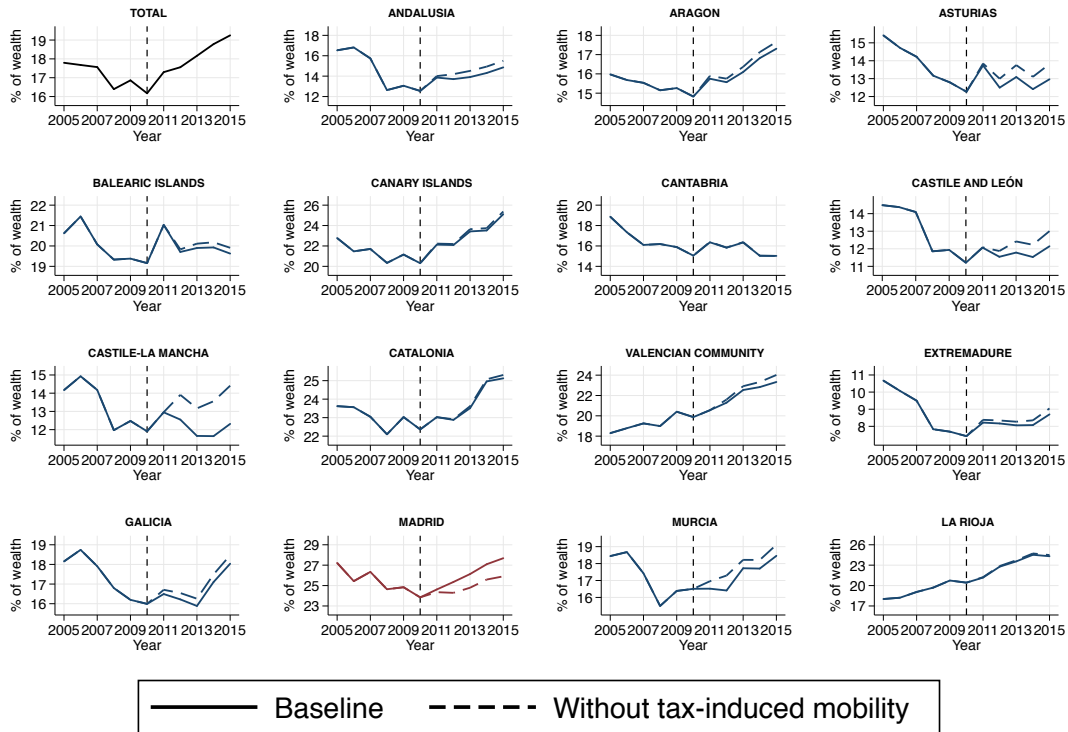


FIGURE A12: Top 1% Wealth Concentration Across Spanish Regions, 2005-2015 (With vs. Without Tax-Induced Mobility)

Notes: This figure compares the evolution of top 1% wealth concentration in Spain and across Spanish regions under the benchmark scenario with mobility and the counterfactual scenario absent tax-induced mobility over the period 2005-2015. To identify the population of tax-induced movers, we use the annual coefficients of the relative change in the stock of movers to Madrid after decentralization from (2). We then apportion the relative increase in Madrid’s stock in proportion to the relative change in net migration from each region as a share of the total change in net migration involving Madrid. To select which taxpayers do not move under the conterfactual, we draw randomly from movers to Madrid. We also fix the distribution of the total adult population and total wealth in each region at their pre-reform levels. Finally, we correct each individual’s wealth for the difference in wealth tax liability between the benchmark scenario with mobility and the counterfactual scenario absent tax-induced mobility using our wealth tax simulator. The autonomous cities of Ceuta and Melilla are excluded from the figure as they account for a very small fraction of total wealth and have a very small number of movers.

Variable	Definition
y	Year identifier (2005-2007, 2011-2015)
pers_handicap	Handicap status: 0 - not handicapped 1 - handicapped up to 33% 2 - between 33%-66% 3 - above 66%
tb_general	PIT labor income tax base
tb_capital	PIT capital income tax base
tb_cgains	Positive capital gains from the selling of assets purchased more than one year in advance (part of the capital income tax base)
tl_cg()	PIT liabilities to central government
tl_rg()	PIT liabilities to regional government
div_nont()	non-taxable dividends in the personal income tax
sample_type()	Type of personal income tax filing: 1 - individual 2 - joint
taxl_wt_lim()	Wealth tax liability cap (60% of the personal income tax base + div_nont + tb_cgains)
taxl_wt()	Wealth tax liability before applying the wealth-income tax liability cap
tl_saving()	Capital income tax liability
id_houshold()	Household identifier

TABLE A1: Input Variables

Notes: This table presents the input variables for the tax simulator.

<b>SUMMARY STATISTICS, 2010 (2010 Wealthy)</b>					
Variables	# obs	Mean	sd	Min	Max
<b>Panel A: All filers in 2010</b>					
Labor income	375,170	62.24	270.5	0	14,006
Business income	375,170	30.72	190.6	-1,125	21,560
Capital income	375,170	72.49	245.1	-3,193	22,162
Debt	375,170	179.6	1,365	0	203,162
Wealth tax base	375,170	2,355	5,972	700.0	313,634
Age	375,170	64.77	12.05	11	106
Female	375,170	0.441	0.497	0	1
<b>Panel B: Filers residing outside Madrid</b>					
Labor income	294,463	48.30	204.9	0	14,006
Business income	294,463	28.10	128.8	-1,079	5,535
Capital income	294,463	68.93	186.0	-3,193	8,164
Debt	294,463	158.2	748.8	0	30,799
Wealth tax base	294,463	2,141	5,375	700.0	313,634
Age	294,463	65.16	11.97	11	104
Female	294,463	0.442	0.497	0	1
<b>Panel C: Filers residing in Madrid</b>					
Labor income	80,707	113.1	428.5	0	12,154
Business income	80,707	40.30	328.9	-1,125	21,560
Capital income	80,707	85.47	391.0	-2,168	22,162
Debt	80,707	257.4	2,570	0	203,162
Wealth tax base	80,707	3,136	7,719	700.1	310,083
Age	80,707	63.37	12.23	17	106
Female	80,707	0.437	0.496	0	1
<b>Panel D: Filers which moved to any region other than Madrid</b>					
Labor income	1,094	28.07	53.60	0	377.1
Business income	1,094	46.92	160.2	-298.7	886.0
Capital income	1,094	50.81	68.58	-2,774	317.3
Debt	1,094	339.0	1,409	0	10,113
Wealth tax base	1,094	2,203	2,434	704.0	12,654
Age	1,094	63.04	12.66	34	97
Female	1,094	0.376	0.485	0	1
<b>Panel E: Filers which moved to Madrid</b>					
Labor income	880	37.27	79.13	0	478.8
Business income	880	36.98	104.2	-27.25	577.3
Capital income	880	93.21	176.5	-48.98	955.5
Debt	880	217.3	622.6	0	4,510
Wealth tax base	880	4,080	6,255	705.5	38,252
Age	880	65.22	13.17	36	91
Female	880	0.463	0.499	0	1

TABLE A2: Summary Statistics, 2010 (2010 Wealthy Treatment Sample)

Notes: This table presents summary statistics for our preferred treatment sample (i.e., “2010 wealthy”, those who have wealth above 700,000 Euro in 2010) in pre-reform year 2010. Note that all figures are calculated using weights to match the total number of wealth tax filers in every region and year. All monetary values are in thousands of Euro.

**EVIDENCE FROM MODEL WITH  
2007 TREATMENT AND COMPARISON GROUP**

	Comparison: High Dividends			Comparison: All non-filers		
<b>Panel I: Average Effect</b>						
	(1a)	(1b)	(1c)	(1d)	(1e)	(1f)
Madrid x Post x $W_f$	0.091	0.077	0.063	0.094	0.079	0.062
Uncorrected SEs	(0.007)	(0.009)	(0.012)	(0.007)	(0.009)	(0.012)
Bootstrap p-values	0.098*	0.000***	0.000***	0.064*	0.000***	0.000***
<b>Panel II: Cumulative Effect</b>						
	(2a)	(2b)	(2c)	(2d)	(2e)	(2f)
Madrid x 2015 x $W_f$	0.125	0.117	0.111	0.130	0.076	0.111
Uncorrected SEs	(0.009)	(0.014)	(0.010)	(0.009)	(0.004)	(0.010)
Bootstrap p-values	0.086*	0.002***	0.004***	0.061*	0.004***	0.004***
# obs	272	272	272	272	272	272
Spending Controls	no	yes	yes	no	yes	yes
Economic Controls	no	no	yes	no	no	yes
Amenity Controls	no	no	yes	no	no	yes
Demographic Controls	no	no	yes	no	no	yes

TABLE A3: Effect of Madrid’s Tax Haven Status: Aggregate Analysis

Notes: The only difference from Table 1 in the text is that the treatment group is the 2007 wealthy, such that extrapolated data are not used to define the treatment or comparison group. Panel I presents coefficients from a simplified version of (2) that only uses Madrid  $\times$  post  $\times$  filer rather than the event study specification. Panel II shows the coefficient on the final treatment by filer by event year dummy from regression (2). In all specifications,  $N_{rt}$  is the number of wealth tax filers. The first three columns use individuals that received greater than 1,500 Euro of dividends as the comparison group while the last three columns use all non-filers as the comparison group. All regressions weight by population and the totals match 2010 taxpayers’ totals in each region. We cluster standard errors at the regional level. Because we have a small number of clusters, we implement the percentile-t wild cluster bootstrap, imposing the null hypothesis, and report p-values, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

**ELASTICITIES OF THE STOCKS FOR 2007 WEALTH TAX FILERS  
WITH RESPECT TO THE NET-OF-TAX RATE**

	Number of Wealthy Filers				Total Wealth			
	All	w/o Mad.	All	w/o Mad.	All	w/o Mad.	All	w/o Mad.
<b>Panel I: Panel Data with Only Filers</b>								
	(1a)	(1b)	(1c)	(1d)	(1e)	(1f)	(1g)	(1h)
$\ln(1 - atr_{rt})$	3.967	3.781	5.592	1.868	3.186	2.868	4.005	1.485
Uncorrected SEs	(0.802)	(0.780)	(1.395)	(0.450)	(1.244)	(1.256)	(2.441)	(1.140)
Bootstrap p-values	0.006***	0.006***	0.024**	0.106	0.074*	0.102	0.254	0.234
Observations	136	136	136	128	136	136	136	128
F-stat	-	>1000	60	>1000	-	>1000	60	>1000
<b>Panel B: Panel Data with Filers and non-filers</b>								
$W_f \times \ln(1 - atr_{rtf})$	5.552	5.277	7.930	2.241	6.055	5.745	8.780	2.106
Uncorrected SEs	(1.157)	(1.128)	(1.087)	(0.832)	(1.481)	(1.445)	(1.130)	(1.248)
Bootstrap p-values	0.004***	0.006***	0.000***	0.116	0.000***	0.000***	0.000***	0.156
Observations	272	272	272	256	272	272	272	256
F-Stat	-	>1000	51	>1000	-	>1000	51	>1000
Controls	yes	yes	yes	yes	yes	yes	yes	yes
OLS	yes	no	no	no	no	no	no	no
Simulated IV with Fixed Wealth	no	yes	no	yes	no	no	no	yes
Madrid x Post IV	no	no	yes	no	no	no	no	no

TABLE A4: Aggregate Model: Elasticities for 2007 Wealth Tax Filers

Notes: The top panel presents coefficients from estimation of (3). Panel II shows the coefficient when this equation is augmented to include data on the comparison group. For the number of filers, the comparison is high dividend non-filers (individuals that received more than 1,500 Euro of dividends in at least one year over 2008-2010) while for total wealth, the comparison group is the < 300,000 wealthy. For the first four columns,  $N_{rt}$  is the number of 2007 wealthy filers; in the second panel  $N_{rtf}$  is the number of 2007 wealthy filers and high dividend non-filers. For the last four columns  $N_{rt}$  is the amount of wealth. Columns (d) and (h) drop Madrid from the regression to test whether smaller tax differentials between other regions matter. The only difference from the table in the text is that the treatment group is 2007 wealth tax filers that have wealth greater than 700,000 Euro in 2007. Thus, this treatment specification does not rely on extrapolated data to determine this grouping. All regressions are weighted by population and the totals match 2007 taxpayers' totals in each region. We cluster standard errors at the regional level. Because we have a small number of clusters, we implement the percentile-t wild cluster bootstrap, imposing the null hypothesis, and report p-values, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

### INDIVIDUAL CHOICE MODEL - ROBUSTNESS

	2007 filers above 700k		low labor income	
	(a) all	(b) movers	(c) all	(d) movers
Madrid <sub>j</sub> × Post <sub>t</sub>	0.017*** (0.004)	0.232*** (0.031)	0.018*** (0.005)	0.228*** (0.044)
R <sup>2</sup>	0.102	0.318	0.084	0.294
# obs	4,910,603	37,111	4,026,518	31,484
alternative FE	yes	yes	yes	yes
individual controls	yes	yes	yes	yes
alternative region controls	yes	yes	yes	yes

TABLE A5: Individual Choice Model - Robustness

Notes: This table presents the results from the full specification of the individual choice model (6). All models include a full set of case, alternative, and year fixed effects and controls at the individual and alternative level. Models (a) and (c) are for the full sample, while (b) and (d) focus on movers. The sample in (a) and (b) includes wealth tax filers in 2007 which declared a tax base above 700,000 Euro (the 2011 threshold). In this way, it does not rely on extrapolated data to estimate the treatment group. As can be seen by the number of observations, less than 4% of observations are classified differently than in the approach from the text. Models (c) and (d) exclude observations with labor income above 100,000 Euro from the sample. As shown in Agrawal and Foremny (2019), there are few incentives to move in response to income tax differentials for labor income of less than 100,000 Euro. Standard errors clustered at the origin-tax-bracket and alternative-bracket level, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

<b>INDIVIDUAL CHOICE MODEL - INSTRUMENTS</b>				
<b>Panel I - FULL SAMPLE</b>				
	(1a)	(1b)	(1c)	(1d)
$\ln(1 - \tau_{i,t,j})$ 7.686***	7.807*** (1.382)	5.138*** (1.440)	4.516*** (1.006)	(0.826)
# obs	5,136,040			
mean ATR (std.)	0.237 (.364)			
<b>Panel II - MOVERS</b>				
	(2a)	(2b)	(2c)	(2d)
$\ln(1 - \tau_{i,t,j})$	6.674*** (2.286)	6.609*** (2.328)	47.478*** (13.018)	46.151*** (12.208)
# obs	38,675			
mean ATR (std)	0.446 (.488)			
alternative FE	no	no	yes	yes
alternative-year FE	yes	yes	no	no
individual controls	no	yes	no	yes
alternative region controls	no	no	no	no

TABLE A6: Individual Choice Model - Instruments

Notes: This table presents the results of (8) for different instruments. Model (a) and model (b) fixes the observed tax base in 2007 to simulate the average tax rate instrument over time. Model (c) and model (d) use the Madrid  $\times$  post dummy as an instrument. Standard errors clustered at the origin-tax-bracket and alternative-tax-bracket level, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1