Preliminary - Do not circulate without permission of authors

Behavioral Responses to State Income Taxation of High Earners: Evidence from California*

Joshua Rauh
Hoover Institution,
Stanford Graduate School of Business,
Stanford Institute for Economic Policy Research
and NBER

Ryan Shyu
Stanford Graduate School of Business

May 20, 2019

ABSTRACT

In November 2012, California voters passed increases to state marginal income tax rates of 1 to 3 percentage points for upper-income households at different points in the income distribution. Drawing on the universe of California income tax filings and the variation imposed by this tax policy change, we present new findings about the effects of personal income taxation on household location choice and pre-tax income. First, over and above baseline rates of taxpayer departure from California, an additional 0.8% of the California residential tax filing base whose 2012 income would have been in the new 12.3% top tax bracket introduced by Proposition 30 moved out from full-year residency of California in 2013. The majority of this mobility is accounted for by taxpayers who persistently earn high incomes relocating to states with zero income tax. Second, to identify the causal impact of the California tax policy shift on the pre-tax earnings of high-income CA residents, we use as a control group high-earning out-of-state taxpayers who persistently file as CA non-residents. Using a differences-in-differences strategy paired with propensity score matching, we estimate a substantial intensive margin response which begins in 2012 and persists through 2014 amongst CA top-bracket taxpayers. This response is concentrated in non-investment income. Our estimates imply an intensive margin elasticity of 2013 income with respect to the marginal net-of-tax rate of 2.36. Among top-bracket CA taxpayers, outward migration and behavioral responses by stayers together eroded 45.2% of the windfall tax revenues from the reform in 2013, with the extensive margin accounting for 9.5% of this total response.

*Rauh: rauh@stanford.edu. Shyu: rshyu@stanford.edu. We are grateful to the California Franchise Tax Board (FTB) for providing the data used in this study, and especially to Allen Prohofsky and Chad Angaretis. We thank Daniel Feenberg for help with TAXSIM, and Greg Kearney, Juan Carlos Suárez Serrato, Danny Yagan, Owen Zidar, and Eric Zwick for helpful comments and feedback.

1. Introduction

The empirical public finance literature has studied the elasticity of taxable income with respect to marginal net of tax rates as a measure of the efficiency of a tax system (see Saez et al. (2012) for a review). In the leading approach for examining the elasticity of taxable income for the personal income tax Gruber and Saez (2002), Giertz (2007), Kleven and Schultz (2014)), the percent change in taxable income is estimated as a function of the percent change in marginal tax rates and a term designed to capture income effects, alongside a rich set of controls for base-period income. The literature's conclusion based on this methodology has generally been that the compensated elasticity of taxable income with respect to marginal tax rates is in the range of 0.1 to 0.4, while the income effects that would lead to greater labor supply under higher taxes are essentially negligible. These relatively modest elasticities have generally translated into calculations of high optimal marginal tax rates (Saez (2001), Piketty et al. (2014)), with perhaps the most widely cited calculation being a top optimal tax rate of 73 percent Diamond and Saez (2011).

At the same time, a growing literature documents the rise in tax avoidance and evasion by wealthy individuals (Zucman (2014)). Agrawal and Foremny (2018, Forthcoming) and Kleven et al. (2014) document a tendency of high earners to relocate in response to changes in the top tax rate in Spain and Denmark. In the context of inventors, Moretti and Wilson (2017) and Akcigit et al. (2016) investigate the influence of taxation on mobility across state lines within the U.S., and international boundaries, respectively. On the other hand, Varner et al. (2018) and Young et al. (2016) use administrative tax data in U.S. states and find relatively small migration responses to changes in top income tax rates. The quantitative implications of such behavioral responses remain an active topic of inquiry. Overall, the impact of cross-border mobility of individuals and capital on the elasticity of the taxable income for states within the U.S. or within other unions with free labor mobility is an open question.

In this paper we study the question of the elasticity of the tax base with respect to taxation using microdata from the California Franchise Tax Board on the universe of California taxpayers around the implementation of Proposition 30 in 2012. This ballot initiative increased marginal income tax rates by 1 percentage point for singles with $250,000-$300,000 in taxable income (married couples with $500,000-$600,000), by 2 percentage points for singles with $300,000-$500,000 in taxable income (married couples with $600,000-$1 million), and by 3 percentage points for singles with over $500,000 in taxable income (married couples with over $1 million). These increases came on top of the 9.3% rate that applied to income over $48,942 for singles and $97,884 for married couples, and also in addition to the 1% mental health tax that since 2004 had applied to incomes of over $1 million. The reform therefore brought the top marginal tax rate in California to 13.3% for incomes of over $1 million. The reform was voted in November 2012 and applied retroactively to tax year 2012 as well as for future tax years through 2018. California Proposition 55 during the 2016 election year extended these rate increases through 2030.

We first study the extensive margin response to taxation, and document a substantial one-

time outflow of high-earning taxpayers from California in response to Proposition 30. Defining a departure as a taxpayer who went from resident to non-resident filing status,[1] the rate of departures in 2013 over 2012 spiked from 1.5% after the 2011 tax year to 2.125% for those primary taxpayers earning over $5 million in 2012, with a similar effect among taxpayers earning $2-5 million in 2012. On the other hand, departure rates are negligible for taxpayers in the new top bracket earning under $2 million. The fact that the effect increases with income is consistent with the established theory that average tax rates matter for extensive margin individual location decisions (Moretti and Wilson (2017), Agrawal and Foremny (2018, Forthcoming)).[2] These results highlight the importance of considering the extensive margin of taxpayer behavior when examining state-level tax changes. On the whole, relative to the pre-period 2000-10, the taxable income weighted rate of departures amongst top-bracket taxpayers was abnormally high by 0.8% in 2012-13.[3]

Gauging the size of the Proposition 30-driven incentive to relocate is complicated by the fact that federal tax policy also changed between 2012 and 2013. The U.S. Congress passed the American Taxpayer Relief Act (ATRA) of 2012 on January 1, 2013, which increased the top marginal tax rate for single filers earning $400,000 or more (and couples earning $450,000 or more) from 35% to 39%, except for those taxpayers whose income and deductions caused their marginal rate to be determined by the alternative minimum tax (AMT). The federal tax increase reduced the incentive to move from California for taxpayers not in the AMT, since the full deductibility of state and local taxes that prevailed at the time became more valuable. We estimate that the treatment on California households' average tax rates relative to the average tax rates they would have faced in zero-income-tax states such as Nevada, Texas, and Florida would have been 23-40% higher (depending on their income level and composition) in the absence of ATRA.

We combine these results on the extensive margin behavioral response with conclusions of analysis of the intensive margin response to Proposition 30. Our focus on the California tax reform on this margin is motivated by the need for a credible counterfactual group to assess the average treatment effect of Proposition 30 on the pre-tax income of California high earners. Much of the empirical public finance literature studies population-level reforms (i.e. federal tax reforms) and thus must use taxpayers of different income levels to impute the potential outcomes of treated groups, with the aid of regression adjustments. While potentially credible in some contexts, regression adjustment is particularly problematic when treatment and control groups are substantially different, as would be the case in comparing top earners in California to lower income taxpayers. Thus we take a different approach: in particular, we use a differences-in-differences design in which

[1] Since non-residents of California must file a California return if they have any California-source income, this procedure captures essentially all tax-compliant movers. The out migration effect is primarily accounted for by taxpayers who remain non-resident filers in the 2014 tax year; we discuss this mode of out migration at length in Section 5.a.1. On average, the state loses 83.6% of the adjusted-gross income tax base of top-bracket out-movers within two years from this mode of migration, with the remaining income continuing to be taxed in 2014 on non-resident tax returns these individual submit.

[2] Analogous intuition on the importance of average tax rates for extensive margin decisions is found in the literature on firm location choices. See for example Devereux and Griffith (1998).

[3] Of the 66,936 primary taxpayers whom Proposition 30 placed in the to 12.3% bracket in 2012, this implies an income-weighted increase in departures of 535 top-bracket taxpayers.

we compare upper-income California resident taxpayers to a matched sample of non-resident California filers, for which there is relatively rich data given that any substantive California-source income requires the filing of a California tax return even by non-residents.[4].

Our procedure in particular focuses on the intensive-margin impact of Proposition 30 on those California taxpayers who file in the new Proposition 30 top-bracket in each of the years 2009, 2010, and 2011. The motivation for using this definition of high-earners is the well known issue in the empirical public finance literature that top incomes are highly mean reverting. In a recent treatment of this topic, Weber (2016) shows that using long lags of income to instrument for pre-treatment income increases estimation credibility. Requiring consistently high pre-Proposition 30 incomes is a simple way to translate this intuition into the definition of a treatment group in our setting. We use 2009 as the beginning year as it avoids the height of the Great Recession in 2008 and 2011 as the ending year as it is the last year unaffected by tax reforms in 2012-13; in particular Proposition 30 was retroactive to 2012, and Saez (2017) finds that the Federal tax reform of 2012-13 led to substantial income time-shifting from 2013 into 2012. The counterfactual control group of non-resident filers is defined to be those taxpayers who do not reside in California, but file California non-resident returns, and who if California residents would have filed in the top California Proposition 30 created bracket from 2009-11. Our definition of "top earners" turns out to also be natural in the sense that the out-migration effect we find is concentrated amongst this exact group of California residents; that is, those who have filed top-bracket incomes for three consecutive years.

While there is no evidence of substantially different pre-trends between our treatment and control populations, they are substantially unbalanced on covariates. We thus use propensity score matching as a pre-processing step. We match only on 2009-10 covariates. Following the logic in Imbens and Wooldridge (2009), the equality of covariate values in 2011 is a testable implication of the unconfoundedness assumption; we indeed find that this restriction is satisfied, increasing confidence in the estimation design.

Our estimates show a substantial intensive margin response to Proposition 30, which appears in 2012 and persists through the last year of our analysis in 2014. We find that California top-earners on average report $522,000 less in taxable income than their counterfactuals in 2012, $357,000 less in 2013, and $599,000 less in 2014; this is relative to a baseline mean income of $4.15 million amongst our defined group of California top-earners in 2011. The appearance of an intensive margin response in 2012 is consistent with the fact that Proposition 30 was retroactive to 2012, was known to have a substantial chance of passage, and in general was a salient issue in California policy and popular circles during the bulk of 2012[5]. We also estimate the average effect in logs, which leads to even larger estimates. We find that this intensive margin response is concentrated in non-investment income (where investment income is defined as capital gains, dividends, and interest income). Using the levels result from 2013, the estimates imply an elasticity of taxable income with

[4]Appendix Table A7 shows that such filers on average have a California AGI to Federal AGI ratio of between 4.8% and 7.5% over the course of the 2009-14 period

[5]See the discussion of the Proposition 30 institutional setting in Section 3.

respect to the marginal net of tax rate of 2.36. This is a large estimate, especially relative to the classic public finance literature. It is important to emphasize that the estimate is for a population of taxpayers earning over $4 million dollars in taxable income annually. We view the magnitudes of our estimates as broadly in line with the magnitude of the elasticity of CEO income with respect to marginal net of tax rates as reported in Piketty et al. (2014), which are around 2.

We do not take a stand on the broad normative implications of our estimates. For example, one possibility is that lower earnings in response to high tax rates reflects a reduction in productive labor supply amongst high earners. On the other hand, as shown by Piketty et al. (2014), a major driver of top income responses to taxation could be a reduction in rent-seeking, for example a reduction in wage bargaining by CEOs. Our data, while rich, do not allow sufficient granularity to confidently disentangle such channels.

Finally, we assess the implications of our estimates for tax revenue[6] in the context of California Proposition 30. A back of the envelope calculation based on our econometric estimates finds that the intensive and extensive margin responses to taxation combined to undo 45.2% of the revenue gains from taxation that otherwise would have accrued to California in the absence of behavioral responses. The intensive margin accounts for the majority of this effect, but the extensive margin comprises a non-trivial 9.5% of this total response.

This paper proceeds as follows. In Section 2, we review related literature. In Section 3, we discuss the institutional setting, specifically California Proposition 30 and the federal tax changes that occurred at the same time. In Section 4, we describe the data. In Section 5, we describe the empirical methodology. Sections 6 and 7 present the extensive and intensive margin results respectively. Section 9 concludes.

2. Related Literature

2.a. Extensive Margin

While the question of whether tax rates affects migration would seem to be straightforward, as Kleven et al. (2019) discusses in a recent survey, both lack of access to administrative data and identification challenges have to some extent constrained this literature. In addition, literature on the behavioral response to taxation has aimed to analyze the response to taxable income as a whole (Feldstein (1999)) under the notion that this is a sufficient statistic for the efficiency of the tax system. The availability of administrative micro-data, however, allow for the separation of the behavioral response into intensive and extensive margins, so that the behavioral impact of taxation on stayers can be separated from the impact on the decision to move out of a state or region.

Within the tax-induced mobility literature, several studies examine the issue in an international context. Agrawal and Foremny (2018, Forthcoming) finds using administrative Spanish data that

[6]Our calculations bear on revenue implications with regard to the behavior of high-income taxpayers in the sense of taxpayers who file in the top Proposition 30 tax bracket in three consecutive years; the intensive margin analysis focuses on this group, and our extensive margin results are concentrated amongst these persistently high-earning taxpayers.

conditional on a decision to move, a one percent increase in the net-of-tax rate for a region relative to others increases the probability of moving to that region by 1.7 percentage points. Kleven et al. (2014) document an increased tendency of high earning foreigners to relocate to Denmark when a preferential top rate is introduced for all workers who have lived outside Denmark for at east three years, with estimates implying an elasticity of between 1.5 and 2. Though Danish expatriates are afforded this same relocation tax incentive, Kleven et al. (2014) finds small elasticities for such workers. Focusing on specialized groups, Kleven et al. (2013) finds an elasticity of foreign European football players with respect to the net-of-tax rate of around 1, with domestic players significantly less sensitive to tax rates in the decision to leave their own country. Similarly, Akcigit et al. (2016) studies the international mobility of investors and also finds an elasticity of around 1 for foreign superstar investors, but a negligible elasticity for domestic superstar inventors.

As discussed by Kleven et al. (2019), an emerging theme in the microeconometric literature on the migration response to taxation is that treatment effects are strikingly heterogeneous, and may depend on factors such as the size of the tax base, local amenities, and agglomeration effects. The above studies thus may not be informative for migration dynamics within the U.S. Several studies that have considered mobility across the U.S. states have resembled Kleven et al. (2013) and Akcigit et al. (2016) in that they are focused on specialized groups. For example, Moretti and Wilson (2017) considers evidence from star scientists moving in response to taxation across state borders and finds an elasticity with respect to the personal income tax of 1.8 and to the corporate income tax of 1.9. Coomes and Hoyt (2008) examine the propensity of in-movers to a metropolitan area to choose the part of that metropolitan area that is located in a lower tax state. Work by Feldstein and Wrobel (1998) and Leigh (2008) examines the question of the incidence of state income taxation, and in particular the mechanism whereby extensive margin movement could affect the net-of-tax wage, thus considering the somewhat separate question of whether extensive margin movement reduces the ability of state tax policy to redistribute income.

More general work on extensive margin response to tax rates in the U.S. context includes work on millionaire migration such as Young et al. (2016) who use IRS data and argues that millionaire migration is a phenomenon of limited economic significance. Young and Varner (2011) consider micro-data from New Jersey around the imposition of a millionaire and find muted effects. Most recently, and closest to the part of our study that considers the extensive margin, Varner et al. (2018) provide an empirical investigation of high-earner migration in the wake of tax increases using the same dataset as in our work. They find negligible effects of high-earner taxes on either the margins of inward or outward migration. We have little to add to their analysis on the in-migration margin. However, we provide new evidence of substantial high earner out-migration in response to rising state income taxes.

2.b. Intensive Margin

Much has been written about the intensive margin response of taxable income to marginal net of tax rates. The classic study by Feldstein (1995) was the first to use panel data methods in this

context, analyzing TRA-86 and finding elasticities from 1 to over 3 across specifications. Gruber and Saez (2002) use panel data methods in the context of the NBER Continuous Work History File from 1979-1990. This analysis yields a main estimate of 0.4. Kleven and Schultz (2014) in an important recent study finds elasticities in the 0.2-0.3 range in Danish data. The datasets used in these papers give rise to the question of whether the studies reflect the responses of high earners as well as earners in the middle of the distribution. For example, the data used by Gruber and Saez (2002) contain only 13 observations of taxable income over 1 million dollars. In Kleven and Schultz (2014), the average taxpayer in this sample earns approximately 250,000 DKK (2013 values) annually, which is $44,642 in 2013 dollars. As of 2018, the cutoff for the top bracket in Denmark is 542,282, which is $81,537 in 2019 dollars.

Studies of high earners have been more challenging given the need for strong assumptions when working with aggregate data, or administrative data paired with appropriate empirical designs. Saez et al. (2012) uses public use data and aggregate methods to find elasticities for taxable income for the top 1% of U.S. earners with respect to the top marginal rate of between 0.58 and 1.71 between 1960 and 2006, depending on assumptions on time trends in the top 1% share of income. Using microdata from IRS Statistics of Income containing a substantial share of top earners, this paper analyzes the 1993 U.S. top rate increase from 31 percent to 36 or 39.6 percent and finds an elasticity of taxable income with respect to the marginal net of tax rate of 0.5-0.6 using panel data methods. Piketty et al. (2014) presents a theoretical framework in which high top marginal rates reduce income by muting the returns to non-productive bargaining efforts. Using microdata on CEO compensation, they find that the returns to U.S. CEOs from luck are stronger when top rates are low rather than high. Using a sample of international CEOs, they elasticities of CEO pay with respect to top marginal rates of between 1.9 and 2 even after controlling for firm performance and CEO characteristics.

A recent literature has analyzed the impact of federal tax reforms from 2012013. Saez (2017) analyzes the intensive margin impact of the 2013 ATRA reform using aggregate data, finding a substantial time-shifting of income from 2013 into 2012 in response to the policy shift. Kawano et al. (2016) uses federal tax return microdata, restricting the sample to taxpayers earning from $350,000 to $650,000, comparing taxpayers whose pre-ATRA incomes placed them just above and below the 2013 federal top rate hikes. They broadly find negligible intensive margin effects.

3. Institutional Setting

3.a. California Proposition 30

In 2012 California governor Jerry Brown advocated and campaigned for the passage of Proposition 30, the "Schools and Local Public Safety Protection Act". This effort was based on a desire to preserve statewide education funding by instituting new tax increases on California's wealthiest taxpayers. The Proposition also sought to establish the Education Protection Account (EPA) within the state's General Fund, an account that would collect any new tax revenues that were

derived from the newly passed ballot measure for the purposes of education spending.

In total, the Department of Finance believed that the new tax rates would result in an overall increase in combined tax revenue of $8.5 billion over the tax years 2011-2012 and 2012-2013. With this increase in tax revenue, there would be an additional $2.9 billion dollars constitutionally required by Proposition 98 for the minimum funding of schools and community colleges. The remaining $5.6 billion dollars in the General Fund would be appropriated for the purpose of closing the budget gap.[7]

After the formal passage of Proposition 30, California's upper-income taxpayers saw three newly established personal income tax rates. More specifically, the new tax brackets were the following:

- 10.3 percent tax bracket for single filers' taxable income between $250,001 and $300,000 and joint filers' taxable income between $500,001 and $600,000;
- 11.3 percent tax bracket for single filers' taxable income between $300,001 and $500,000 and joint filers' taxable income between $600,001 and $1 million; and
- 12.3 percent tax bracket for single filers' taxable income above $500,000 and joint filers' taxable income above $1 million.

These tax rates would initially be in effect for seven years (from tax year 2012 through tax year 2018).

In addition to the increase in individual tax rates, there would also be an accompanying one-quarter percent increase in the state's sales tax rate, resulting in a sales tax rate of 7.5 percent (up from 7.25 percent), not including local sales tax rates which were subject to potential increases upon the discretion of local governments. When factoring in the state and local sales tax rates in tandem, the average combined tax rate statewide was just above 8 percent.[8]

Ultimately, the wealthiest one percent of California taxpayers, individuals making incomes of more than $533,000, were expected to provide approximately 78.8 percent of the revenues raised by Proposition 30's tax increases, while California's top five percent of taxpayers, individuals making incomes of more than $206,000, would contribute 81.2 percent of the revenues raised. The tax rate would amount to a 1.1 percent increase in income taxes for the top one percent of California taxpayers and an increase in 0.05 percent for the top five percent of California taxpayers.[9]

3.b. 2012-13 Federal Tax Changes

Simultaneous to the changes to state level taxes were notable changes to the federal tax system with the passing of the American Taxpayer Relief Act (ATRA) of 2012. While much of the bill extended provisions from tax bills of the past, there were quite a few nuanced yet significant changes that meaningfully impacted the wealthiest American taxpayers.

[7] "What Would Proposition 30 Mean for California?" pg. 2, see `https://calbudgetcenter.org/wp-content/uploads/120911_Proposition_30_BB.pdf`

[8] Ibid. pg. 1, see `https://calbudgetcenter.org/wp-content/uploads/120911_Proposition_30_BB.pdf`

[9] Ibid. pg. 2, see `https://calbudgetcenter.org/wp-content/uploads/120911_Proposition_30_BB.pdf`

3.b.1. Tax Rates and Brackets

In 2001, President George W. Bush signed into law the Economic Growth and Tax Relief Reconciliation Act of 2001 (EGTRRA). One of the main provisions of the law was to phase-in tax cuts over the course of five years that would stabilize and become permanent. The rates of 28 percent, 31 percent, 36 percent, and 39.6 percent would eventually be reduced to 25 percent, 28 percent, 33 percent, and 35 percent, respectively, in 2006. However, the bill included a sunset provision that would ultimately end the tax cuts in 2011.[10]

With the passing of ATRA, the first three tax rates (25 percent, 38 percent, and 33 percent) were permanently extended. Additionally, this remained true for the top bracket of 35 percent, but only for individuals making less than $400,000, heads of households making less than $425,000, and couples making less than $450,000. If taxable income exceeded those income levels, the rate would rise to the original pre-EGTRRA level of 39.6 percent.[11] Furthermore, all of the taxable income thresholds for these tax rates would be indexed for inflation after 2013.

3.b.2. Capital Gains

In 2003, Congress continued to make substantive changes to the U.S. tax system by passing the Jobs and Growth Relief Act of 2003 (JGTRRA). As a consequence of the bill, realized capital gains received by individual shareholders saw decreases in tax rates to which they were subject. More specifically, realized capital gains that were initially subject to a tax rate of 10 percent (in brackets where the ordinary income tax was higher than 15 percent) and 20 percent (in brackets where the ordinary income tax was higher than 15 percent) were lowered to 5 percent and 15 percent, respectively, through 2007 and zero and 15 percent in 2008.[12]

ATRA, acting in the same fashion as the bill had done with respect to tax rates, permitted the original decreases in the capital gains tax rates to remain permanent. However, this would not be the case for those taxpayers who fell into the reestablished 39.6 percent tax bracket. For those taxpayers, the tax rate on capital gains reverted to its original, pre-ATRA value of 20 percent.[13]

3.b.3. Qualified Dividends

The JGTRRA of 2003 also established new tax rates for qualified dividends. These rates followed the same 5 percent and 15 percent structure as the capital gains tax rates. However, with the passage of ATRA, the rates were slightly altered to continue to mirror the new capital gains tax rate structure (0 percent, 15 percent and 20 percent).[14]

[10] "Economic Growth and Tax Relief Reconciliation Act of 2001" pg. 5, see https://www.govinfo.gov/content/pkg/BILLS-107hr1836enr/pdf/BILLS-107hr1836enr.pdf

[11] "Tax Provisions in the American Taxpayer Relief Act of 2012 (ATRA)", see pg. 5 https://tpc.io/2P2IKcq

[12] "Bush Administration Tax Policy: Introduction and Background" pg. 1292, see https://www.brookings.edu/wp-content/uploads/2016/06/20040913galeorszag.pdf

[13] "Tax Provisions in the American Taxpayer Relief Act of 2012 (ATRA)" pg. 5, see https://tpc.io/2P2IKcq

[14] Ibid.

3.b.4. Alternative Minimum Tax Provisions

ATRA also provided relief to middle income earners by raising the alternative minimum tax (AMT) exemption limit from $45,000 for married couples ($33,750 for singles) and certain personal credits to $78,750 for married couples ($50,600 for singles) and personal credits without notice to an individual's tentative AMT. For 2013 and onward, the AMT exemption would be indexed for inflation.

However, these taxpayer-friendly changes did not extend to higher income earners. Under ATRA rules, the AMT imposed a 26 percent tax on taxable income for AMT purposes up to $175,000. Any amount greater than $175,000 would be subject to a 28 percent rate. For 2013 onward, the bill indexed the threshold for inflation.[15]

3.c. Interaction between State and Federal Taxes

A vital point in determining whether or not confluences of legislative action on both state and federal levels would have mitigating or accelerating effects on outward or inward migration is understanding the ways these legislative provisions interact with one another. As far as ATRA and Proposition 30 are concerned, the newly established tax rates and their interaction with the newly instituted "Pease Provision" can be instructive.

As discussed in depth by Saez (2017), ATRA introduced significant changes with respect to itemized deductions. Through the new provision, the Pease limitation, itemized deductions were reduced by 3 percent of an individual's adjusted gross income when that income exceeded more than $300,000 for couples ($250,000 for singles and $275,000 for head of household filers) for up to 80 percent of the itemized deduction. The addition of this provision ostensibly increased the marginal tax rate of high-income earners by 1.2 percent ($3\% \times 39.6\% = 1.2\%$). However, when factoring in the new state tax increase on the top marginal tax rate, an individual's marginal net tax rate is effectively lower as a result. Consider, for example, an individual in the top tax bracket on both the state and federal level living in California in 2013. This individual's marginal tax rate on the federal level would be 39.6 percent while on the state level the state rate would be 13.3 percent. The top marginal tax rate on income at the federal level in 2013 is 39.6%, the taxpayer share of the health care marginal rate is 1.9%, and the state rate in California is 13.3%. The effective federal marginal rate is $39.6 \times (1 - .133 + .03) = 35.52$, where 3% is added back due to the Pease Provision's limits on itemized deductions[16]. Under a no-Proposition 30 counterfactual, the effective federal marginal rate is $39.6 \times (1 - .103 + .03) = 36.71$. Thus, under Proposition 30 the marginal net of tax rate is

$$100 - 35.52 - 13.3 - 1.9 = 49.28$$

[15] Ibid, pg. 6

[16] Note that the Pease Provision was repealed as of the 2018 tax year

whereas without it would be

$$100 - 36.71 - 10.3 - 1.9 = 51.09$$

3.d. Polling Data and Proposition 30

From the moment Karen Getman and Thomas A. Willis requested a ballot title for Proposition 30 on March 14, 2012 there was a lively public debate regarding the ballot measure. Almost immediately, polls began to gauge public sentiment regarding the ideas in the proposition; on March 14, the firm Greenberg Quinlan Rosner conducted a poll in which California residents supported the measure by a 64% to 33% margin. While this margin would wane to some extent in coming months, support for the proposition prevailed in every poll save for a SurveyUSA poll in October of 2012; this same poll had 29 percent of its respondents identify themselves as "Undecided," which was a figure 15 points higher than any of the other polls conducted concerning the debate on Proposition 30. Furthermore, those in favor of the measure averaged a +12 point margin over those who opposed when analyzing the results of all of the polls in the lead up to the vote.[17]

At the same time, both proponents and opponents of the measure mobilized state-wide fundraising efforts. A total of $120,500,000 was donated relating to Proposition 30; of this total amount, $67,100,000 (55 percent) of the funds were donated in favor of the measure's passage to the opposition's $53,400,000 (45 percent).[18] The majority of anti-Proposition 30 donations derived from one donor – Charles Munger, Jr. Munger donated $35,075,000, or approximately 66 percent, of all donations in opposition to the measure. Anti-Proposition 30 donations in general represented the interests of high earners; in total the top three donations (outside Munger, $11,000,000 came from Americans for Responsible Leadership and $1,100,000 came from William Oberndorf), accounted for 88 percent of all donations for the opposition.[19] Munger and Oberndorf are wealthy businessmen, while Americans for Responsible Leadership in 2013 received the majority of its funding from an organization linked to the Koch brothers[20]. Donations in favor of the proposition derived from a broad coalition representing decidedly less moneyed interests. The largest such donation was $11,439,297 from the California Teachers Association, which amounted to only 17 percent of the total donation pool. The next-largest donations were $10,746,928 from Service Employees International Union/California State Council of Service Employees Issues Committee and $5,089,646 from Democratic State Central Committee of California.[21]

Overall, as is clear from the discussion of polling and political donations, Proposition 30 was a first order issue in both California popular and political circles during much of 2012. It was clear early on in 2012 that the Proposition had a substantial chance of passage, leading some interests representing high-earning California residents to take political action against it. In general, this

[17] "California Proposition 30, Sales and Income Tax Increase (2012)," see `https://ballotpedia.org/California_Proposition_30,_Sales_and_Income_Tax_Increase_(2012)`

[18] Ibid.

[19] Ibid.

[20] See `https://https://bit.ly/2UTkWx8/`

[21] Ibid.

suggests that even as of early 2012 many in California may have been adjusting their behavior in anticipation of the passage of Proposition 30.

4. Data

This paper uses administrative data from the California Franchise Tax Board (FTB). The data file contains the universe of California tax returns from 2000-2015. These tax returns include both the filings of California residents, non-residents and partial-year residents. Non-residents and partial-year residents are coded identically in the data and thus from this point forward will be referred to interchangeably.

From these returns, we have population-level coverage of certain variables measured from the California Form 540. Variables for which we have full coverage include California Taxable Income and Adjusted Gross Income (AGI), Federal AGI, Capital Gains (we observe the sum of long term and short term capital gains), Interest, and Dividends[22]. Appendix section L shows the components of "Total Income," which is then adjusted to AGI through subtractions. AGI then becomes taxable income by removing deductions. State and federal quantities differ due to state and federal specific adjustments. For example, state and local taxes can be itemized in deductions from federal AGI.

Income variables in the data are measured at the household level, or more precisely the level of the primary taxpayer in a household. Three filing statuses account for the near-universe of filings: single, married joint-filers[23], and head of household[24]. In the case of married joint-filers, spousal incomes are aggregated together so that it is not possible to attribute income to one spouse or another. The FTB designates one spouse the "primary taxpayer" and the other a "redundant spouse," and the data include identical records for each party reflecting household quantities. All of our analysis is conducted at the level of a primary taxpayer – that is, a household. However, when appropriate we use the comprehensive panel nature of the data; for instance, when constructing out-migration variables, a taxpayer who today is a primary taxpayer and tomorrow is a redundant spouse is not defined as an out-migration event. We observe taxpayer-level demographic information on marital status, dependents, and for years 2010 and after we observe taxpayer age.

All dollar amounts are inflation-adjusted to 2015 dollars using inflation factors from the California FTB (see Table A12 in the Appendix for these inflation factors). Table A1 contains summary statistics for the full sample, 2000-15.

Lastly, to impute tax rates and taxes paid, we follow the literature in using the TAXSIM calculator developed by the NBER. See Feenberg and Coutts (1993) for a description of TAXSIM. See Appendix Section B for details on this implementation. We use taxpayer-level TAXSIM computations only in our assessment of the average-tax-rate effects of Proposition 30 to inform the extensive margin analysis.

[22]Data for Interest and Dividends are missing for 2009, and capital gains data is missing for 2015

[23]In nearly all cases it is sub-optimal to file separately when part of a married couple.

[24]Head of Household is for unmarried taxpayers who manage the upkeep of a home for a qualified set of individuals.

5. Methodology

5.a. Extensive Margin Responses: Migration

Our ability to detect a larger out-migration effect as compared to the work of Varner et al. (2018) owes primarily to our use of a more general definition of out-migration. In the following we will define this measure and demonstrate its validity and quantitative importance for high-earners.

5.a.1. Measuring Out-Migration

To define an out-migration event, Varner et al. (2018) identify cases in which a taxpayer in three consecutive years $t, t+1, t+2$ displays the following behavior:

- Year t: Files as a California Resident
- Year $t+1$: Files as a California Non-Resident or Partial Year Resident
- Year $t+2$: Does not file

We agree that such behavior patterns constitute migration, and term this phenomenon "full out-migration" occurring in year t. However, this definition may under-count out-migration in the following sense. Some California households may have California-based sources of income which are not easy to immediately relocate. Thus, even if the household for all practical purposes has relocated to another state, it may still file taxes in California due to these income sources. For example, a household may own properties other than its residence from which it derives rental income. Further, it is likely that this scenario is particularly relevant to high-income households. Thus, we consider the additional channel of migration, in which a taxpayer in three consecutive years $t, t+1, t+2$ displays the following behavior:

- Year t: Files as a California Resident
- Year $t+1$: Files as a California Non-Resident or Partial Year Resident
- Year $t+2$: Files as a California Non-Resident or Partial Year Resident

We refer to this sequence of events as "partial out-migration" occurring in year t. While we have provided an intuition for this definition, we proceed to validate this definition in the data, as well as the quantitative relevance of this out-migration margin.

First, we show that such events fit the intuitive definition of a migration. Figure 2 plots the cumulative ratio of California adjusted gross income (AGI) to Federal AGI amongst all partial out-migrations of top-bracket taxpayers[25] which occur in years 2000-09, and separately for partial out-migrations occurring in year 2012. We rely on this ratio to measure the fraction of total taxpayer

[25] "Top-bracket" refers to households which are in the top tax bracket under Proposition 30 policy, based on inflation-adjusted taxable income

income derived from California-based sources because we directly observe both the numerator and denominator in the data (we do not observe state and federal quantities simultaneously for any other component of income, such as taxable income). The figure demonstrates that among partial migration events occurring in 2012, a top-bracket household decreases its California to Federal AGI by 83.6% by 2014. This effect is nearly identical during years 2000-09. Appendix Figure A11a shows that the dynamics of this ratio are driven by a drop in the level of California AGI, whereas Federal AGI does not appreciably drop after the partial out migration.

Secondly, we check whether such events are quantitatively important in the data. Appendix Table A5 shows, over the 2000-09 period, percentage rates of out-migration for various income bins. This tables makes clear that "full out migration" is the dominant mode of out-migration for taxpayers in the 9.3% bracket, but that "partial out-migration" is the primary mode of out-migration observed amongst high-earners.

5.a.2. Out-Migration Regression Specification

We adopt a simple time disaggregated differences-in-differences regression specification to evaluate the impact of Proposition 30 on out-migration. First, we restrict the sample to CA-resident tax returns from years 2000-2013 which are at the post-reform 9.3% tax bracket. The 9.3% bracket forms the "control" group. We allow for three "treatment" groups: those in the post-reform 10.3%, 11.3%, and 12.3% tax brackets. The bracket index b runs through the set $b \in \{9.3\%, 10.3\%, 11.3\%, 12.3\%\}$ in the baseline specification, with alternative specifications including finer cuts of the top income bracket. The dependent variable $\mathbf{1}\{\text{Move Out}\}_{it}$ indicates that taxpayer i engages in full out-migration or partial out-migration beginning in year t, as defined above. We also consider each source of out-migration separately. We use years 2000-10 as the "pre period," and estimate effects separately for years 2011-13.

$$\mathbf{1}\{\text{Move Out}\}_{it} = \alpha_t + \alpha_{\text{Marital Status}} + \mathbf{1}\{t \leq 2010\}_{it} \times \sum_b \beta_{b,Pre} \mathbf{1}\{\text{In Bracket b at Year t}\}_{it}$$

$$+ \sum_{x=2011}^{2013} \mathbf{1}\{t = x\}_{it} \times \sum_b \beta_{b,x} \mathbf{1}\{\text{In Bracket b at Year x}\}_{it} + \phi' X_{it} + \varepsilon_{it} \quad (1)$$

All specifications include year and marital-status fixed effects. We run the regressions either with an empty covariate vector X_{it}, or allow this vector to include the log of taxable income along with fixed effects for 100 bins of taxable income. The baseline regression is weighted by taxable income (inflation adjusted so that weights are consistent across years), so that the coefficients are interpreted not as the fraction of taxpayers moving out, but the fraction of taxable base moving out.

Finally, we stop the sample at 2013 because, even though we have data through 2016, the data from 2016 are problematic in the sense that tax returns from high-earners take longer to process,

and this may bias the sample. Practically this choice does not affect the estimates because we estimate year-by-year coefficients.

5.a.3. Incentives to Move

Our methodology aims to estimate the abnormal rate of out-migration in the years surrounding the passage of Proposition 30 in different categories of taxpayers. A naïve interpretation of our results would state that they are driven by a three-point hike in the marginal income tax rate of top bracket taxpayers, or two and one point hikes for lower brackets. Such statements would be misleading in two ways. First, extensive margin decisions respond to changes in average tax rates (not marginal rates). Secondly and more importantly, even it were the case that these two rates were equal – as may approximately be the case for very high earners – the deductibility of state taxes paid from federal taxable income leads the effective increase in tax rates due to Proposition 30 to be lower than 3%.

To illustrate the issue, suppose that marginal rates are equal to average rates and that state rates are 10.3% and federal rates are 40%. The taxpayer's cumulative tax rate is 10.3% + (1-.103) $\times$ 40% = 46.18%. If state rates are raised to 13.3%, the taxpayer's cumulative rate is 47.98% by the same logic, which amounts to a net tax increase of 1.8%.

Complicating matters further, federal rates rose from 2012-13, which would further mitigate the change in average tax rates for those 2012 California residents contemplating out-migration, which implies that in the absence of a federal tax increase any out-migration incentives would in fact have been stronger.

To precisely understand how Proposition 30 altered incentives to move out of California, we undertake the following exercise. We fix taxpayer behavior at 2012 levels. We first use TAXSIM to compute the difference in the average tax rate each taxpayer i would face if she moved to a state outside California i, relative to California, under 2011 tax policy[26]:

$$\{T^{CA}_{2011}(z_{i,2012}) - T^{S}_{2011}(z_{i,2012})\}_{\forall i, S \neq CA}$$

This quantity represents for each taxpayer the pre-Proposition 30 tax gains to moving out of California.[27] Next, we compute this same quantity for 2012 tax policy:

$$\{T^{CA}_{2012}(z_{i,2012}) - T^{S}_{2012}(z_{i,2012})\}_{\forall i, S \neq CA}$$

Federal tax policy did not change substantially from 2011 to 2012. On the other hand, TAXSIM's 2012 policy incorporates Proposition 30 due to its retroactive nature. Thus, this quan-

[26] To render average tax rates comparable across states, we fix as the denominator 2012 California Taxable Income. This is not ideal, but is advantageous compared to either using raw amounts of taxes paid (which is difficult to interpret), state-by-state taxable income (this quantity cannot be computed in zero-tax states like Texas and Nevada), or a measure of federal taxable income (which will be different under different amounts of state taxes paid).

[27] We note that this calculation disregards movements out of America, but we will show in the results that this does not represent a sizeable share of Proposition-30 driven out-migration.

tity can be interpreted as the post-Proposition 30 tax gains to moving out of California, before the 2012-13 federal tax increase. Finally, we repeat the computation for 2013 tax policy, computing:

$$\{T^{CA}_{2013}(z_{i,2012}) - T^{S}_{2013}(z_{i,2012})\}_{\forall i, S \neq CA}$$

This quantity represents for each taxpayer the post-Proposition 30, post 2012-13 federal policy shift gains to moving out of California.

To systematically summarize the results of this exercise, we first disaggregate taxpayers i into groups B based on their 2012 income: those in the 10.3% bracket, the 11.3% bracket, 12.3% bracket earning under $2 million, $2-$5 million, and over $5 million. For each such group, we report first how Proposition 30 altered incentives to leave California, averaged over individuals and destination states:

$$[\frac{1}{\sum_{i \in B, S \neq CA} 1}] \sum_{i \in B, S \neq CA} [T^{CA}_{2012}(z_{i,2012}) - T^{S}_{2012}(z_{i,2012})] - [T^{CA}_{2011}(z_{i,2012}) - T^{S}_{2011}(z_{i,2012})]$$

We report such averages in the "Only Prop 30" column of Table 1. Note that if $T^{S}_{2012}(z_{i,2012}) = T^{S}_{2011}(z_{i,2012})$ – that is, the destination state does not change tax policy between 2011 and 2012 – the quantity collapses to $T^{CA}_{2012}(z_{i,2012}) - T^{CA}_{2011}(z_{i,2012})$. Thus, we do not disaggregate these averages across destination states, as very few states other than California changed tax policy between 2011 and 2012. These figures show that even for very high earners earning over $5 million dollars in 2015 dollars, the effective increase in average tax rate is closer to 2% than to the top marginal rate increase of 3%. This is due both to the federal deductibility of state taxes and the discrepancy of average and marginal tax rates.

Second, we then account for how this increase in move-out incentives is altered by the concurrent 2012-13 increase in federal tax rates, which induce variation in cross-state movement incentives due to the interaction of the federal policy shift with the existing state of tax deductions in non-California states. That is, we compute disaggregated averages of the form:

$$[\frac{1}{\sum_{i \in B, S \neq CA} 1}] \sum_{i \in B, S \neq CA} [T^{CA}_{2012}(z_{i,2013}) - T^{S}_{2013}(z_{i,2012})] - [T^{CA}_{2011}(z_{i,2012}) - T^{S}_{2011}(z_{i,2012})]$$

We report such averages in the "Prop 30 + Federal Tax Increase" column of Table 1. To provide a broad picture of this heterogeneity, we split the destination states into three groups in the latter columns of Table 1. First, zero-tax states, which have zero state income taxes in 2012 and 2013. Second, non-zero tax states which tax income but do not change tax policy between 2012-13. Finally, we report Iowa, Kansas and Maine separately because these states enacted tax cuts[28] between 2012 and 2013, thus increasing the incentive to move there. Lastly, in the Table

[28]Kansas and Maine explicitly cut rates, while Iowa held its rates constant but reduced its definition of taxable base

calculations we omit Minnestota, which raised the top state income tax rate from 7.85 to 9.85 so that there was little incentive to move from California to Minnesota. Figure 1 provides a visualization state-by-state of average rate increases for taxpayers in the $5+ Million income bin.

The largest marginal gains from out-migration in this most realistic calculation are realized by moving to Kansas and Maine, which themselves dropped taxes. However, outside these cases, we see that empirically the most tax savings over and above pre-existing gaps are realized by relocating previously low-tax states such as Texas and Nevada, as opposed to states which previously had non-zero income taxes. This is not what we would expect given only the interaction of the federal tax rise in conjunction with the state tax deduction; it occurs in the data because the 2012-13 included a phase-out of itemized deductions, called the "Pease Provision" (Saez (2017)).

It is theoretically ambiguous whether out-migration in response to a California tax increase should flow more strongly to states with higher marginal increases in tax savings, such as Kansas, Maine, and Iowa, or whether migration should flow toward the states with all-in highest savings in taxes, which are the zero-tax states. The latter behavior would be rationalized in a model in which taxpayers only value tax savings in location decisions, in which case the salient decision criterion is the minimum average tax rate obtainable by moving to any state within the U.S. The former behavior could be rationalized in a model in which taxpayers have very strong idiosyncratic destination preferences; in an extreme case suppose each taxpayer can only move to one destination state at random (perhaps due to social networks or an employment situation), in which case the decision criterion is the minimum average tax rate obtainable by moving to that one state. In this case and given random preferences, states such as Kansas should see higher out-migration from California than would a zero-tax state like Texas.

We note that while all analysis here is framed in terms savings in the average tax realized from leaving CA, it can be considered equivalently as gains in the net of tax rate. These are equivalent here because we are using levels (not logs).

Logs. Much of the literature on the extensive margin response to taxation uses logs of the net of tax rate, instead of levels, as the indepenent variable of interest (i.e. Kleven et al. (2014), Moretti and Wilson (2017), Agrawal and Foremny (2018, Forthcoming)). Appendix Table A2 shows the analysis in terms of logs of the net of tax average rate. Note here that the incorporation of the federal tax increase from 2012-13 in fact can lead to higher increases in the log net of tax rate benefits from leaving California. This is because, although the levels difference argument from above carries through, differences in logs are approximately percent differences. The large federal tax increase leads all net of tax rates to fall, leading to the magnification of any percent difference. Based on these calculations, the average incentive to move is approximately equal for states with non-zero taxes and no tax changes when incorporating the federal tax rise, but it is 38% higher for zero-tax states with the federal tax change.

5.b. Intensive Margin Methodology

Our focus with regard to the intensive margin impact of taxation is estimating the effect of the California tax reform, attempting to difference out behavioral responses to the federal tax reform. We do this because the federal tax reform affects all U.S. citizens and thus it is difficult to construct a credible counterfactual group. Existing studies largely attempt to use lower-income groups to control for the income trends in top-brackets (see Kawano et al. (2016) in the context of the 2013 federal tax reform). In contrast, our approach is to focus on state tax reforms for which we have cross sectional variation for taxpayers of comparable earnings status.

5.b.1. Differences in Differences

To study the causal effect of the California tax reform (and to difference out income re-timing from 2013 into 2012 resulting from the federal tax increase), we use the following empirical strategy. We define the "treatment group" of taxpayers as those who from 2009 to 2011 filed as California residents, and further who for each year earned taxable income which placed them in the range of the top-bracket as newly introduced by California Proposition 30. Finally, we require that each "treated" taxpayer file as a California resident through 2014. The motivation for defining treatment status based on a measure of persistent high-earnings is the well-known issue in the literature on intensive margin responses to taxation that high incomes are strongly mean reverting (see for example Weber (2016)). For example, in our setting of California, incomes may mean revert due to startup IPOs or other liquidity events.

To identify the causal response of such taxpayers to California Proposition 30, we need a suitable counterfactual. Our "control group" is defined as those taxpayers who file non-resident returns in California in every year from 2009 to 2014, and whose inflation-adjusted CA taxable income[29] places them in the top California bracket (as introduced under Proposition 30) for 2009-11. Such taxpayers are not subject to California taxes except for their California source income; Appendix Table A7 shows that such filers on average have a California AGI to Federal AGI ratio of between 4.8% and 7.5% over the course of the 2009-14 period. On the other hand, California residents are subject to state income taxation on all income regardless of its geographic source.

This setup suggests a differences-in-differences strategy. We show the raw plots of this differences-in-differences for levels and logs of taxable income and AGI in Appendix Figure A9. As is evident in this figure, and from the tabulation in Table 5, non-resident filers in the control group display substantially higher earnings than do residents. Thus, covariate imbalance is severe and is a major endogeneity concern.

[29] That is, their California taxable income if they were California residents, in which case their entire income base would be subject to California taxation. This quantity is a variable in our dataset.

5.b.2. Differences in Differences with Matching

To address this concern, we use as a pre-processing step a simple matching procedure. Our procedure matches with replacement on propensity scores calculated using a logistic regression on 2009-10 total AGI, taxable income, and capital gains, and matches with replacement. This approach retaining the full "treatment" group while re-weighting the "control" group to achieve better covariate balance. The procedure enables us to recover an average treatment effect on the treated, where the "treated" are persistently high-earning California residents in our particular fashion.

We conduct matching in two ways. First, we use the full set of non-resident controls as matching candidates. Secondly, as a robustness check, we use only taxpayers filing in 2011 from states with similar state tax rates to California. We define this group of states as Hawaii (11% top rate), Oregon (9.9% top rate), Minnesota (9.85% top rate), Iowa (8.98% top rate), New Jersey (8.97% top rate), Vermont (8.95% top rate), District of Columbia (8.95% top rate), and New York (8.82% top rate). To motivate this robustness check, suppose in the initial procedure we match a California taxpayer to a Texas resident filing as a California non-resident with the same pre-period income. If the Texan were transplanted to California, she would presumably earn less given the higher marginal tax rate in California, which contaminates the matching. That is, we would like to match on pre period incomes under identical tax regimes. Using states with high tax rates in the pre-period helps alleviate this concern.

After matching, we apply a year by year differences-in-differences estimation to adjust for any remaining differences in covariate balance across the matched treatment and control groups. As discussed in Imbens and Wooldridge (2009), while the unconfoundedness assumption justifying the matching procedure cannot be directly tested, its plausibility can be assessed through placebo-style tests. In our setting, while 2009-2011 covariates are predetermined from the viewpoint of the tax policy treatment, we only match on 2009-10 covariates. This allows us to examine outcomes in 2011 as a placebo-style test. If unconfoundedness were true, we would not expect the matched control and treatment groups to display systematic differences in 2011. As such, in our differences-in-differences regression we take the pre-period as 2009-10, and estimate "treatment effects" separately for 2011-2014. If unconfoundedness holds, we do not expect to see a substantial the 2011 "treatment effect". The estimating equation is as follows.

$$z_{it} = \alpha_i + \alpha_t + \alpha_{\text{Marital Status}} + \sum_{x=2011}^{2014} \mathbf{1}\{t = x\}_{it} \times \mathbf{1}\{\text{CA Resident}\}_{it} \times \beta_t + \varepsilon_{it} \tag{2}$$

Regression specification and income re-timing. Our estimating equation differs from the classical equation in the literature estimating intensive margin responses to tax policy using microdata, which runs the year on year log difference in income variables on the left hand side (see Gruber and Saez (2002) for a classic treatment, and Kawano et al. (2016) in the context of the 2013 federal tax change).

We use this specification because it enables a cleaner treatment of income re-timing than the classic approach. To see this, consider the following framework. Suppose that observed income in

year t for taxpayer i is $z_{it}(W_{it})$ where W_{it} the treatment is binary: 0 corresponds to tax policy prior to the reform, while 1 corresponds to the post reform tax policy. That is, we observe $z_{it}(0)$ in the absence of Proposition 30, and $z_{it}(1)$ under Proposition 30. This potential outcomes formalism encapsulates all behavioral responses (including "non-real" responses such as tax base shifting) except for income re-timing responses. For such responses, let $F_i > 0$ denotes income shifted from 2013 into 2012 in response to the federal tax reform. Explicitly, in the absence of Proposition 30 the observed sequence of incomes for taxpayer i is

$$\{z_{i,2009}(0), z_{i,2010}(0), z_{i,2011}(0), z_{i,2012}(0), z_{i,2013}(0), z_{i,2014}(0)\}$$

In reality we observe the following sequence:

$$\{z_{i,2009}(0), z_{i,2010}(0), z_{i,2011}(0), z_{i,2012}(0) + F_i, z_{i,2013}(1) - F_i, z_{i,2014}(1)\}$$

Given this setup, any log-difference variables involving 2012 or 2013 are all mis-measured due to front loading. We note that the year on year difference 2012-13 double-counts the front-loading quantity, and any longer difference involving 2012 or 13 (such as a 2011-13 difference) will still be contaminated by the income re-timing.

Front loading of this type is empirically relevant. For example, Saez (2017) uses aggregate public-use data to infer substantial front loading from 2013 into 2012 in response to the federal tax reform. We corroborate this in our data with the following exercise. Appendix Figure A5 presents raw time trends of year on year log differences of taxable income for California residents (indexed for inflation). Despite the absence of a suitable control group, we see that on average the 2012-13 effect seems quite large. However, given the brief framework outlined here, the 2012-13 reponse may be large precisely because of front loading. One way to purge the sample of front loading is to average 2012 and 2013 incomes together. Figure A6 displays log differences across 2-year averages thus calculated. This figure shows in particular that the log difference between 2010-11 and 2012-13 incomes is not particularly small for any income bracket, and in fact is historically quite high. To see this in more granular income bins, Figure A7 shows that the effect in 2012-13 is very pronounced at the very top of the income distribution, and Figure A8 shows again that the apparent effect disappears when averaging across 2-year periods.

In sum, working in levels instead of differences allows a year-by-year comparison of income levels and avoids the problems in interpretation created by using log differences in the presence of front loading. We also note that any 2012 treatment effects we estimate in the context of the California Proposition 30 treatment effect do not have a re-timing interpretation because the California policy was retroactive to 2012. We do not expect a 2011 front loading response as Proposition 30 was not widely expected or discussed as of 2011.

6. Extensive Margin Response

Figure 3 shows the main graphical results on out-migration. The top two graphs show taxable-income weighted out-migration probabilities by year and tax bracket for taxpayers who filed as California residents in year t, disaggregated across the two ways that taxpayers leave the state: (i) resident to non-resident to non-resident; and (ii) resident to non-resident to non-filer. The bottom panel shows the combined effect of both types of departure. In order to examine how the departure rates vary at different points of the income distribution for high earners, we decompose the 12.3% bracket into three subgroups: 12.3% under $2 million, $2-$5 million, and greater than $5 million.[30]

The top graph shows a sharp uptick in taxpayers who earned $5 million or more in 2012 leaving the state after 2012 for multiple years of non-resident tax filings, from a rate of around 1.2% in the prior years to over 1.6% in the year 2012 to 2013. Taxpayers earning between $2 million and $5 million display a similarly large effect. Figure 3 corroborates the aggregated statistics from Appendix Table A5 in demonstrating that this tax structure of departure is substantially more common for this group than moving from resident to non-resident to non-filer, presumably given the fact that most very high earners have some remaining California source income and then would have to file a California tax return even as a non-resident for several years after departure. As discussed in Section 5.a.1, this mode of migration leads to an outflow of 83.6% of taxable base within two years. The middle graph shows an increase in full out migration as well, although smaller. Overall, the bottom graph shows that when the departure structures are combined, there is a clear increase from a 1.5% departure rate after the 2011 tax year to a 2.125% departure rate after the 2012 tax year for taxpayers with more than $5 million in taxable income. Similar patterns are seen in the $2-$5 million range of broadly comparable magnitude. We note that there is no evidence of pre-trends in the departure rates for the taxpayers in the highest income categories.

Table 2 provides regression estimates of the magnitude of the out-migration effect, showing estimates of the the baseline equation 1. The estimates from column (1) show that, relative to the 2000-10 period, we cannot detect statistically or economically significant deviations in the rate of migration in 2011-12 for the newly introduced top bracket, but from 2012-13 California loses 0.8% of the taxable base in this income range. Column (2) demonstrates that the inclusion of log income and fixed effects for 100 income percentiles as income controls does not diminish these results. The remaining columns of the table decompose mover types into those who file the next two years as non-resident versus those who file for one year as a non-resident and then do not file. The majority of the effect (0.5%) is concentrated in taxpayers moving from resident status into persistent non-resident filing. Table 3 shows unweighted estimates with more granular income bins, showing that the out-migration effect is indeed concentrated in higher-earning taxpayers. This table directly mirrors the graphs in Figure 3.

Based on the differences reported in Table 1 between the increases in average tax rates based on Proposition 30 alone versus based on Proposition 30 plus federal variation relative to other

[30]The tax brackets or taxable income bins are assigned based on 2012 rules and income, with income indexed to inflation to lead and lagged years use California FTB inflation factors.

states, we estimate that the treatment on California households' relative average tax rates would have been 23-40% higher without the federal reform. In the absence of the ATRA, and assuming taxpayers understood the actual net change in incentives due to both state and federal variation, this analysis suggests that the hazard rates of departure would have been larger. See Section 5.a.3 for a full discussion of this issue.

6.a. Transitory vs. Persistent High Earners

It is well known that high incomes are strongly mean reverting, and this issue has been the subject of much research for example in the literature on the intensive margin response to taxation (see Weber (2016) for a recent discussion). Further, the tax revenue implications of transitorily high-earners leaving California are less problematic than the out-migration of persistent high earners. It turns out that out-migration in response to Proposition 30 is driven by persistently high earners.

To see this, in Table 4 we replicate the baseline analysis in Table 2, but add one extra taxpayer group: those whose taxable income places them in the Proposition 30 top bracket not only in year t, but also in $t-1$ and $t-2$. We restrict the sample to years 2002 and after to accommodate the definition of this group. The first two columns confirm that the out-migration effect holds when dropping the early years of the table; columns (3) and (4) show that taxpayers persistently filing in the top bracket fully subsume the out-migration effect from 2012-13. Figure 4 shows the year to year movements trends for such taxpayers in isolation (Appendix Figure A1 shows this series along with other income bins). Notably, this series is far more stable than the relatively noisy top-earner migration rates shown in Figure 3, suggesting that noisy year to year migration rates are due to the behavior of transitory high earners.

6.b. Mover Origins and Destinations

Figure 5 disaggregates the out-migration effect across the six largest MSAs in California by total taxable income. California resident locations in year t are measured as of year $t-1$, as if year t is a taxpayer's last year filing as a resident, by the time of filing taxes the taxpayer is often already located in a different state. The figure shows that the out migration effect appears to be primarily driven by the Los Angeles - Long Beach and San Diego metropolitan areas. Appendix Table A3 shows accompanying regression estimates confirming this graphical intuition.

Figure 6 disaggregates the out-migration effect across mover destinations, by state of residence as measured in the year $t+1$ for taxpayers filing in year t as California residents and moving immediately thereafter. The figure shows that the out migration effect is strongest in the direction of states with zero state taxes. This is consistent with the strong salience of tax considerations in relocation decisions. Appendix Table A4 contains the accompanying regression estimates, which show that $\frac{2}{3}$ of the out-migration in the \$2-5 income range is directed toward states with zero state income tax, and $\frac{5}{7}$ of the effect is directed toward such states amongst those earning more than 5 million in taxable income. Appendix Figure shows in a map the destination states of households that move out of California.

6.c. Elasticity Calculations

As highlighted by Kleven et al. (2019), the elasticity of mobility with respect to tax policy may vary substantially depending on the specific context. However, for completeness we present here a calculation of the elasticity of out-migration to zero-tax states with respect to the difference in average tax rates between such states and California.

Focusing only on moves to zero-tax states, Appendix Table A4 shows that the treatment effects are 0.4% for the 2-5 million bin, and 0.5% for the 5+ million bin. Appendix Table A6 reports that the baseline rates of migration from California to these zero-tax states are 0.394% and 0.428%, respectively. These figures supply the necessary ingredients for the numerator of the elasticity. To evaluate the denominator, the the disparity in average tax rate from California to the zero tax states was 6.56% in 2011 and 8.22% in 2013 for taxpayers earning $2-$5 million in 2012, and similarly 6.78% in 2011 and 8.65% in 2013 for those earning over $5 Million (see Section 5.a.3 for a discussion of how these figures are computed).

For taxpayers earning $2-5 million, the elasticity is

$$\frac{\frac{0.4}{0.394}}{\frac{8.22}{6.56}-1} = 4.01$$

For taxpayers earning over $5 million, the elasticity is

$$\frac{\frac{0.5}{0.428}}{\frac{8.22}{6.56}-1} = 4.23$$

Log of Net of Tax Rate. Using the log specification of Moretti and Wilson (2017) along with the log net of tax rate differences computed in Appendix Table A2, we compute the elasticity of migration with respect to the log net of tax rate as for the $2-$5 million bracket:

$$\frac{\log(\frac{0.004+0.00394}{1-(0.004+0.00394)}) - \log(\frac{0.00394}{1-0.00394})}{0.0450} = 15.31$$

and for the $5+ million category:

$$\frac{\log(\frac{0.005+0.00428}{1-(0.005+0.00428)}) - \log(\frac{0.00428}{1-0.00428})}{0.0504} = 15.45$$

These magnitudes are far higher than those documented in Moretti and Wilson (2017), which are around 2. However, we again emphasize that our elasticity calculations should be interpreted with substantial caution; they are likely to over-state magnitudes relative to other papers because the out-migration effect we find is a one-time movement; out migration in our context reverts to pre-Proposition 30 levels after 2012-13, while for example Moretti and Wilson (2017)'s analysis finds a hazard rate of migration which increases with time.

7. Intensive Margin Response

7.a. Covariate Balance After Matching

Table 5 shows summary statistics for covariate balance in the year 2011 across the treatment group (that is, taxpayers filing as California residents from 2009-14 who file in the top Proposition 30 bracket in 2009-11), raw control group (taxpayers filing as California non-residents from 2009-14 who would file in the top Proposition 30 bracket in 2009-11 if all of their income were CA-sourced), and the two matched samples (first using the full control set as matching candidates, and secondly using only control observations filing from states with similar tax rates to California). We note that the matching procedure uses only the average levels of taxable income, AGI, and capital gains across 2009-10 to estimate the propensity score, so that 2011 balance is not baked into the procedure. Matching achieves reasonable balance across the 2011 income variables, and further also in demographics.

7.b. Main Estimates

Figure 7 shows yearly group averages for both logs and levels of AGI and Taxable Income. Visually, we observe parallel trends between resident and non resident groups both in levels and logs from 2009-11. This is not baked into the matching procedure, but rather is a reassuring result. Further, visually it does not appear that there are differential income trends across California residents and non-residents in 2011. As previously discussed, this is consistent with the unconfoundedness assumption.

Table 6 shows the accompanying difference in difference regression estimates, corresponding to equation 2. The first row of the table shows that we do not estimate statistically or economically significant placebo treatment effects in 2011, which confirms the graphical analysis. Across specifications, we estimate economically and statistically significant treatment effects of Proposition 30 in years 2012-14. The average high earning California resident reports .134 log points less in taxable income in 2012 due to Proposition 30, .174 log points in 2013, and .282 log points in 2014. In levels, we find that residents on average reported $0.522 million less in 2012 income, $0.357 million less in 2013 in come, and $0.599 million less in 2014 income. The appearance of an intensive margin response in 2012 is consistent with the fact that Proposition 30 was retroactive to 2012, and as discussed in Section 3 was known to have a substantial chance of passage and in general was a salient issue in policy circles during the bulk of 2012.

Using as a baseline the 2011 average taxable income of $4.15 million among residents, the levels magnitudes are smaller than the log estimates in each year. That is, the average percentage treatment effect is larger than the cumulative percentage response. This outcome could be generated by the presence of a few taxpayers experiencing high income growth while the majority of others see a decline, a plausible scenario given our setting in California.

We note that across logs and levels of both AGI and taxable income, the response in 2014 broadly appears larger than the 2012 and 2013 responses. This could be explained as a dynamic

treatment effect, whereby arranging the mechanisms for tax avoidance takes time. It could also be the result of diverging macroeconomic conditions in California and other states: the credibility of our identification strategy likely wanes over time.

Table 7 examines the contribution of investment income to the main estimates. In the data, we are able to consistently observe dividends and interest for the full sample of taxpayers from 2010 through 2013 (in other years these variables are missing for at least 90% of our sample). Thus, in this specification we restrict to years 2010-13, using the year 2010 as the only pre period. We further restrict to regressions in levels (not logs), because this provides a natural setting for a decomposition as logs do admit additive decompositions. In columns (1) and (2) we confirm that the results from the main estimates carry through with this altered sample; they are smaller in magnitude, but still economically and statistically significant. We define "investment income" as the sum of capital gains, dividends, and interest income. Columns (3) and (4) show that the estimated treatment effects persist when subtracting out investment income, and if anything appear larger. Columns (5) through (8) show that we are unable to conclude that Proposition 30 has statistically significant impacts on investment income. The first row of this table confirms the lack of 2011 pre trends in any of the income categories. Appendix Figure A10 shows the accompanying difference in difference graphs.

7.c. Tax-Similar States Control Group

Figure 8 shows the results when only tax-similar states are used for the matching. Table 8 shows the accompanying regression estimates. For taxable income, in logs the treatment effects here appears somewhat larger, while in levels the treatment effects appear smaller. For AGI, the estimates appear to be similar or slightly smaller. Either way, this provides a useful robustness check to the main estimates which more closely approximates the ideal of matching income variables in the pre-period under identical tax regimes.

7.d. Elasticity Calculations

As discsussed in Section 3.c, under Proposition 30 the top marginal net of tax rate for California residents is 49.28 whereas without it would be 51.09 The percentage difference between these is 3.54%; this quantity is the denominator in the elasticity calculation.

To compute the numerator – that is, the change in taxable income – we rely on the main estimates for the treatment effect of Proposition 30 on the level of taxable income in 2013, found in Table 6 column 2. We choose to use the estimate in levels rather than logs because the concavity of the log function shifts the focus away from large level movements. While helpful in some circumstances, this property in our setting may not be desirable. For example, suppose that there are 100 taxpayers for whom the marginal tax rate is raised from 10.3% to 13.3% at any level of income. Of these, there are 99 taxpayers each of whom in the absence of the tax reform would earn $100, and each of these taxpayers display earnings under the tax reform of $95. The last taxpayer earns $1000 and does not respond to the treatment. The average treatment effect in logs is

$\frac{99}{100}[\log(95) - \log(100)] \simeq -0.05$, whereas the average treatment effect in levels is $\frac{99}{100} \times -5 = -4.95$. Using these treatment effect estimates, the revenue consequences using the log version would imply far more serious revenue consequences than would the levels version. This is because the log result focuses on the average percentage effect, which in this scenario is concentrated in lower-level incomes which are less relevant to revenue considerations than the behavior of the single taxpayer earning $1000. This example is obviously highly stylized and unrealistic, but displays the intuition that levels are perhaps a more natural specification for studying the revenue consequences of taxing high-earners. Further, it turns out that in our specifications the levels estimates are more conservative than log estimates, so in a practical sense this procedure gives conservative estimates.

Using a $4.15 million baseline value for taxable income, the 2013 treatment effect is $0.347 million dollars, which is 8.36% of the mean value. This yields a rough elasticity of 2013 income with respect to the marginal net of tax rate of 2.36. This estimate is robust when using the tax-similar states, which yields a 2013 treatment effect of $0.373 million dollars and a corresponding elasticity estimate of 2.53. This is a large estimate, especially relative to the classic public finance literature. However, we believe the results are reasonable because the estimate is for California residents on average earning over $4 million dollars in taxable income annually. We view the magnitudes of our estimates as broadly in line with the magnitude of the elasticity of CEO income with respect to marginal net of tax rates as reported in Piketty et al. (2014), which are around 2.

8. Policy Implications

8.a. California Tax Revenue

We use the estimates from our intensive margin estimation exercise to perform a back of the envelope calculation, aimed at quantifying the fraction of windfall revenue accruing to the state of California from the Prop 30 policy shift which was lost to behavioral responses.

Intensive Margin. The matching and differences in differences methodology above yields yearly estimates of average treatment effects in levels among perpetually top - bracket California taxpayers for each of 2012, 2013, and 2014. We re-estimate these treatment effects separately within marital status cells using a disaggregated version of our main specification, since tax bracket cutoffs vary across such cells[31]. For each marital status by year cell, we define a representative taxpayer as the mean taxable income in each cell, assuming all income is in wages and no itemized deductions outside the state tax deduction. For each such earnings profile, we first compute the revenue gains to California from Proposition 30's tax increases assuming no behavioral change. We then use the econometric estimates to compute the revenue gains from Prop 30 under observed behavioral changes. Aggregating up across marital status cells using population ratios allows us to compute the percentage of windfall revenue gains dissipated by behavioral responses on the intensive margin.

Using this procedure, the levels results imply that 46.6% of windfall revenue gains are dissipated by intensive-margin behavioral response in 2012 among the group of California resident taxpayers

[31] Appendix Tables A8, A9, and A10 contain the marital status specific estimates used for this procedure

analyzed. The intensive margin response dissipates 40.9% of such gains in 2013, and 56.7% in 2014.

These aggregate figures are driven heavily by married California residents, who in every year from 2012-14 comprise approximately 67% of the sample (single filers account for 29%, and head of household filers make up the remaining 4%). To illustrate the calculation consider the case of married California residents in 2013 (and note all calculations use 2015 dollar values). For this subset, the mean observed income is $4,459,590. To compute the revenue gains to the state of California from Proposition 30 under this observed behavior, we calculate that this representative taxpayer pays an additional amount of

$$(631,732 - 526,444) * .01 + (1,052,886 - 631,732) * .02 = \$9475.96$$

over the 10.3% and 11.3% brackets. The taxpayer then has $3,406,704 of income in the top bracket, on which California earns an additional 3%, leading to a revenue gain of $102201.10. Despite these revenue gains, the state loses $\$298,000 \times .103$ due to behavioral responses (in the absence of the tax, this amount would have been earned and taxed at the pre-reform top rate of 10.3% – the figure -$\$298,000$ is taken from Table A9 and is the married-specific treatment effect estimate.). This leads to revenue gain of $80,983.10, net of the behavioral response. Now, suppose there were no behavioral response. The additional revenue from inframarginal tax brackets does not change. however, the taxpayer has $3,406,704 + $298,000 of income in the top bracket, on which California earns an additional 3%, leading to a revenue gain of $120617.10. This implies that among married couples, the intensive margin behavioral response dissipates $1 - \frac{80,983.1}{120617.10} = 0.328$ of windfall revenue gains from taxation. This is aggregated with single and head of household figures through a weighted average (using the weights 0.67, 0.29, and 0.04) leading to the aggregate figure 40.9% (the treatment effect points estimates in 2013 are larger for singles and heads of household' see Appendix Tables A8 and A10).

Extensive Margin. To understand the impact together of the extensive and intensive margin estimates, we rely on the estimates in Table 4 which demonstrate that the out-migration effect is concentrated among taxpayers who have filed in the top California bracket three years in a row. In this manner we aim to arrive at an estimate which will inform the revenue implications of our behavioral estimates with regard to this particular class of high-earning taxpayers.

To incorporate this margin, we allow for a 99.1% probability that continuing taxpayers do not out-migrate and stay in-state. With 0.9% probability a representative taxpayer earning 4.15 million dollars[32] and paying $515,134.74 in taxes to California[33]. Given this additional margin, the state loses 45.2% of its windfall gains in 2013, so that the extensive margin accounts for 9.5% of the behavioral response impact on tax revenues in the year 2013.

State Tax Deductibility and Revenue Impact Magnitudes. We note that the analysis

[32]This uses the average taxable income for 2011, which is more conservative than using the average from 2012 which is distorted by income shifting from 2013

[33]This quantity is computed using TAXSIM assuming a married taxpayer earning all wage income, and that 83.6% of the taxable base moves out of California, which is conservative as some high earners do fully migrate out.

of California Tax Revenues is a bit peculiar in that a very large intensive margin elasticity estimate leads to a somewhat smaller revenue impact than would be reasonably expected. This is an artifact of the deductibility of state and local taxes during our sample period: whereas California raised top rates by 3% and state tax revenues reflect this fully, the state tax increase implicitly lowers the federal tax increase so that the effective top rate increases less than 3%. In particular, with a 39.6% top rate, a 3% state tax increase is accompanied by a $39.6\% \times .03 = 1.188$ drop in the federal tax rate, so that the effective top rate increase is 1.812%.

8.b. 2018 Federal Tax Reform

In 2018, Congress passed the "Tax Cuts and Jobs Act" (TCJA). Under this law, the top rate is 37% for single and head-of-household filers earning over $500,000, and for married filers earning over $600,000. Despite this nominal cut to top rates, the legislation on net increased rates on top earners because it capped state and local deductions at $10,000 total[34]

Intensive Margin. First we use our top line intensive margin elasticity estimate to provide a ballpark quantification of the federal tax revenue implications of TCJA for the particular set of California high earners in our treatment group. In 2017, incorporating the SALT deduction and the Pease Provision, the top rate for a California high earner is $39.6\times(1\text{-}.133\text{+}.03) + 13.3 + \frac{3.8}{2}$, implying a marginal net of tax rate of 49.28. In 2018, the top rate is $37 + 13.3 + \frac{3.8}{2}$, implying a marginal net of tax rate of 47.8. Using the elasticity estimate of 2.36, we compute that top-earner incomes for the particular group of high-income California residents in our sample would change by $2.36 \times (\log(47.8) - \log(49.28)) = -0.072$ log points.

Consider a married California taxpayer earning $4.15 million of wage income. In 2017, this taxpayer pays a federal tax bill of $1,431,305.17. In 2018, incorporating the 7% income decrease, this taxpayer pays a federal tax bill of $1,358,514.00. This amounts to a 5% decrease in tax revenue, putting the TCJA on the wrong side of the Laffer Curve for high-earning individuals in California. This calculation should be interpreted with substantial caution, since our estimates are interpreted as an average treatment effect specific to our particular group of California high-earners (that is, those filing in the top California tax bracket three years in a row), and further the literature as in Gruber and Saez (2002) has found that taxpayer intensive margin decisions are more sensitive to state than to federal tax policy changes.

Extensive Margin. The TCJA led to changes in average tax rate differences between states as a result of the SALT deduction cap. In Appendix Figure A11, we repeat the computations from Table 1 to assess how the 2018 CA-other state gap in average taxes paid grew over and above the 2017 CA-other state gap. The gap is reported only for the case of zero-tax states, that is states with zero state income tax, as these were the salient destinations for tax-driven out-migration identified in our extensive margin empirical results. The zero-tax states in this period are the same as in the prior exercise, with the exception of Wyoming which changed policy between 2017-18[35]. Taxpayer

[34]The "Pease provision" was repealed by TCJA until 2025 under this legislation. The Pease Provision had reduced the marginal rate gains to itemized deductions by 3%.

[35]This group is as follows: Alaska, Florida, Nevada, Texas, South Dakota, and Washington.

behavior is still fixed at year 2012 levels suitably inflation-indexed; while we would ideally use year 2017 data, we do not have access to these data. We simply carry through 2012 behavior for parsimony and ease of comparison with our other calculations.

Comparing Table 1 to Table A11 reveals that the TCJA increased incentives (in terms of the level of the average tax rate gap) to leave California for zero-tax states by 2.15 the amount of Proposition 30 for those earning over $5 million, and by a factor of 2.43 for those earning from $2-5 million. Based on these scaling factors, we would expect an out-migration effect of 1.46% of those earning $2-5 million, and 1.51% of those earning $5 million.

9. Conclusion

The issue of behavioral responses to income taxation is an important question in academic and policy circles. Prior research has made important progress in this area, but substantial controversy remains. In this paper we draw on rich microdata on the universe of tax returns from the California FTB to provide two new data points to inform this debate with a particular focus on the income taxation of high earners.

First, we document a substantial one-time out-migration response to increased state tax rates. Relative to the pre-period 2000-10, the taxable income weighted rate of departures amongst top-bracket taxpayers was abnormally high by 0.8% in 2012-13. Consistent with the theoretical prediction that migration decisions respond to average tax rates, this migration effect increases with income and is concentrated among taxpayers earning over $2 million dollars.

Second, we provide a simple, transparent framework to study the intensive margin response to Proposition 30's increased marginal tax rates for taxpayers who do not respond on the extensive margin. We use a differences-in-differences design which compares upper-income California resident taxpayers to a matched sample of non-resident California filers who are not subject to Proposition 30's higher tax rates (except through the small share of their income filed in California). Our design focuses on California taxpayers who are likely to earn top-bracket incomes in the absence of Proposition 30, defined as those who file in the new Proposition 30 top-bracket in each of the years 2009, 2010, and 2011. To increase covariate balance between the treatment and control groups, we apply a propensity score matching method which matches only on 2009-10 covariates. This procedure leaves the equality of covariate values in 2011 as a testable implication of the unconfoundedness assumption, which we cannot reject. This increases our confidence in the empirical design.

Our intensive margin estimates show a substantial intensive margin response to Proposition 30, which appears in 2012 and persists through the last year of our analysis in 2014. Relative to a baseline mean income of $4.15 million amongst our defined group of California top-earners in 2011, we find that California top-earners on average report $522,000 less in taxable income than their counterfactuals in 2012, $357,000 less in 2013, and $599,000 less in 2014. An average effect in logs yields even larger estimates. We find that this intensive margin response is concentrated in non-investment income (where investment income is defined as capital gains, dividends, and

interest income). Using the levels result from 2013, the estimates imply an elasticity of taxable income with respect to the marginal net of tax rate of 2.36.

Overall, we find strong behavioral responses to income taxation amongst high earners. Despite this, we are unable to provide convincing evidence as to the normative implications of the results. On the one hand, decreased high-earner income in response to taxation could reflect the distortion of productive activity among those residents whom California's most innovative residents. This could encompass the classic labor supply channel or other channels such as idea generation and innovation, as in Jones (2019). On the other hand, our results may also be driven by higher taxes reducing the incentive to engage in wasteful rent-seeking activities, such as wage negotiations by CEOs (as in Piketty et al. (2014)). While we are able to perform simple calculations to inform the revenue consequences of our estimates, the broad policy and welfare implications of our work depend on these unanswered questions. We view this as an important avenue for future research.

References

David Agrawal and Dirk Foremny. Relocation of the Rich: Migration in Response to Top Tax Rate Changes from Spanish Reforms. *Review of Economics and Statistics*, 2018, Forthcoming.

Ufuk Akcigit, Salome Baslandze, and Stefanie Stantcheva. Taxation and the International Mobility of Inventors. *American Economic Review*, 106(10):2390–2981, 2016.

Raj Chetty. Is the taxable income elasticity sufficient to calculate deadweight loss? the implications of evasion and avoidance. *American Economic Journal: Economic Policy*, 1(2):31–52, 2009.

Paul A. Coomes and William H. Hoyt. Income Taxes and the Destination of Movers to Multistate MSAs. *Journal of Urban Economics*, 63(3), 2008.

Michael P. Devereux and Rachel Griffith. Taxes and the Location of Production: Evidence from a Panel of Multinationals. *Journal of Public Economics*, 68(3):335–367, 1998.

Peter Diamond and Emmanuel Saez. The Case for a Progressive Tax: From Basic Research to Policy Recommendations. *Journal of Economic Perspectives*, 25(4):165–190, 2011.

D. Feenberg and E. Coutts. An introduction to the TAXSIM model. *Journal of Policy Analysis and Management*, 12(1):189–194, 1993.

Martin Feldstein. The effect of marginal tax rates on taxable income: a panel study of the 1986 tax reform act. *Journal of Political Economy*, 103(3):551–572, 1995.

Martin Feldstein. Tax avoidance and the deadweight loss of the income tax. *Review of Economics and Statistics*, 81(4):674–680, 1999.

Martin Feldstein and Marian Vaillant Wrobel. Can state taxes redistribute income? *Journal of Public Economics*, 68(3):369–396, 1998.

Seth H. Giertz. The Elasticity of Taxable Income Over the 1980s and 1990s. *National Tax Journal*, 60(4):743–768, 2007.

Jonathan Gruber and Emmanuel Saez. The elasticity of taxable income: evidence and implications. *Journal of Public Economics*, 84:1–32, 2002.

Guido Imbens and Jeffrey Wooldridge. Recent Developments in the Econometrics of Program Evaluation. *Journal of Economic Literature*, 46(1):5–86, 2009.

Chad Jones. Taxing Top Incomes in a World of Ideas. *Working paper*, 2019.

Laura Kawano, Caroline Weber, and Andrew Whitten. Estimating the Elasticity of Broad Income for High-Income Taxpayers. *Working Paper*, 2016.

Henrik Jacobson Kleven and Esben Anton Schultz. Estimating Taxable Income Responses Using Danish Tax Reforms. *American Economic Journal*, 6(4):271–301, 2014.

Henrik Jacobson Kleven, Camille Landais, and Emmanuel Saez. Taxation and international migration of superstars: Evidence from the European football market. *American Economic Review*, pages 1892–1924, 2013.

Henrik Jacobson Kleven, Camille Landais, Emmanuel Saez, and Esben Anton Schultz. Migration and Wage Effects of Taxing Top Earners: Evidence from the Foreigners' Tax Scheme in Denmark. *Quarterly Journal of Economics*, pages 333–378, 2014.

Henrk Kleven, Camille Landais, Mathilde Munoz, and Stefanie Stantcheva. Taxation and Migration: Evidence and Policy Implications. *Working Paper*, 2019.

Andrew Leigh. Do Redistributive State Taxes Reduce Inequality? *National Tax Journal*, 61(1): 81–104, 2008.

Enrico Moretti and Daniel Wilson. The Effect of State Taxes on the Geographical Location of Top Earners: Evidence from Star Scientists. *American Economic Review*, 107(7):1858–1903, 2017.

Thomas Piketty, Emmanuel Saez, and Stefanie Stantcheva. Optimal Taxation of Top Labor Incomes: A Tale of Three Elasticities. *American Economic Journal*, 6(1):230–271, 2014.

Emmanuel Saez. Using Elasticities to Derive Optimal Income Tax Rates. *The Review of Economic Studies*, 68(1):205–229, 2001.

Emmanuel Saez. Taxing the Rich More: Preliminary Evidence from the 2013 Tax Increase. *Tax Policy and the Economy*, 31:71–120, 2017.

Emmanuel Saez, Joel Slemrod, and Seth Giertz. The Elasticity of Taxable Income with Respect to Marginal Tax Rates: A Critical Review. *Journal of Economic Literature*, 50(1):3–50, 2012.

Joel Slemrod and Shlomo Yitzhaki. Tax avoidance, evasion, and administration. In *Handbook of public economics*, volume 3, pages 1423–1470. Elsevier, 2002.

Charles Varner, Cristobal Young, and Allen Prohofsky. Millionaire Migration in California: Administrative Data for Three Waves of Tax Reform. *Working Paper*, 2018.

Caroline Weber. Toward Obtaining a Consistent Estimate of the Elasticity of Taxable Income Using Difference-in- Differences. *Journal of Public Economics*, 117:90–103, 2016.

Cristobal Young and Charles Varner. Millionaire migration and state taxation of top incomes: Evidence from a natural experiment. *National Tax Journal*, 64(2):255–284, 2011.

Cristobal Young, Charles Varner, Ithai Z. Lurie, and Richard Prisinzano. Millionaire Migration and Taxation of the Elite: Evidence from Administrative Data. *American Sociological Review*, 81 (3):421–446, 2016.

Gabriel Zucman. Taxing across Borders: Tracking Personal Wealth and Corporate Profits. *American Economic Journal*, 28(4):121–148, 2014.

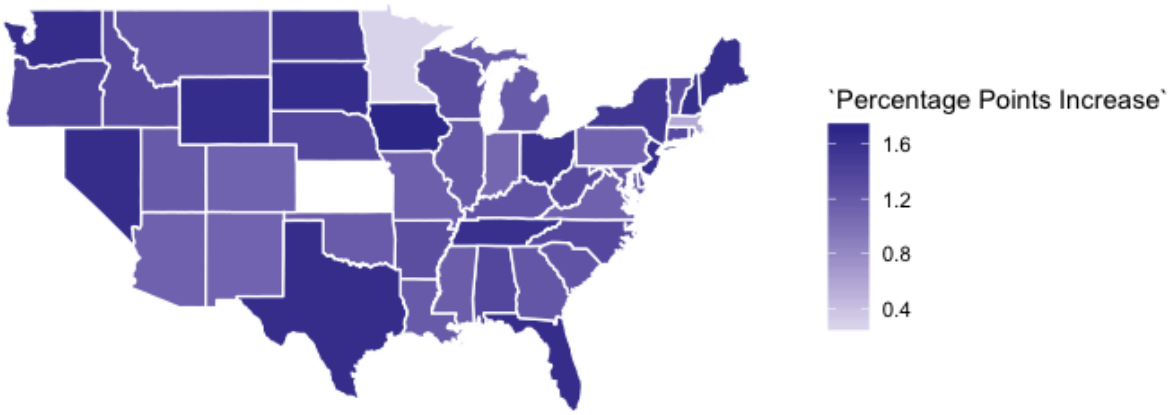


Figure 1: 2012-13 CA Average Rate Increases Relative to Other States, $5+ Million Earners

See Section 5.a.3 for a full discussion of this figure. This map shows graphically the Proposition 30-driven incremental savings in average taxes paid from moving out of California from years 2012-13. Note: Kansas is omitted as it dropped rates substantially from 2012-13, leading to large value (around 3) which obscures the variation in other values.

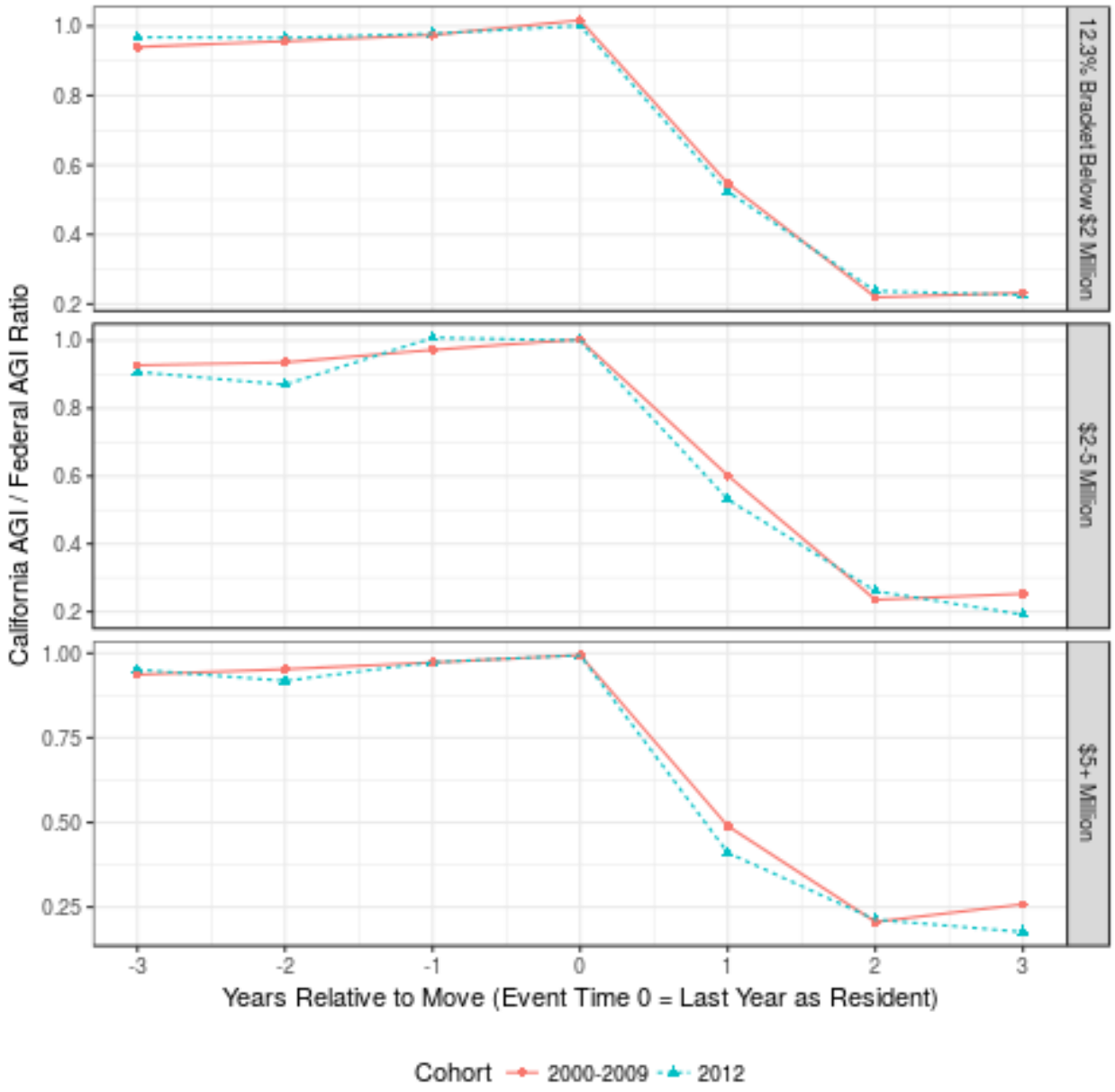


Figure 2: How Much Income Leaves California with Non-Resident Out-Migrants?

The sample is all taxpayers who displayed a Resident - Non resident - Non resident transition, where in the "Resident" year the taxpayer was in the top tax bracket according to 2012 tax policy.

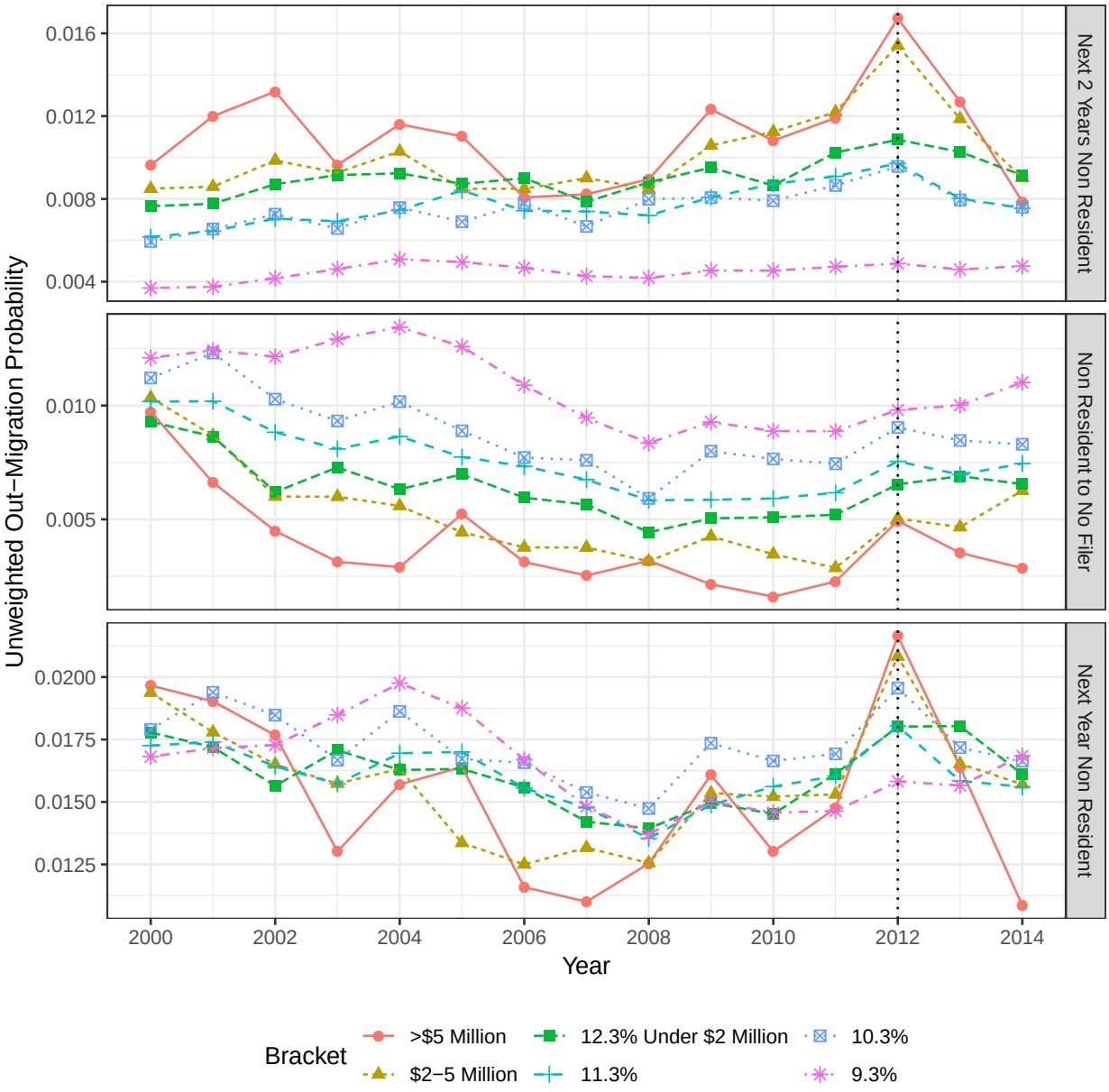


Figure 3: Out-Migration Probabilities

This figure shows the rate of out-migration among current-year residents, disaggregated by taxable income bins.

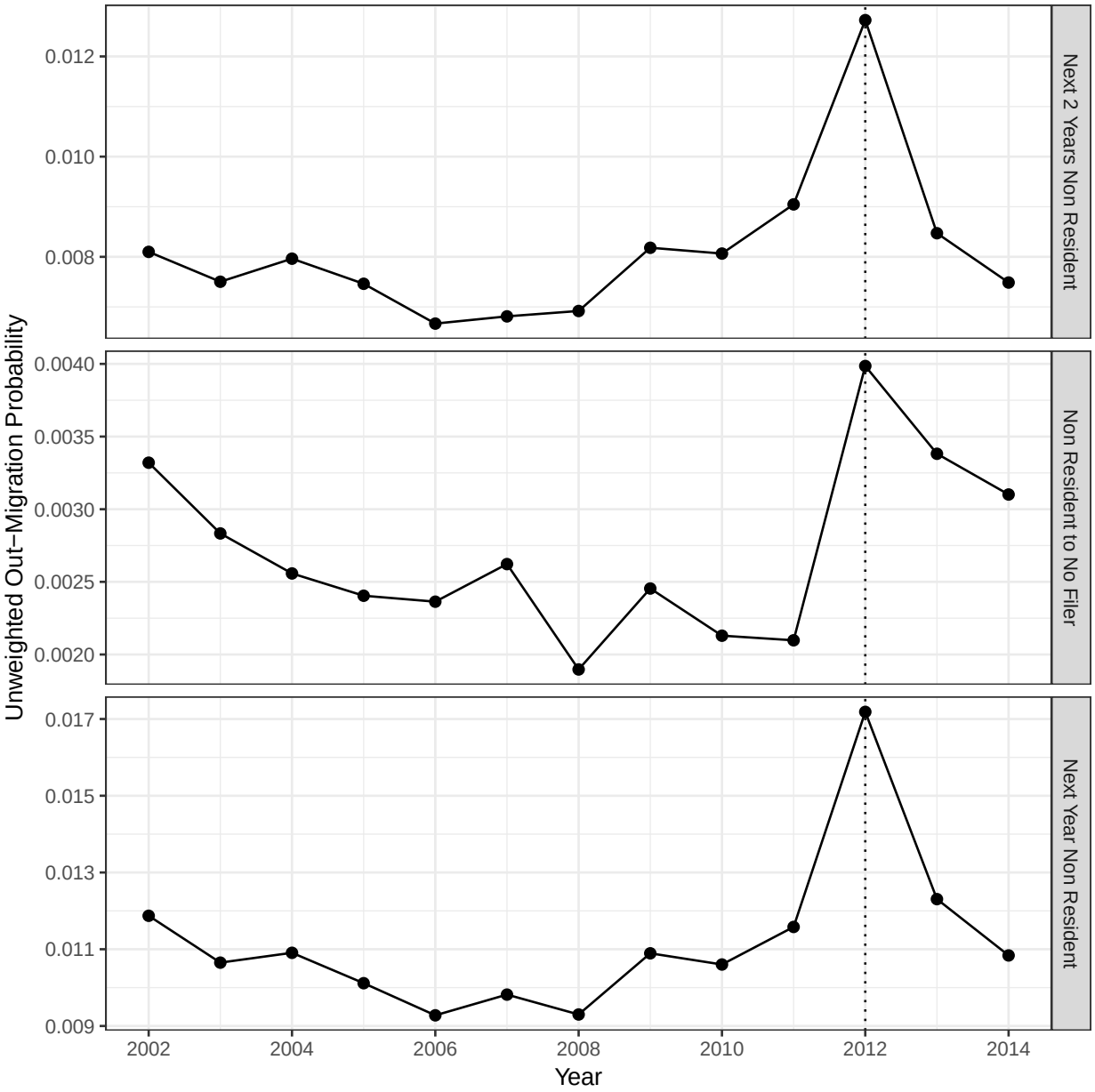


Figure 4: Out-Migration Probabilities - Three-Year Top Bracket Only

This figure shows the rate of out-migration among current-year residents who are in the top bracket in not only the current year, but also the past two years.

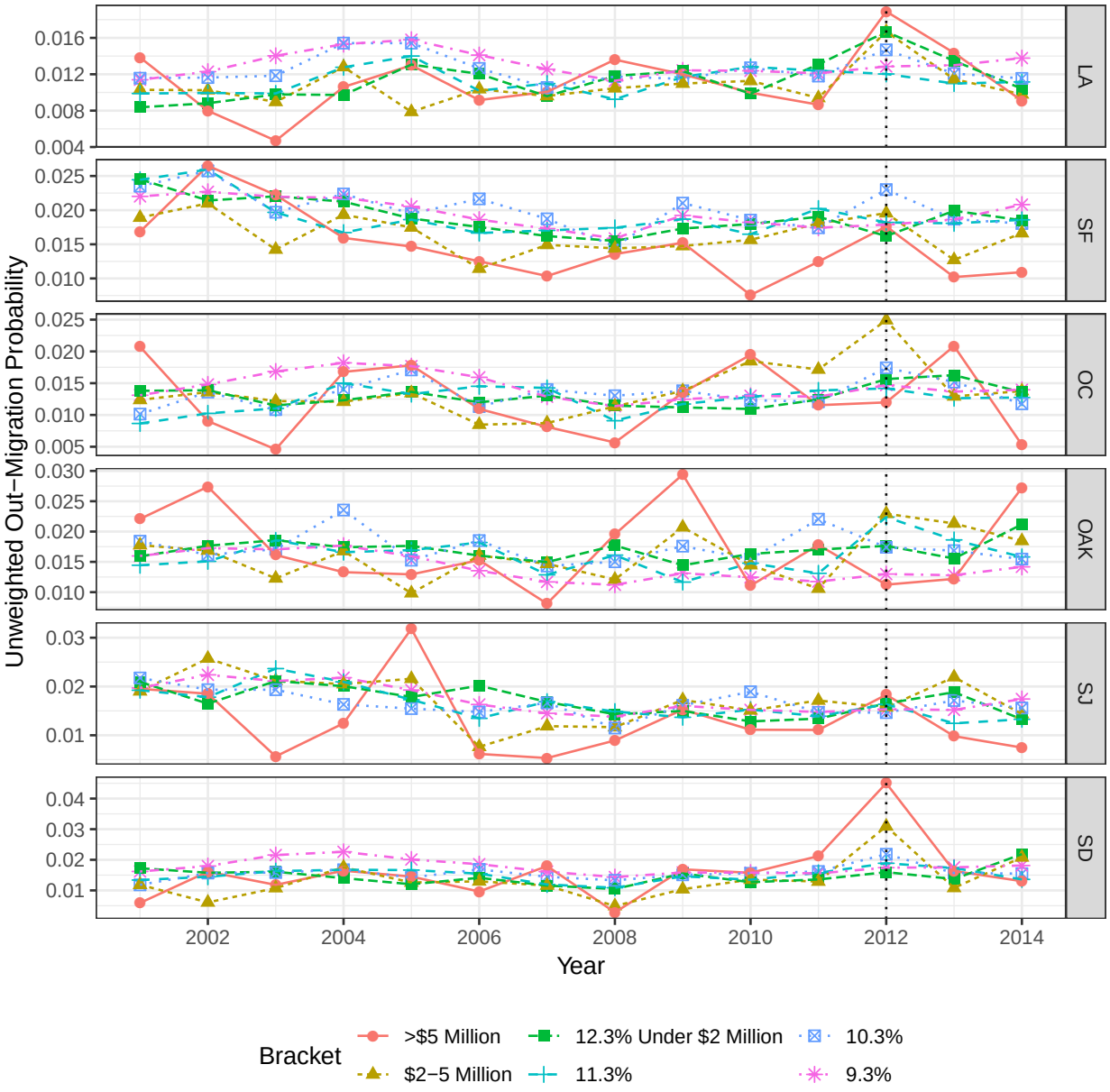


Figure 5: Out Migration by MSA

This figure decomposes out-migration across the 6 largest MSAs in California, by total tax base as of 2010; these MSAs account for 73.5% of CA Taxable Income in 2010. LA is Los Angeles-Long Beach (Los Angeles County), SF is San Francisco (Marin County, San Francisco County, and San Mateo County), OC is Orange County (Orange County), OAK is Oakland (Alameda County and Contra Costa County), SJ is San Jose (Santa Clara County), SD is San Diego (San Diego County). MSA classifications are based on a 2005 crosswalk accessible through the NBER website[36] and a zip code to county crosswalk is accessible through the Census.[37]

[36]https://www.nber.org/data/cbsa-msa-fips-ssa-county-crosswalk.html
[37]https://www.census.gov/geo/maps-data/data/relationship.html

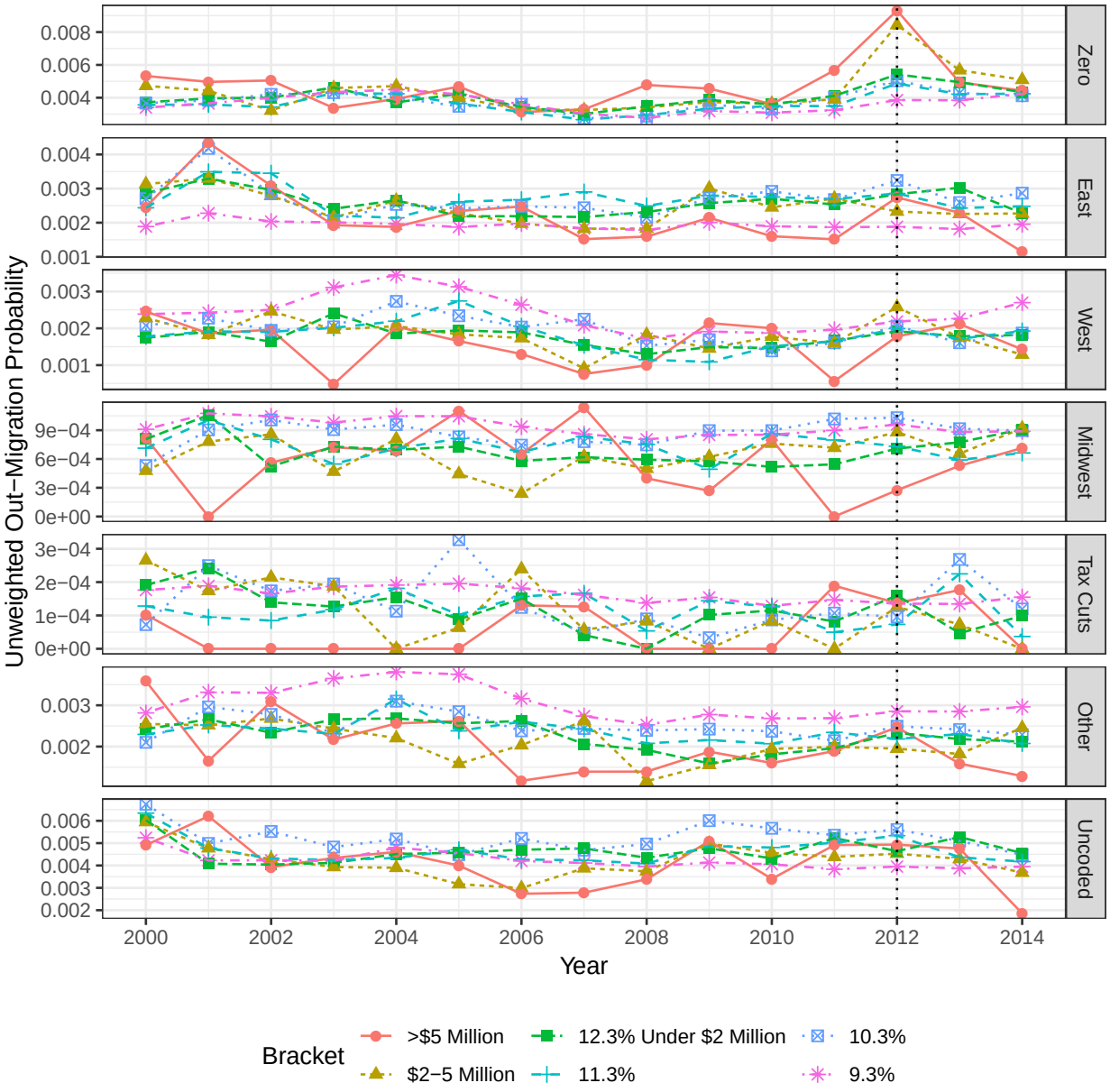


Figure 6: Out Migration Destinations

Mover destinations are measured as of year $t+1$ for a move beginning in year t for a year t CA resident. "Zero" denotes states with a zero state tax, which is Wyoming, Washington, Texas, South Dakota, Nevada, Florida, and Alaska. "East" denotes New York, New Jersey, Massachusetts, Pennsylvania, District of Columbia, and Connecticut. "Midwest" denotes Illinois, Ohio, Michigan, and Wisconsin. "West" denotes Oregon, Colorado, Arizona, and Utah. "Tax Cuts" denotes Iowa, Kansas, and Maine. "Other" is all other states, and "Uncoded" are observations for which the forward zip code is not populated or does not map to a state.

Figure 7: Matched Sample Income Trends

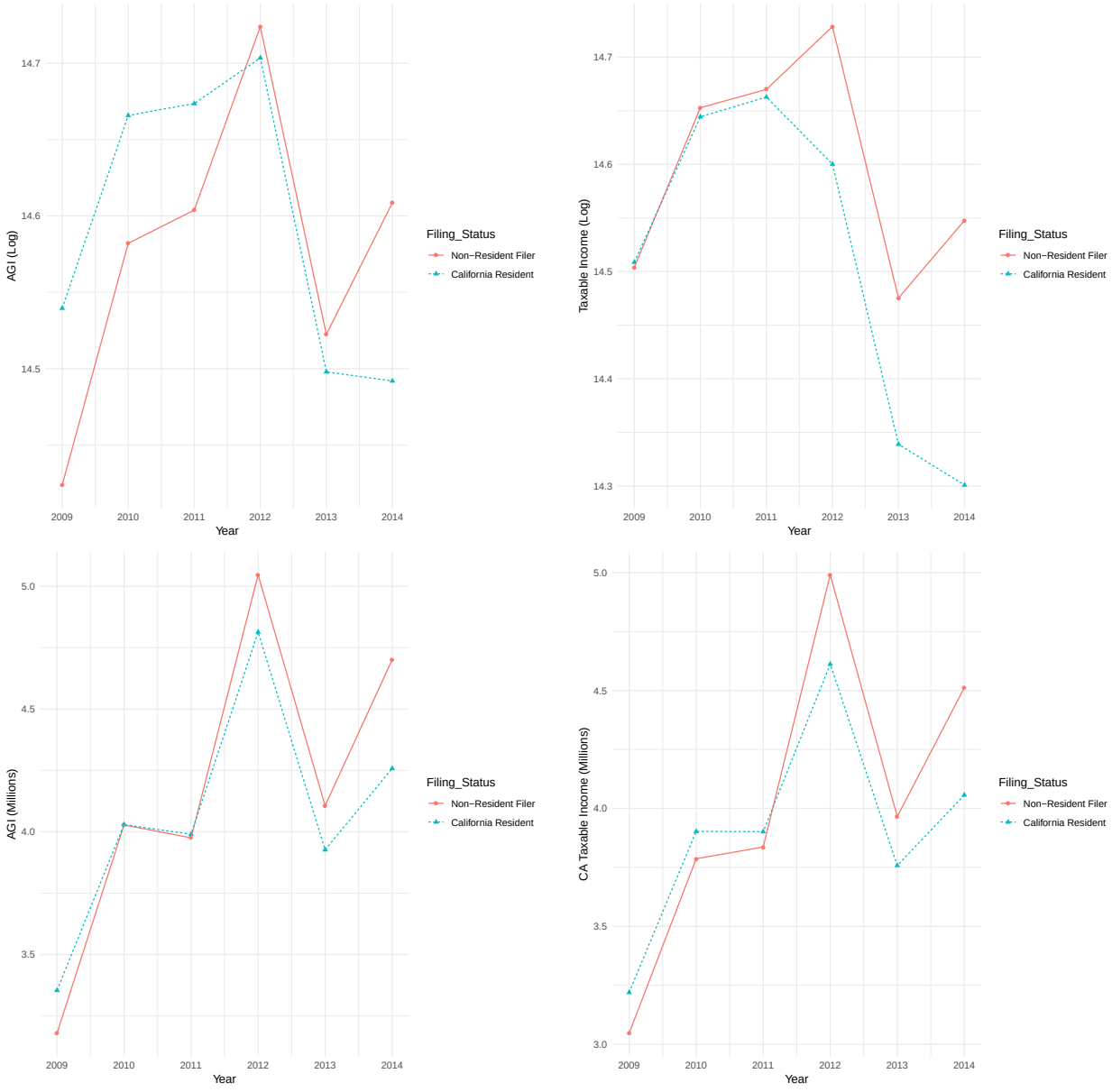


Figure 8: Matched Sample Income Trends: Similar-Tax States Control Group Restriction

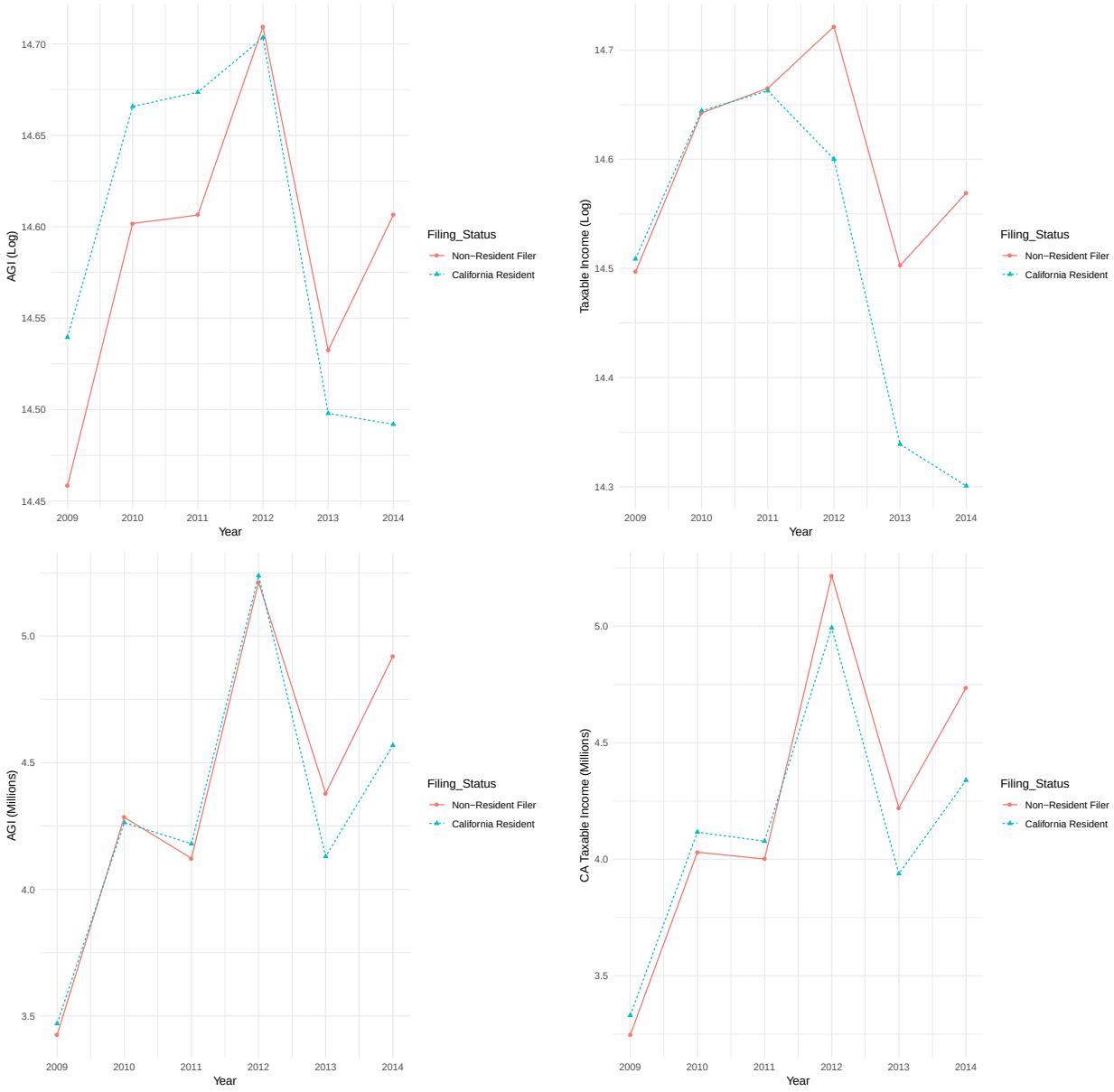


Table 1: Increase in Average Tax Rate Difference between California and Other States, 2012-13

Income Bin	Only Prop 30	Prop 30 + Federal Tax Increase		
		Zero Tax States	Non-Zero Tax States	Tax Cuts
10.3% Bracket	0.0022	-0.0077	-0.0029	0.0056
11.3% Bracket	0.0061	-0.0009	0.0004	0.0082
12.3% Bracket	0.0125	0.0107	0.0082	0.0163
$2-5 Million	0.0181	0.0166	0.0118	0.0204
$5+ Million	0.0225	0.0187	0.0141	0.0219

See Section 5.a.3 for a full discussion of this table. We first disaggregate taxpayers i into groups B based on their 2012 income: those in the 10.3% bracket, the 11.3% bracket, 12.3% bracket earning under $2 million, $2-$5 million, and over $5 million. For each such group, we report first how Proposition 30 altered incentives to leave California, averaged over individuals and destination states:

$$[\frac{1}{\sum_{i\in B, S\neq CA} 1}] \sum_{i\in B, S\neq CA} [T^{CA}_{2012}(z_{i,2012}) - T^{S}_{2012}(z_{i,2012})] - [T^{CA}_{2011}(z_{i,2012}) - T^{S}_{2011}(z_{i,2012})]$$

We report such averages in the "Only Prop 30" column of Table 1. Note that if $T^{S}_{2012}(z_{i,2012}) = T^{S}_{2011}(z_{i,2012})$ – that is, the destination state does not change tax policy between 2011 and 2012 – the quantity collapses to $T^{CA}_{2012}(z_{i,2012}) - T^{CA}_{2011}(z_{i,2012})$. Thus, we do not disaggregate these averages across destination states, as very few states other than California changed tax policy between 2011 and 2012. The table shows that even for very high earners earning over $5 million dollars in 2015 dollars, the effective increase in average tax rate is closer to 2% than to the top marginal rate increase of 3%. This is due both to the federal deductibility of state taxes and the discrepancy of average and marginal tax rates.

Second, we then account for how this increase in move-out incentives is altered by the concurrent 2012-13 increase in federal tax rates, which induce variation in cross-state movement incentives due to the interaction of the federal policy shift with the existing state of tax deductions in non-CA states. That is, we compute disaggregated averages of the form:

$$[\frac{1}{\sum_{i\in B, S\neq CA} 1}] \sum_{i\in B, S\neq CA} [T^{CA}_{2012}(z_{i,2013}) - T^{S}_{2013}(z_{i,2012})] - [T^{CA}_{2011}(z_{i,2012}) - T^{S}_{2011}(z_{i,2012})]$$

We report such averages in the "Prop 30 + Federal Tax Increase" column of Table 1. To provide a broad picture of this heterogeneity, we split the destination states into three groups in the latter columns of Table 1. First, zero-tax states, which have zero state income taxes in 2012 and 2013. Second, non-zero tax states which tax income but do not change tax policy between 2012-13. Finally, we report Iowa, Kansas and Maine separately because these states enacted tax cuts[38] between 2012 and 2013, thus increasing the incentive to move there. Lastly, in the Table calculations we omit Minnestota, which raised the top state income tax rate from 7.85 to 9.85 so that there was little incentive to move from California to Minnesota. Figure 1 provides a visualization state-by-state of average rate increases for taxpayers in the $5+ Million income bin.

[38]Kansas and Maine explicitly cut rates, while Iowa held its rates constant but reduced its definition of taxable base

Table 2: Movement Regressions: Taxable Income Weighted

	Mover Type					
	Next Year NR/Partial		Next 2 Years NR/Partial		Next year NR, Then Missing	
	(1)	(2)	(3)	(4)	(5)	(6)
10.3% Bracket						
1{2011}	0.002**	0.002***	0.001*	0.001*	0.001*	0.001**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.0005)	(0.0005)
1{2012}	0.003***	0.003***	0.002***	0.002***	0.001**	0.001**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.0005)	(0.0005)
1{2013}	0.001*	0.002*	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.0005)	(0.0005)	(0.0004)	(0.0004)
11.3% Bracket						
1{2011}	0.002***	0.002***	0.001**	0.001**	0.001*	0.001*
	(0.001)	(0.001)	(0.0004)	(0.0004)	(0.0003)	(0.0003)
1{2012}	0.003***	0.003***	0.002***	0.002***	0.001***	0.001***
	(0.001)	(0.001)	(0.0004)	(0.0004)	(0.0003)	(0.0003)
1{2013}	0.001*	0.001*	0.0004	0.0005	0.001	0.001
	(0.0005)	(0.001)	(0.0004)	(0.0004)	(0.0003)	(0.0003)
12.3% Bracket						
1{2011}	0.002	0.002	0.001	0.001	0.002	0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
1{2012}	0.008**	0.008**	0.005**	0.005**	0.003	0.003
	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)
1{2013}	0.002	0.002	0.002	0.002	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.0004)	(0.0004)
Observations	43,851,430	43,851,430	43,851,430	43,851,430	43,851,430	43,851,430
R^2	0.001	0.001	0.001	0.001	0.002	0.002
Adjusted R^2	0.001	0.001	0.001	0.001	0.002	0.002

Regressions include years 2000-2013 but also exclude all taxpayers below the 9.3% bracket. All specifications contain marital status and year fixed effects. 2000-2010 is the "pre" period, and differences in differences effects are estimated for years 2011-13. Standard errors are clustered by taxpayer. Income controls include log income and fixed effects for 100 income percentiles. Regressions weighted by taxable income.
*p<0.05; **p<0.01; ***p<0.001

Table 3: Movement Regressions: Unweighted, Granular Bins

	Mover Type					
	Next Year NR/Partial		Next 2 Years NR/Partial		Next year NR, Then Missing	
	(1)	(2)	(3)	(4)	(5)	(6)
12.3% Bracket Under 2 Million						
1{2011}	0.002***	0.002***	0.001*	0.001*	0.001*	0.001*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.0004)	(0.0004)
1{2012}	0.003***	0.003***	0.002***	0.002***	0.001***	0.001***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.0004)	(0.0004)
1{2013}	0.003***	0.003***	0.002**	0.002**	0.001***	0.001***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.0004)	(0.0004)
2-5 Million						
1{2011}	0.002	0.002	0.003**	0.003**	−0.0004	−0.0004
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
1{2012}	0.006***	0.006***	0.006***	0.006***	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
1{2013}	0.002	0.002*	0.002*	0.003**	0.0002	0.0003
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
5 Million +						
1{2011}	0.002	0.002	0.001	0.001	0.0001	0.0001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)
1{2012}	0.007***	0.007***	0.006***	0.006***	0.002*	0.002*
	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)
1{2013}	0.002	0.002	0.002	0.002	0.0001	0.0002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)
Income Controls		×		×		×
Observations	43,851,430	43,851,430	43,851,430	43,851,430	43,851,430	43,851,430
R^2	0.001	0.001	0.0003	0.001	0.001	0.001
Adjusted R^2	0.001	0.001	0.0003	0.001	0.001	0.001

Regressions include years 2000-2013 but also exclude all taxpayers below the 9.3% bracket. All specifications contain marital status and year fixed effects. 2000-2010 is the "pre" period, and differences in differences effects are estimated for years 2011-13. Standard errors are clustered by taxpayer. Income controls include log income and fixed effects for 100 income percentiles.
*p<0.05; **p<0.01; ***p<0.001

Table 4: Movement Regressions: Income Weighted, Top-Bracket Persistence

	Next Year Non Resident			
	(1)	(2)	(3)	(4)
10.3% Bracket				
1{2011}	0.002***	0.003***	0.002***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)
1{2012}	0.003***	0.003***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)
1{2013}	0.002*	0.002**	0.002*	0.002**
	(0.001)	(0.001)	(0.001)	(0.001)
11.3% Bracket				
1{2011}	0.002***	0.002***	0.002***	0.002***
	(0.001)	(0.001)	(0.001)	(0.001)
1{2012}	0.003***	0.003***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)
1{2013}	0.001*	0.001*	0.001*	0.001*
	(0.001)	(0.001)	(0.001)	(0.001)
12.3% Bracket				
1{2011}	0.003	0.003	0.001	0.001
	(0.001)	(0.001)	(0.002)	(0.002)
1{2012}	0.008**	0.009***	0.003	0.003
	(0.003)	(0.003)	(0.002)	(0.002)
1{2013}	0.003*	0.003*	0.003	0.003*
	(0.001)	(0.001)	(0.002)	(0.002)
3-Year Top Bracket				
1{2011}			0.004	0.004
			(0.002)	(0.002)
1{2012}			0.009**	0.009**
			(0.003)	(0.003)
1{2013}			0.003	0.003
			(0.002)	(0.002)
Income Controls		×		×
Observations	35,289,187	35,289,187	35,265,965	35,265,965
R^2	0.001	0.001	0.001	0.001
Adjusted R^2	0.001	0.001	0.001	0.001

Regressions include years 2003-2013 but also exclude all taxpayers below the 9.3% bracket. All specifications contain marital status and year fixed effects. 2003-2010 is the "pre" period, and differences in differences effects are estimated for years 2011-13. Standard errors are clustered by taxpayer. Income controls include log income and fixed effects for 100 income percentiles. Regressions weighted by taxable income. "3-year top bracket" denotes those taxpayers who in year t, $t-1$ and $t-2$ report top-bracket taxable income.
*p<0.05; **p<0.01; ***p<0.001

Table 5: Covariate Balance: 2011 values

Statistic	N	Mean	St. Dev.	Pctl(25)	Median	Pctl(75)
Resident						
Federal AGI	21,033	4.24	12.82	1.31	1.98	3.64
Taxable Income (CA Definition)	21,033	4.15	11.56	1.29	1.96	3.61
Capital Gains	21,033	0.91	8.83	−0.003	0.00	0.06
Married	21,033	0.67	0.47	0	1	1
Single	21,033	0.30	0.46	0	0	1
Age	21,033	54.90	13.97	47	54	63
Non Resident						
Federal AGI	13,419	7.89	27.01	1.50	2.57	5.51
Taxable Income (CA Definition)	13,419	7.54	24.23	1.52	2.50	5.19
Capital Gains	13,419	2.15	18.22	−0.003	0	0.2
Married	13,419	0.73	0.44	0	1	1
Single	13,419	0.24	0.43	0	0	0
Age	13,419	54.26	13.36	47	54	62
Non Resident, Matched						
Federal AGI	21,033	4.17	13.54	1.30	1.96	3.63
Taxable Income (CA Definition)	21,033	4.08	11.80	1.34	1.96	3.48
Capital Gains	21,033	1.02	8.95	−0.003	0.00	0.09
Married	21,033	0.68	0.46	0	1	1
Single	21,033	0.29	0.45	0	0	1
Age	21,033	53.89	13.32	46	54	62
Non Resident, Matched, Tax-Similar States						
Federal AGI	21,033	4.04	11.95	1.29	1.96	3.62
Taxable Income (CA Definition)	21,033	4.04	10.09	1.32	1.96	3.44
Capital Gains	21,033	0.93	7.36	−0.003	0.00	0.07
Married	21,033	0.66	0.47	0	1	1
Single	21,033	0.31	0.46	0	0	1
Age	21,033	52.83	12.40	45	52	60

Taxable Income (CA Definition) for CA residents is their CA taxable income. For CA non-residents, it is the taxable income of the taxpayer if they were a CA resident and their full income were subject to CA state taxation. We also refer to this quantity as "CA Taxable Income" for brevity. The matching procedure matches residents to non-residents based on a propensity score calculated using pooled 2009-10 data on Federal AGI, CA Taxable Income, and Capital Gains only. For the "Tax Similar States" sample, the control pool used is Hawaii (11% top rate), Oregon (9.9% top rate), Minnesota (9.85% top rate), Iowa (8.98% top rate), New Jersey (8.97% top rate), Vermont (8.95% top rate), District of Columbia (8.95% top rate), and New York (8.82% top rate). Note matching is done only on 2009-10 income variables, and here we compare 2011 covariate values.

Table 6: Matched Differences in Differences: Main Estimates

	Dependent Variable			
	log(CA Taxable Income+1)	CA Taxable Income (Millions)	log(Federal AGI+1)	Federal AGI (Millions)
	(1)	(2)	(3)	(4)
Resident × 2011	−0.005	−0.079	−0.014	−0.046
	(0.008)	(0.065)	(0.009)	(0.079)
Resident × 2012	−0.134***	−0.522***	−0.097***	−0.340***
	(0.023)	(0.096)	(0.012)	(0.095)
Resident × 2013	−0.174***	−0.357***	−0.117***	−0.297***
	(0.034)	(0.077)	(0.014)	(0.084)
Resident × 2014	−0.282***	−0.599***	−0.194***	−0.546***
	(0.035)	(0.092)	(0.015)	(0.098)
Observations	178,782	178,782	177,416	178,782
R^2	0.447	0.702	0.729	0.707
Adjusted R^2	0.336	0.642	0.675	0.649

All regressions include taxpayer fixed effects. CA residents are weighted to 1; CA non-resident control group has weights applied with mean 1 and reflecting matched sample with replacement. 2009-10 is the pre-period. Levels variables are winsorized at 99.5%. Standard errors are clustered by taxpayer. "CA Taxable Income" for CA residents is their CA taxable income. For CA non-residents, it is the taxable income of the taxpayer if they were a CA resident and their full income were subject to CA state taxation.
*p<0.05; **p<0.01; ***p<0.001

Table 7: Matched Differences in Differences: Investment Income Decomposition

	Dependent Variable							
	CA Taxable Income	Federal AGI	CA Taxable Income - Investment	Federal AGI - Investment	Investment	Capital Gains	Dividend	Interest
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Resident × 2011	−0.049	0.051	−0.074	0.026	0.024	0.048	−0.019	−0.004
	(0.079)	(0.096)	(0.114)	(0.121)	(0.140)	(0.132)	(0.037)	(0.011)
Resident × 2012	−0.492***	−0.243*	−0.648***	−0.399**	0.156	0.210	−0.038	−0.016
	(0.104)	(0.106)	(0.148)	(0.142)	(0.176)	(0.167)	(0.044)	(0.015)
Resident × 2013	−0.328***	−0.200*	−0.493***	−0.366*	0.165	0.213	−0.046	−0.001
	(0.090)	(0.101)	(0.144)	(0.143)	(0.161)	(0.149)	(0.043)	(0.014)
Observations	119,188	119,188	119,188	119,188	119,188	119,188	119,188	119,188
R^2	0.754	0.753	0.655	0.643	0.678	0.631	0.633	0.854
Adjusted R^2	0.671	0.671	0.540	0.524	0.570	0.507	0.511	0.805

"Investment" is the sum of capital gains, dividends, and interest. All regressions include taxpayer fixed effects. CA residents are weighted to 1; CA non-resident control group has weights applied with mean 1 and reflecting matched sample with replacement. 2010 is the pre-period. Standard errors are clustered by taxpayer. All variables are denominated in millions of 2015 dollars. "CA Taxable Income" for CA residents is their CA taxable income. For CA non-residents, it is the taxable income of the taxpayer if they were a CA resident and their full income were subject to CA state taxation.

*p<0.05; **p<0.01; ***p<0.001

Table 8: Matched Differences in Differences: Similar-Tax States Control Group Restriction

	Dependent Variable			
	log(CA Taxable Income+1)	CA Taxable Income (Millions)	log(Federal AGI+1)	Federal AGI (Millions)
	(1)	(2)	(3)	(4)
Resident × 2011	−0.007	−0.050	−0.009	−0.072
	(0.012)	(0.093)	(0.012)	(0.095)
Resident × 2012	−0.150***	−0.352**	−0.062***	−0.180
	(0.027)	(0.133)	(0.017)	(0.146)
Resident × 2013	−0.215***	−0.373***	−0.101***	−0.307*
	(0.043)	(0.103)	(0.021)	(0.135)
Resident × 2014	−0.324***	−0.481***	−0.189***	−0.417**
	(0.045)	(0.117)	(0.022)	(0.140)
Observations	151,512	151,512	150,493	151,512
R^2	0.450	0.702	0.721	0.730
Adjusted R^2	0.340	0.643	0.665	0.676

All regressions include taxpayer fixed effects. CA residents are weighted to 1; CA non-resident control group has weights applied with mean 1 and reflecting matched sample with replacement. 2009-10 is the pre-period. Levels variables are winsorized at 99.5%. Standard errors are clustered by taxpayer. "CA Taxable Income" for CA residents is their CA taxable income. For CA non-residents, it is the taxable income of the taxpayer if they were a CA resident and their full income were subject to CA state taxation.

*p<0.05; **p<0.01; ***p<0.001

Appendix

A. Summary Statistics

Table A1: Summary Statistics

	mean	sd	p1	p10	p50	p90	p99
Wage	57105.85	1305920	0	0	29984.94	122423.8	345427.3
Federal AGI	95008.64	1484543	-4266.098	10129.48	44069.75	157387.2	676564.5
CA AGI	75621.14	969202.4	-5290.423	8211.905	40198.01	145392.9	520395.8
Taxable Income	80586.91	1290822	0	2277.02	31638.91	127807.2	625056.9
Dependents	.8106802	1.169949	0	0	0	2	4
Deductions	17273.19	1008324	4042.308	4042.886	8087.055	32849.46	84777
Married	.4073751	.4913457	0	0	0	1	1
Non-resident	.0508939	.219781	0	0	0	0	1
N	241490744						

This pools all primary taxpayers 2000-15

B. Using Taxsim to Construct Marginal and Average Rates

We use TAXSIM version 27 to measure marginal tax rates, and taxes paid, for taxpayers in the FTB data. This was not done using the standard TAXSIM online interface due to contractual limitations on the use of the data. Instead, we obtained the TAXSIM FORTRAN archive directly from the NBER and performed computations locally on the FTB data. These computations at the microdata level are used only in the context of assessing the incentives for California taxpayers to out-migrate driven by either Proposition 30 or the 2018 Federal TCJA.

C. Log Net of Tax Differences

Table A2: Increase in Average Tax Rate Difference between California and Other States, 2012-13

Income Bin	Only Prop 30	Prop 30 + Federal Tax Increase		
		Zero Tax States	Non-Zero Tax States	Tax Cuts
10.3% Bracket	.0039	-.0066	-.0026	.0097
11.3% Bracket	.0100	.0060	.0037	.0150
12.3% Bracket	.0202	.0296	.0190	.0311
$2-5 Million	.0296	.0450	.0288	.0421
$5+ Million	.0363	.0504	.0340	.0457

This table proceeds identically to Table 1, except that we use the log net of tax average rate. That is, we first report

$$[\frac{1}{\sum_{i\in B,S\neq CA}1}]\sum_{i\in B,S\neq CA}[\log(1-T^{S}_{2012}(z_{i,2012}))-\log(1-T^{CA}_{2012}(z_{i,2012}))]-[\log(1-T^{S}_{2011}(z_{i,2012}))-\log(1-T^{CA}_{2011}(z_{i,2012}))]$$

We report such averages in the "Only Prop 30" column of Table 1. Second, we then account for how this increase in move-out incentives is altered by the concurrent 2012-13 increase in federal tax rates, which induce variation in cross-state movement incentives due to the interaction of the federal policy shift with the existing state of tax deductions in non-CA states. That is, we compute disaggregated averages of the form:

$$[\frac{1}{\sum_{i\in B,S\neq CA}1}]\sum_{i\in B,S\neq CA}[\log(1-T^{S}_{2013}(z_{i,2012}))-\log(1-T^{CA}_{2013}(z_{i,2012}))]-[\log(1-T^{S}_{2011}(z_{i,2012}))-\log(1-T^{CA}_{2011}(z_{i,2012}))]$$

We report such averages in the "Prop 30 + Federal Tax Increase" column of Table 1. To provide a broad picture of this heterogeneity, we split the destination states into three groups in the latter columns of Table 1. First, zero-tax states, which have zero state income taxes in 2012 and 2013. Second, non-zero tax states which tax income but do not change tax policy between 2012-13. Finally, we report Iowa, Kansas and Maine separately because these states enacted tax cuts[39] between 2012 and 2013, thus increasing the incentive to move there. Lastly, in the Table calculations we omit Minnestota, which raised the top state income tax rate.

D. Extensive Margin, More Graphs

[39]Kansas and Maine explicitly cut rates, while Iowa held its rates constant but reduced its definition of taxable base

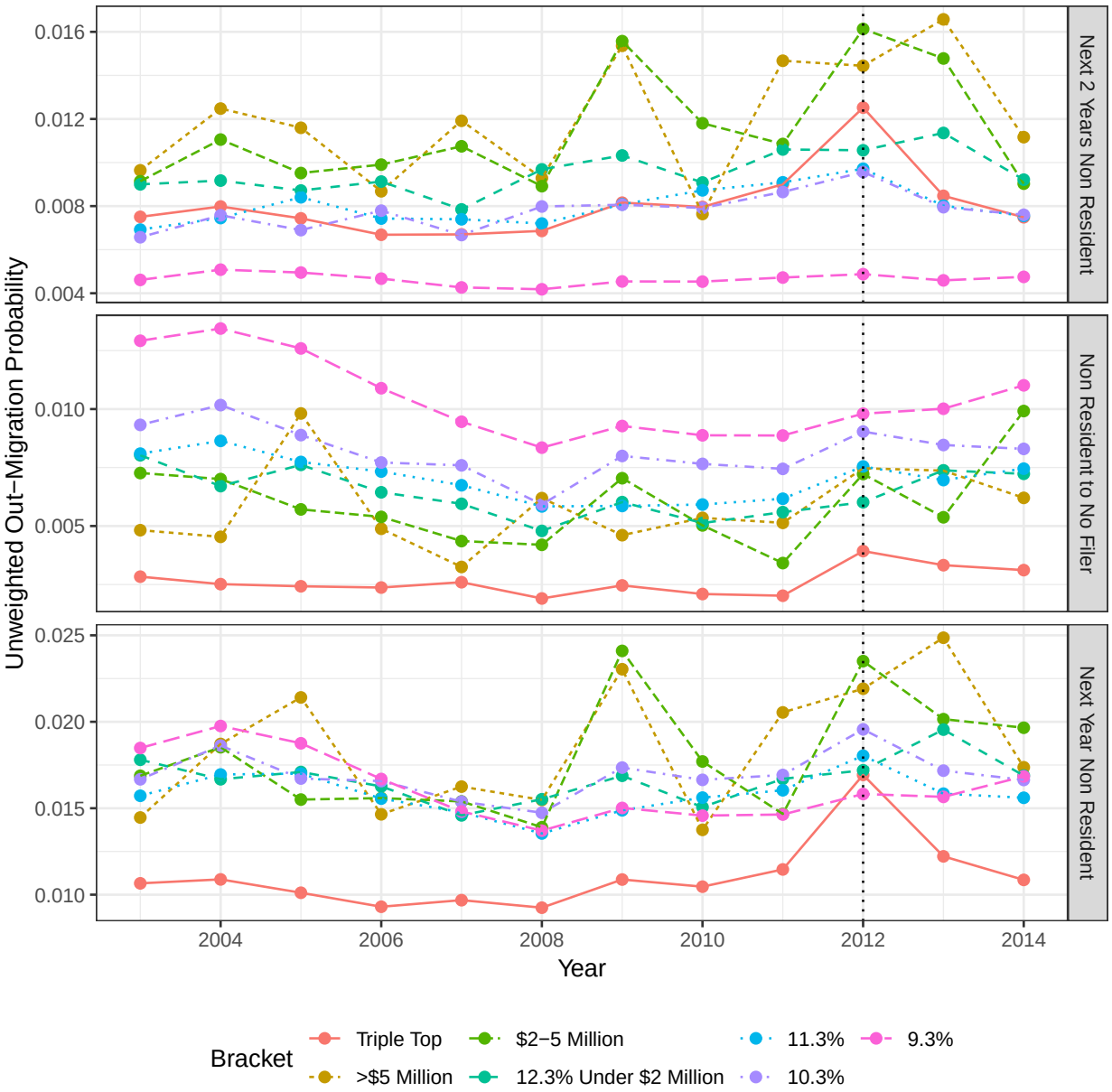


Figure A1: Out-Migration Probabilities, Top Bracket Persistence

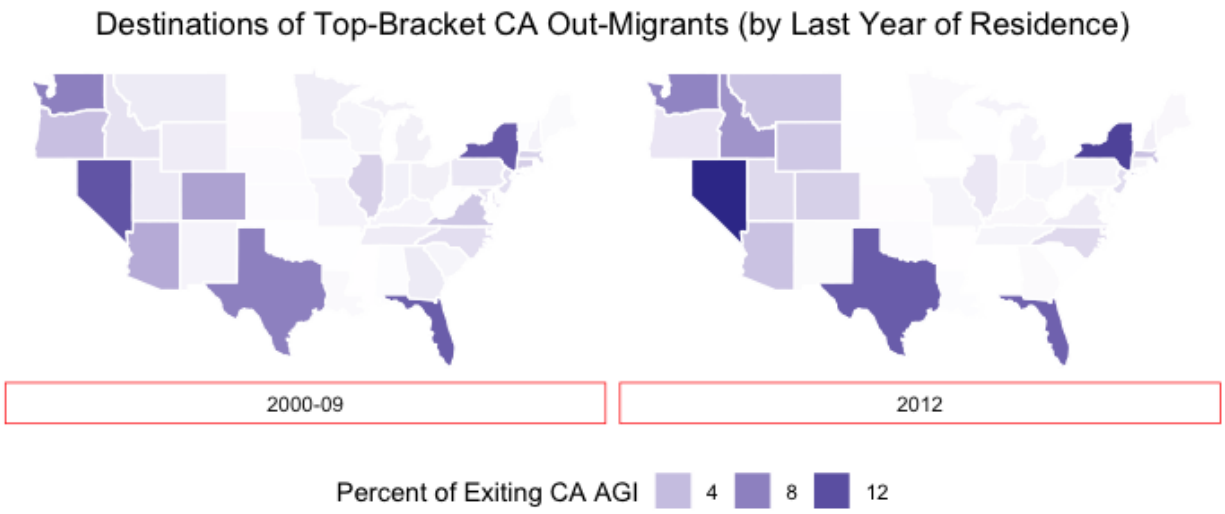


Figure A2: Mover Destinations

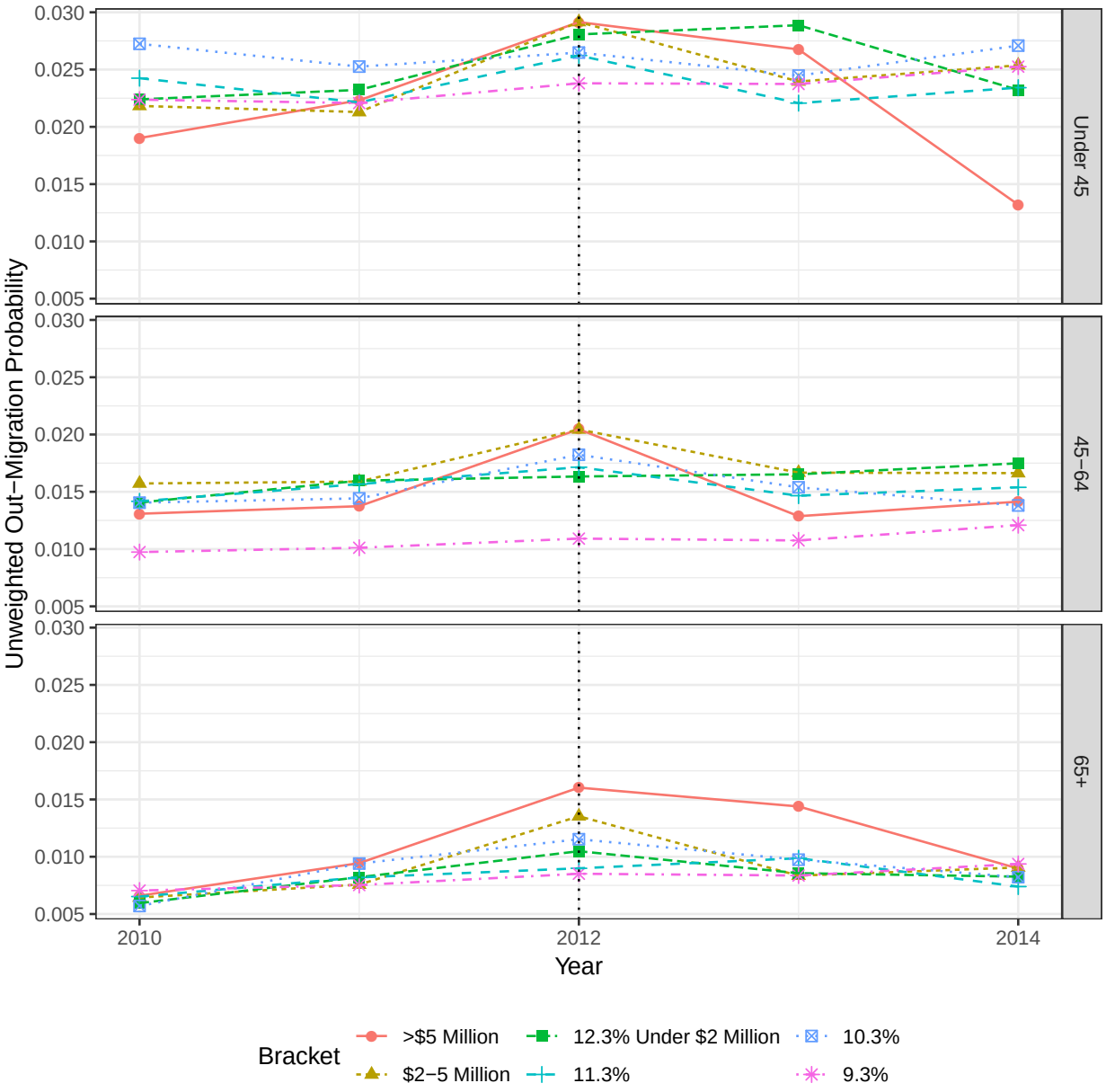


Figure A3: Out-Migration Probabilities, Age

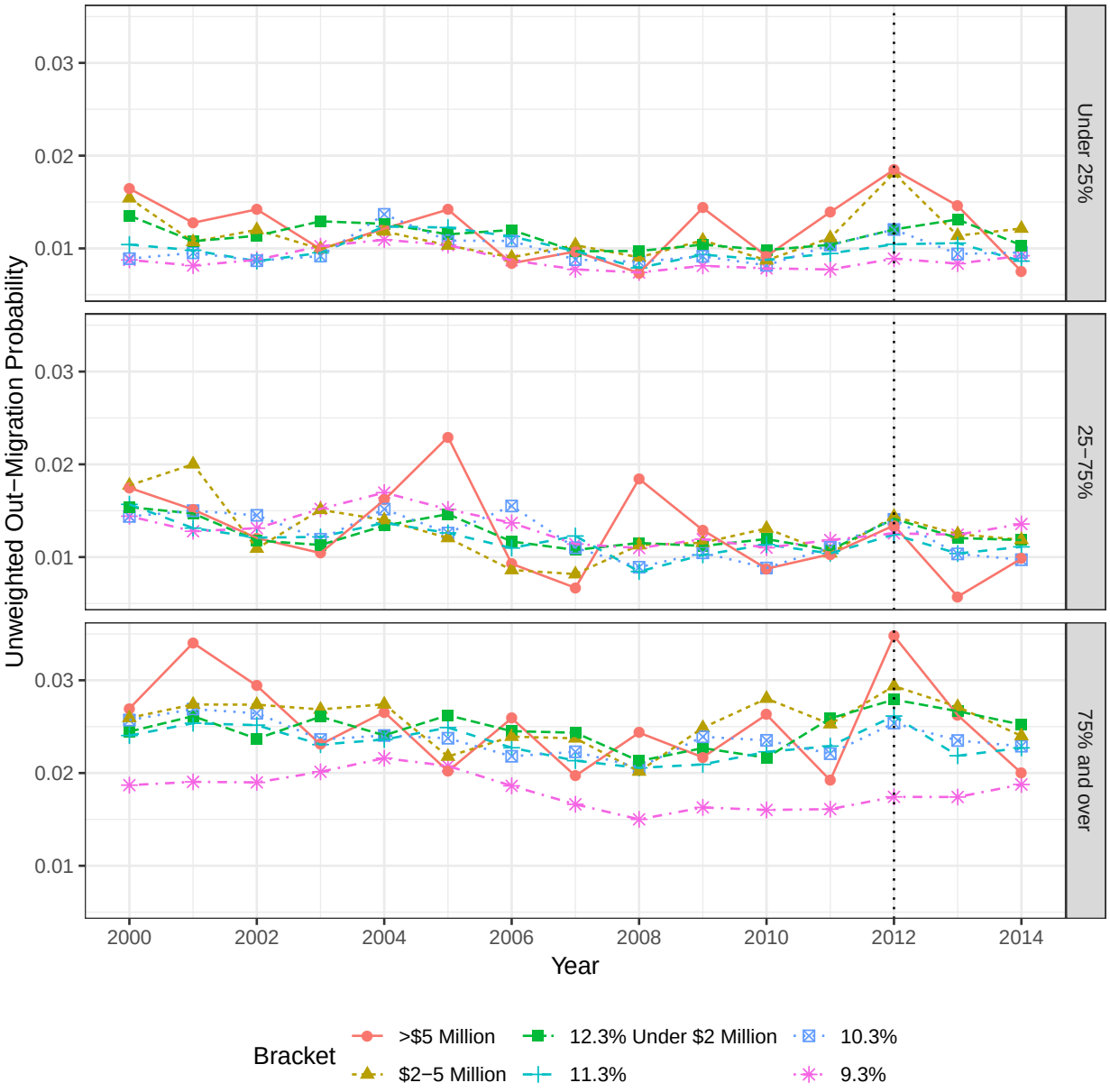


Figure A4: Out-Migration Probabilities, Wage Composition

Table A3: Movement Regressions: Income Weighted, MSA Heterogeneity

	Next Year Non Resident			
	(1)	(2)	(3)	(4)
12.3% Bracket				
1{2012}	0.007**	0.007**	0.015*	0.015**
	(0.002)	(0.002)	(0.006)	(0.006)
Oakland ×**1**{2012}			−0.013*	−0.013*
			(0.007)	(0.007)
Orange County ×**1**{2012}			−0.015	−0.015
			(0.008)	(0.008)
San Diego ×**1**{2012}			0.002	0.002
			(0.007)	(0.007)
San Francisco ×**1**{2012}			−0.013*	−0.013*
			(0.006)	(0.006)
San Jose ×**1**{2012}			−0.011	−0.011
			(0.006)	(0.006)
Observations	24,265,591	24,265,591	24,265,591	24,265,591
R^2	0.001	0.001	0.001	0.001
Adjusted R^2	0.001	0.001	0.001	0.001

Regressions include years 2000-2013 but also exclude all taxpayers below the 9.3% bracket. All specifications contain marital status and year fixed effects. 2000-2010 is the "pre" period, and differences in differences effects are estimated for years 2011-13. Standard errors are clustered by taxpayer and 5-digit ZIP. Income controls include log income and fixed effects for 100 income percentiles. Regressions weighted by taxable income.

Baseline is Los Angeles - Long Beach MSA. Geocodes are based on year $t-1$ zip code. $t-1$ is used because as of filing for year t, many taxpayers are already out of California and filing from another state.

*p<0.05; **p<0.01; ***p<0.001

Table A4: Movement Regressions: Unweighted, Destination Heterogeneity

	Move to:							
	All	Zero-Tax States	East	West	Midwest	Tax Cut States	Other States	State Uncoded
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
12.3% Under 2 Million								
2011	0.002***	0.001*	0.0001	0.0004*	−0.0001	−0.00002	0.0001	0.001**
	(0.001)	(0.0003)	(0.0003)	(0.0002)	(0.0001)	(0.0001)	(0.0002)	(0.0004)
2012	0.003***	0.001***	0.0004	0.0005*	0.00001	0.0001	0.0003	0.0004
	(0.001)	(0.0004)	(0.0003)	(0.0002)	(0.0001)	(0.0001)	(0.0002)	(0.0003)
2013	0.003***	0.001**	0.001*	0.0003	0.0001	−0.00004	0.0001	0.001**
	(0.001)	(0.0004)	(0.0003)	(0.0002)	(0.0001)	(0.00004)	(0.0002)	(0.0004)
2-5 Million								
2011	0.002	0.0003	0.0003	0.0003	0.0002	−0.0001***	0.0003	0.001
	(0.001)	(0.001)	(0.0005)	(0.0004)	(0.0002)	(0.00003)	(0.0004)	(0.001)
2012	0.006***	0.004***	−0.0001	0.001*	0.0003	0.00003	0.0001	0.001
	(0.001)	(0.001)	(0.0004)	(0.0004)	(0.0002)	(0.0001)	(0.0004)	(0.001)
2013	0.002	0.001*	−0.0001	0.0002	0.0001	−0.00002	−0.00005	0.001
	(0.001)	(0.001)	(0.0004)	(0.0004)	(0.0002)	(0.0001)	(0.0004)	(0.001)
5+ Million								
2011	0.002	0.002	−0.001	−0.001	−0.001***	0.0002	0.0002	0.001
	(0.002)	(0.001)	(0.001)	(0.0004)	(0.0001)	(0.0002)	(0.001)	(0.001)
2012	0.007***	0.005***	0.0005	0.0005	−0.0005*	0.0001	0.001	0.001
	(0.002)	(0.001)	(0.001)	(0.001)	(0.0002)	(0.0001)	(0.001)	(0.001)
2013	0.002	0.0004	0.0001	0.001	−0.0001	0.0002	−0.0003	0.001
	(0.002)	(0.001)	(0.001)	(0.001)	(0.0003)	(0.0002)	(0.001)	(0.001)
Observations	43,851,430	43,851,430	43,851,430	43,851,430	43,851,430	43,851,430	43,851,430	43,851,430
R^2	0.001	0.0001	0.0003	0.0001	0.0001	0.00001	0.0001	0.0002
Adjusted R^2	0.001	0.0001	0.0003	0.0001	0.0001	0.00001	0.0001	0.0002

Note: *p<0.05; **p<0.01; ***p<0.001

E. Summary Statistics for Out-Migration Variables

Table A5: Out-Migration Summary Statistics, 2000-09

	Percentage Chance of Next-Year Non Resident Filing		
Income Bin	All	To Non-Filer	To Non-Resident Filer
>$5 Million	1.524	0.467	1.012
$2-5 Million	1.521	0.567	0.905
12.3% Under $2 Million	1.590	0.663	0.859
11.3%	1.597	0.795	0.726
10.3%	1.712	0.911	0.710
9.3%	1.682	1.134	0.439

This table reports the percentage likelihood of different modes of out-migration, disaggregated by income bins reported in 2015 dollars. The calculations omit taxpayers who in the next year file as a non-resident, only to file again as a resident in the subsequent year (these are not quantitatively important). Out-migration rates are unweighted.

Table A6: Out-Migration Summary Statistics, 2000-09, Destination Heterogeneity

	Percentage Chance of Next-Year Non Resident Filing						
Income Bin	Zero-Tax	East	West	Midwest	Tax Cut	Other States	Destination Uncoded
>$5 Million	0.428	0.233	0.159	0.070	0.005	0.219	0.410
$2-5 Million	0.394	0.246	0.181	0.056	0.013	0.215	0.415
12.3% Under $2 Million	0.376	0.253	0.177	0.069	0.012	0.237	0.466
11.3%	0.346	0.270	0.186	0.074	0.013	0.244	0.464
10.3%	0.359	0.264	0.211	0.082	0.014	0.256	0.526
9.3%	0.366	0.196	0.253	0.095	0.017	0.318	0.437

F. Intensive Margin Motivation

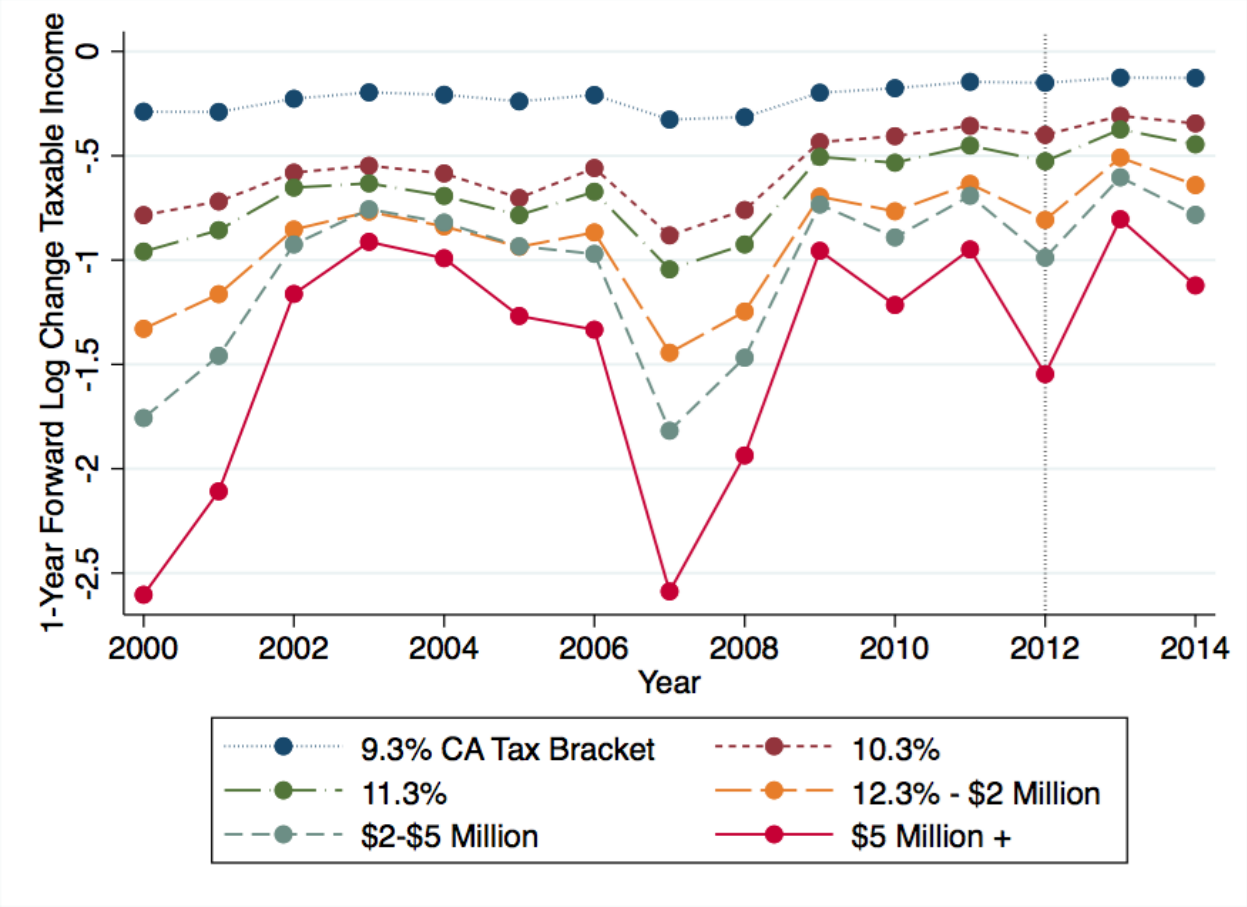


Figure A5: Taxable Income Trends by CA Tax Brackets

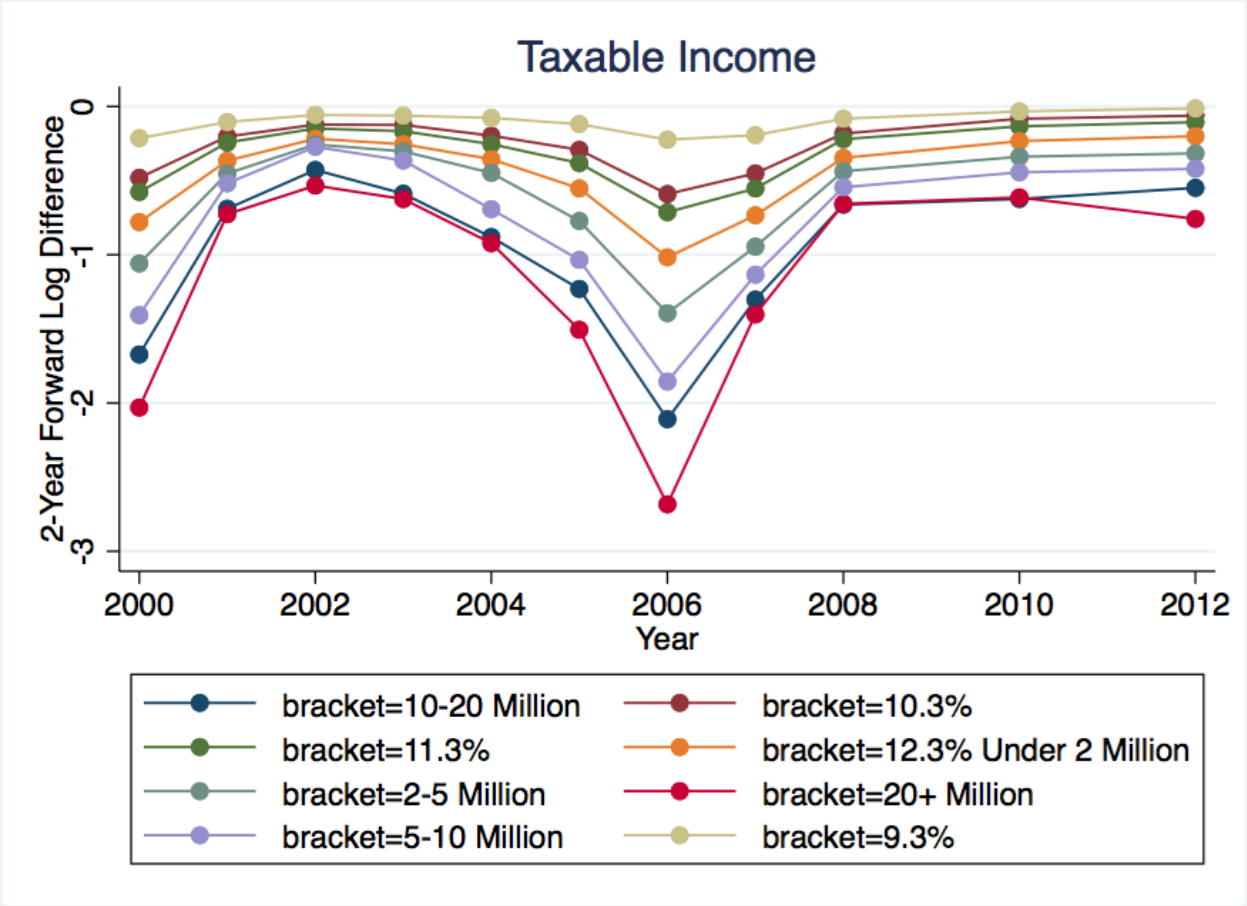


Figure A6: Taxable Income Trends by CA Tax Brackets: 2-year differences

For year t, the graph shows the bin wise average of $\log\{\frac{z_{it+3}+z_{it+2}}{z_{it}+z_{it+1}}\}$ For example, for $t = 2010$, bin wise averages are reported of $\log\{\frac{z_{i,2013}+z_{i,2012}}{z_{i,2011}+z_{i,2010}}\}$.

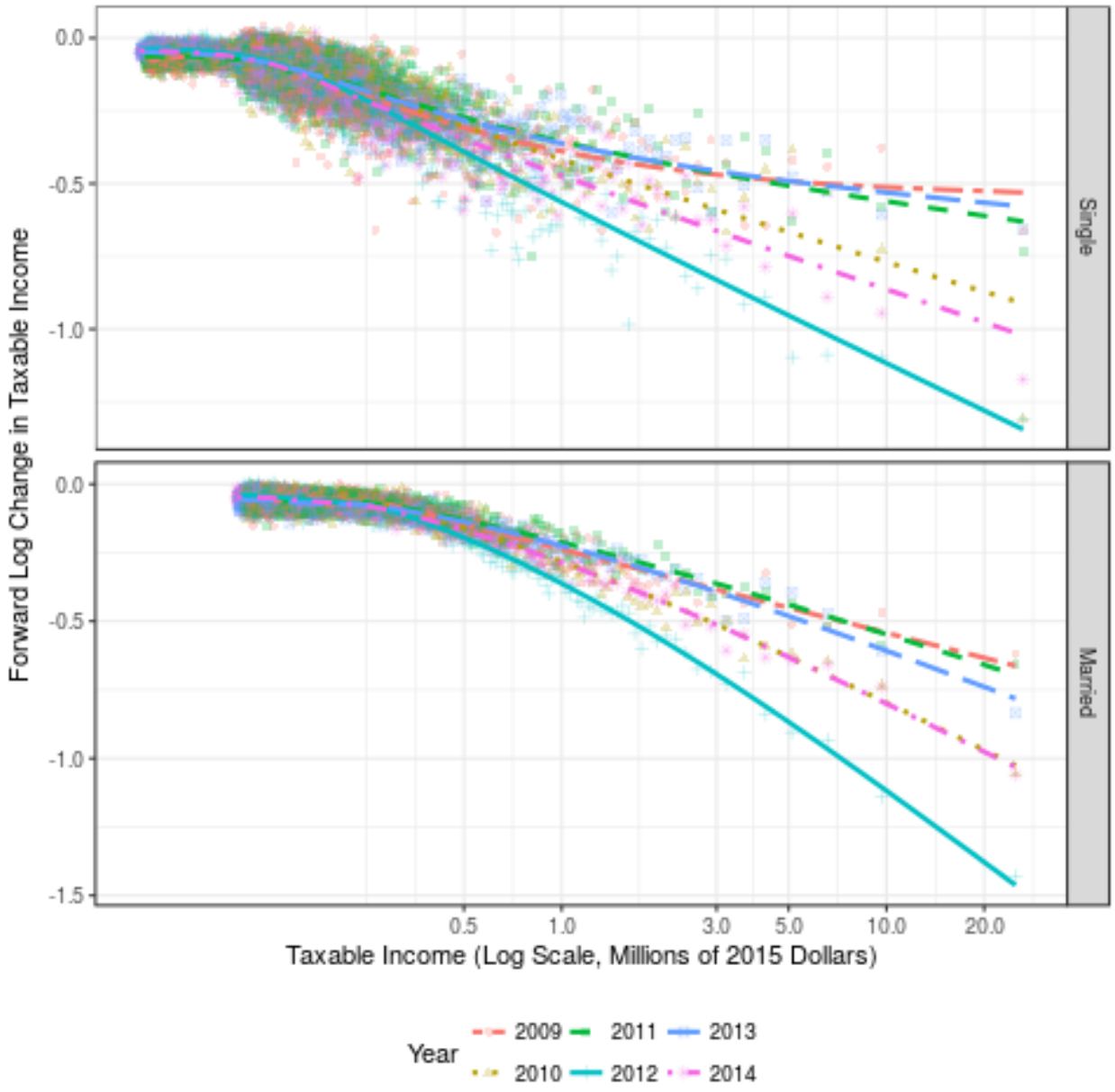


Figure A7: Year on Year Log Change in Income, by Income and Year

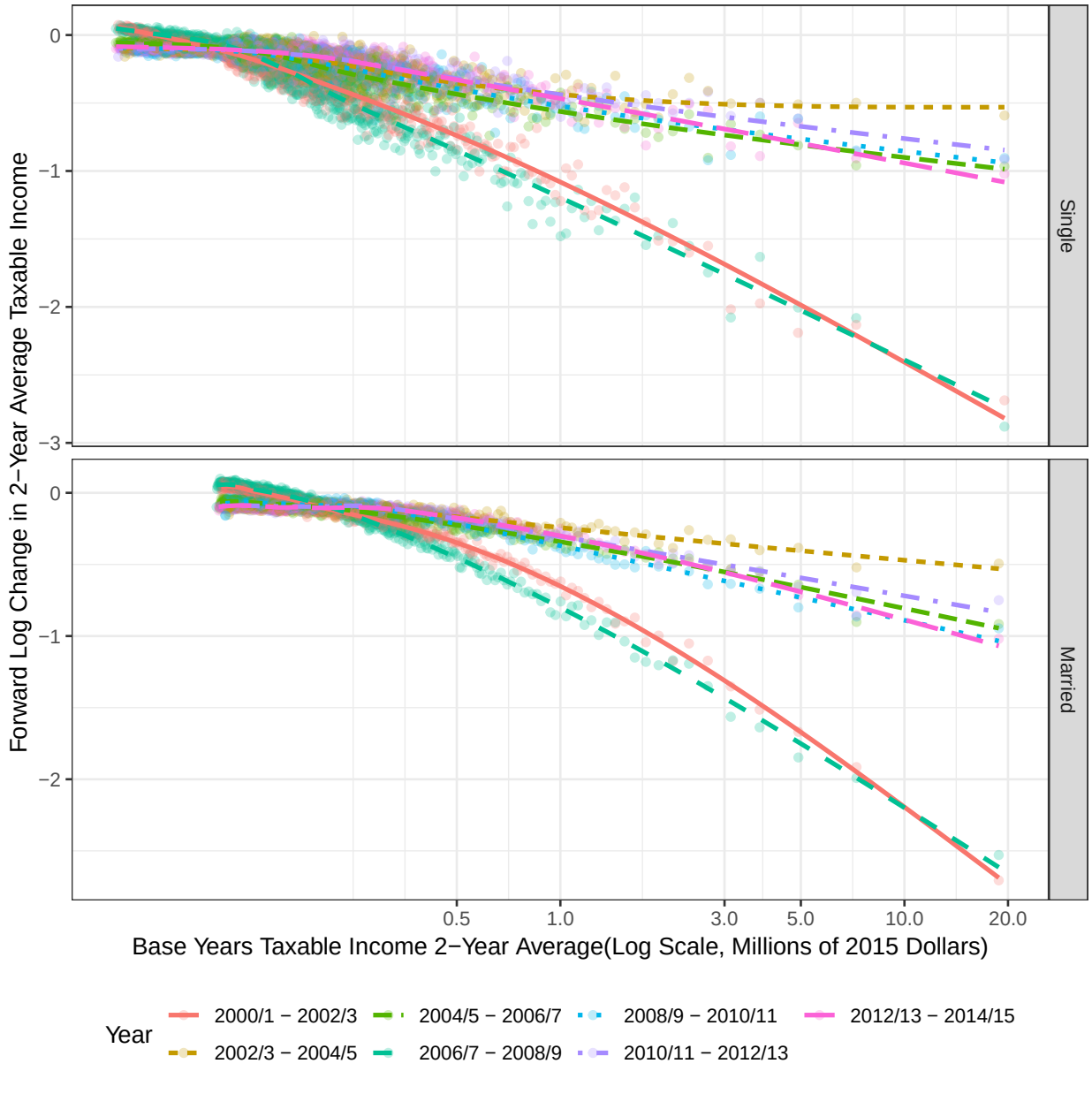


Figure A8: Year on Year Log Change in Income, by Income and Year

G. Intensive Margin Detail

Table A7: Average Ratio CA AGI / Federal AGI

Year	File as Non Resident in 2011	File as Resident in 2011
2009	0.075	0.996
2010	0.067	1.01
2011	0.065	1.02
2012	0.048	0.998
2013	0.056	0.999
2014	0.058	0.982

Table A8: Matched Differences in Differences: Single Households

	Dependent Variable			
	Log(Taxable Income +1)	Taxable Income	Log(AGI+1)	AGI
	(1)	(2)	(3)	(4)
Resident ×2012	−0.132***	−0.495***	−0.093***	−0.324***
	(0.023)	(0.090)	(0.011)	(0.089)
Resident ×2013	−0.172***	−0.330***	−0.112***	−0.281***
	(0.033)	(0.071)	(0.013)	(0.078)
Resident ×2014	−0.280***	−0.572***	−0.189***	−0.530***
	(0.034)	(0.086)	(0.015)	(0.092)
Observations	178,782	178,782	177,416	178,782
R^2	0.447	0.702	0.729	0.707
Adjusted R^2	0.336	0.642	0.675	0.649

Note: *p<0.05; **p<0.01; ***p<0.001

Table A9: Matched Differences in Differences: Married

	Dependent Variable			
	Log(Taxable Income +1)	Taxable Income	Log(AGI+1)	AGI
	(1)	(2)	(3)	(4)
Resident ×2012	−0.116***	−0.513***	−0.080***	−0.317**
	(0.026)	(0.120)	(0.013)	(0.119)
Resident ×2013	−0.144***	−0.298**	−0.088***	−0.227*
	(0.039)	(0.092)	(0.014)	(0.102)
Resident ×2014	−0.256***	−0.548***	−0.169***	−0.503***
	(0.038)	(0.111)	(0.016)	(0.119)
Observations	122,412	122,412	121,659	122,412
R^2	0.445	0.706	0.705	0.708
Adjusted R^2	0.325	0.642	0.641	0.645
Note:				*p<0.05; **p<0.01; ***p<0.001

Table A10: Matched Differences in Differences: Head of Household

	Dependent Variable			
	Log(Taxable Income +1)	Taxable Income	Log(AGI+1)	AGI
	(1)	(2)	(3)	(4)
Resident ×2012	0.029	−1.332*	−0.123	−1.322*
	(0.284)	(0.581)	(0.076)	(0.623)
Resident ×2013	−0.512*	−1.130**	−0.228**	−1.237**
	(0.210)	(0.409)	(0.076)	(0.464)
Resident ×2014	−0.301	−0.936*	−0.209*	−1.062*
	(0.208)	(0.404)	(0.095)	(0.451)
Observations	6,018	6,018	5,974	6,018
R^2	0.558	0.734	0.783	0.746
Adjusted R^2	0.395	0.635	0.702	0.652
Note:				*p<0.05; **p<0.01; ***p<0.001

Figure A9: Raw Diff in Diff Trends

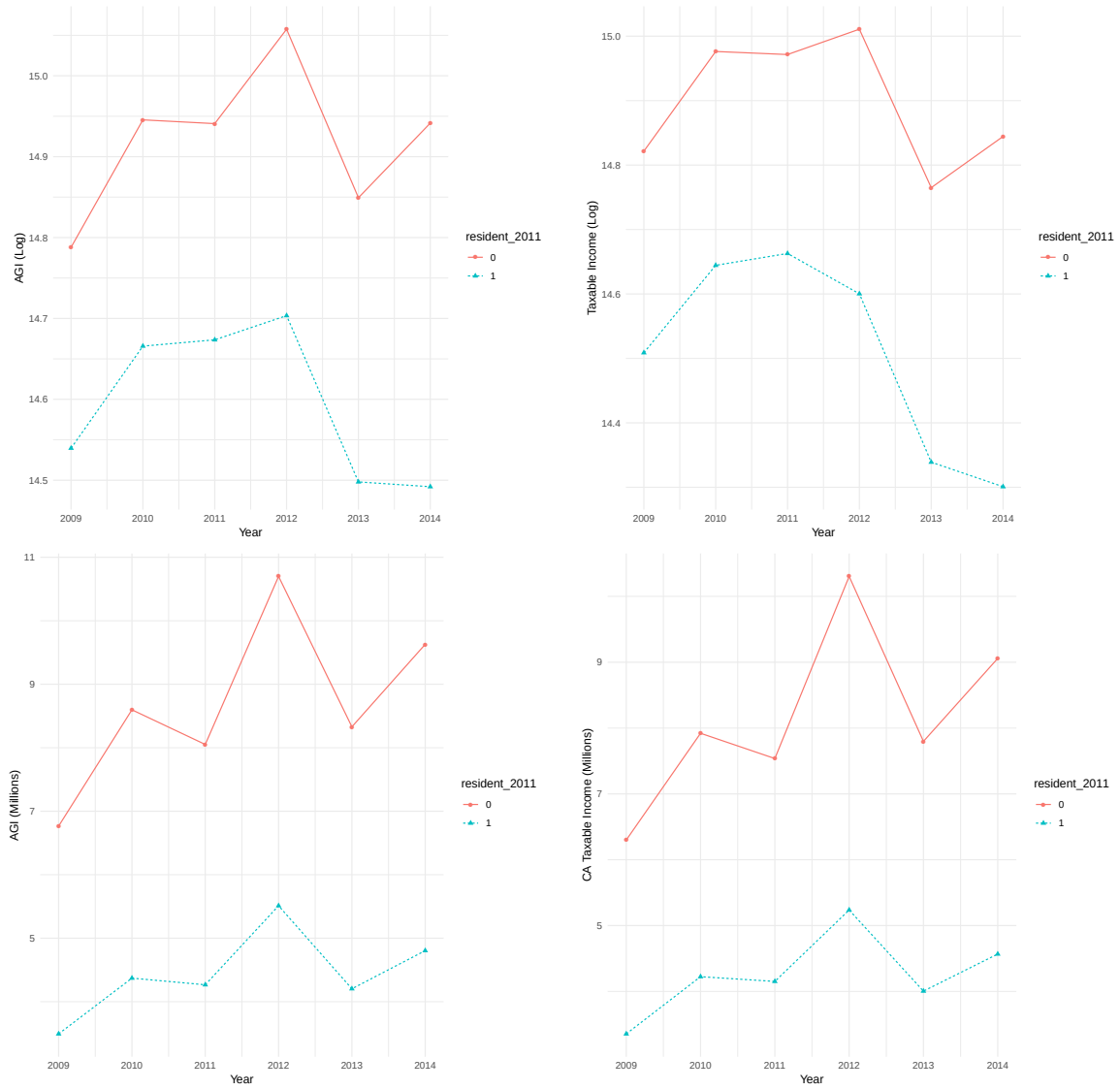
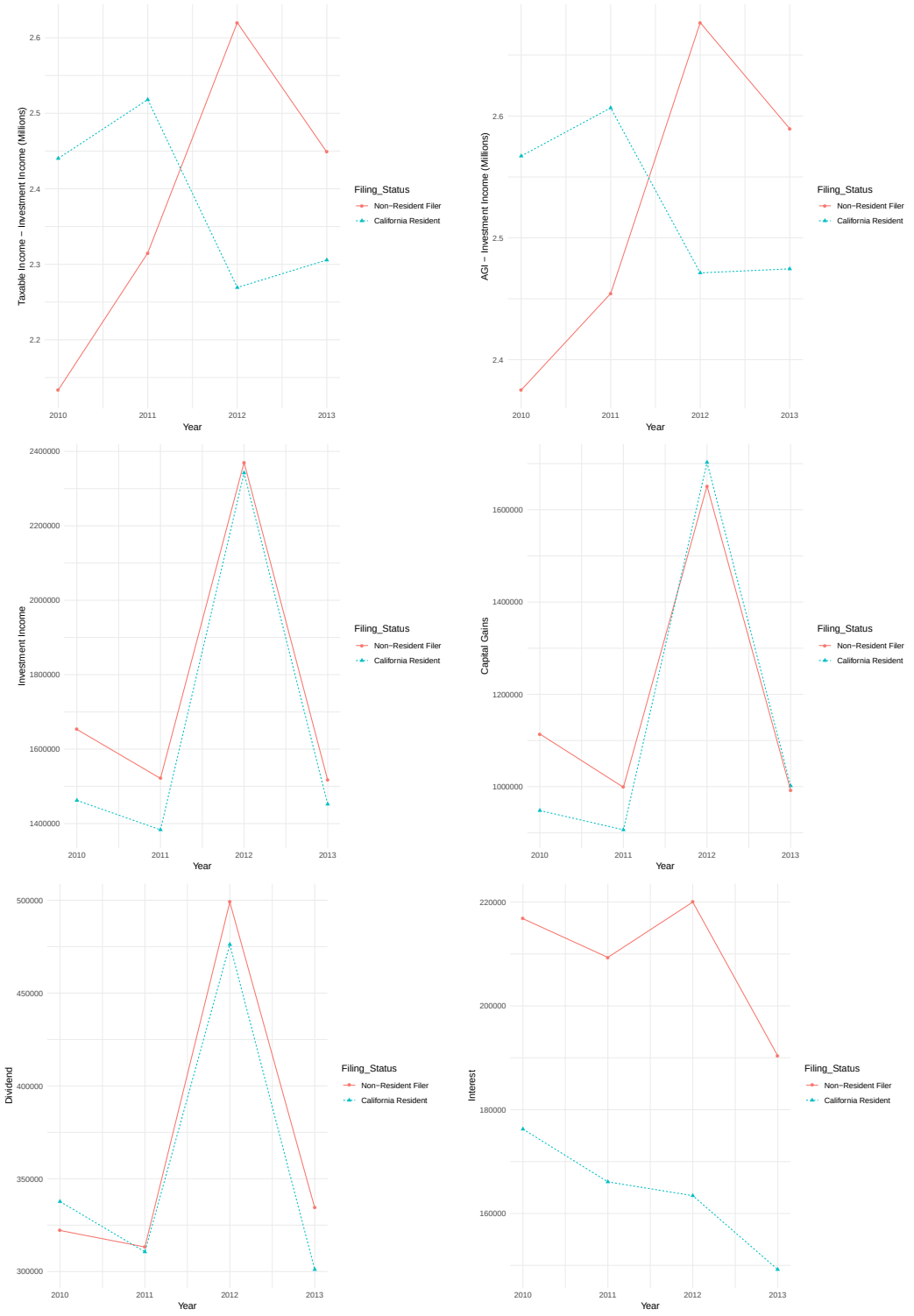


Figure A10: Matched Sample Income Trends: Decomposition



H. TCJA-Driven Average Tax Rate Differences, CA vs. Zero-Tax States

Table A11: Increase in Average Tax Rate Difference Between California and Other States, 2017-18

Income Bin	Increase in Average Tax Difference, CA vs. Zero-Tax States
10.3% Bracket	0.0197
11.3% Bracket	0.0261
12.3% Bracket under $2 Million	0.0362
$2-5 Million	0.0440
$5 Million +	0.0485

This table repeats the exercise of Table 1, but computes how the 2018 CA-other state gap in average taxes paid grew over and above the 2017 CA-other state gap. The gap is reported only for the case of zero-tax states, that is states with zero state income tax. This is the same group as in the prior exercise, with the exception of Wyoming which changed policy between 2017-18. This group is as follows: Alaska, Florida, Nevada, Texas, South Dakota, and Washington. Taxpayer behavior is still fixed at year 2012 levels suitably inflation-indexed; while we would ideally use year 2017 data, we do not have access to these data. We simply carry through 2012 behavior for parsimony and ease of comparison with our other calculations.

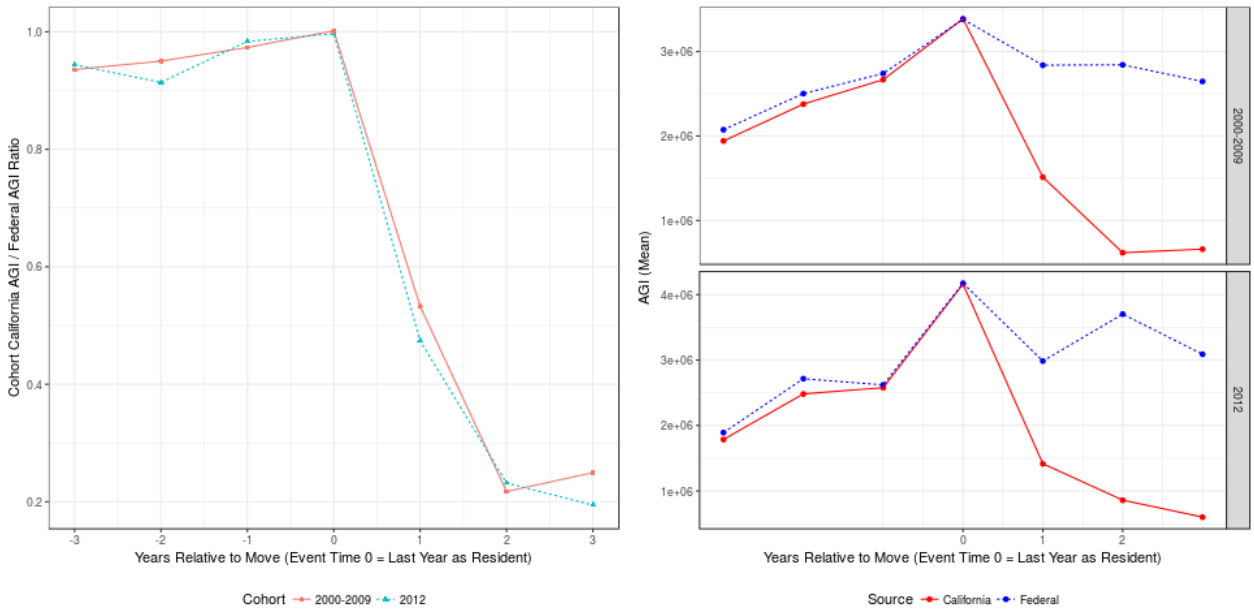
I. CA FTB Inflation Factors

Table A12: CA FTB Inflation Index

Year	Inflation Factor (Percent)
2000-01	5.3
2001-02	1.5
2002-03	2.2
2003-04	3.1
2004-05	2.8
2005-06	4.8
2006-07	3.1
2007-08	5
2008-09	-1.5
2009-10	0.9
2010-11	2.7
2011-12	1.9
2012-13	1.7
2013-14	2.2
2014-15	1.3
2015-16	2.1

J. AGI Ratios of NR Movers

The sample is all taxpayers who displayed a Resident - NR - NR transition, where in the "Resident" year the taxpayer was in the top tax bracket according to 2012 tax policy.



(a) CA AGI / Federal AGI Ratio **(b)** AGI Levels

Figure A11: AGI Dynamics of Top-Bracket Resident Filter to 2x Non-Resident/Partial Year Filer

K. Year on Year Income Persistence

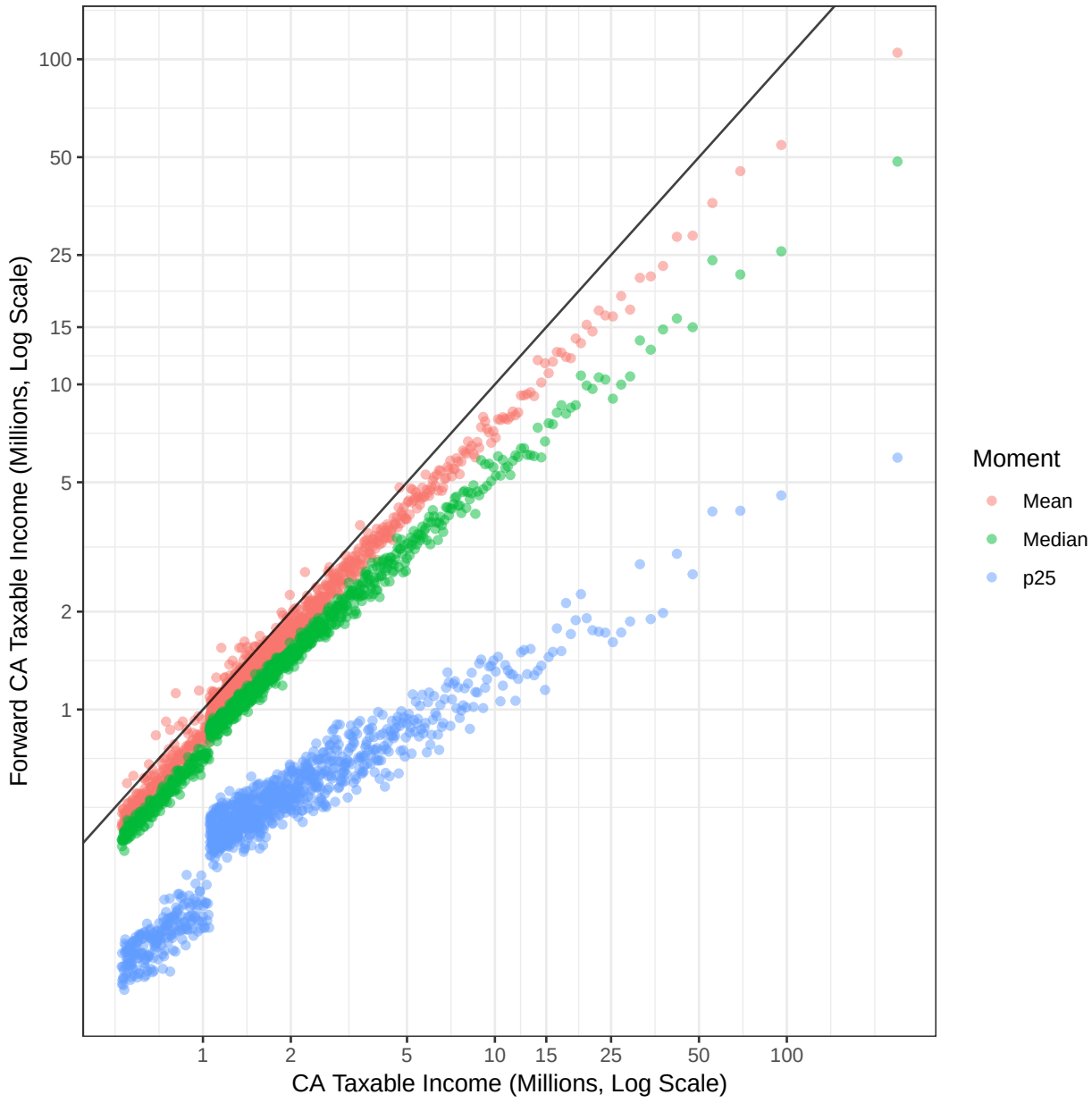


Figure A12: Year on Year Income Persistence

Sample is from 2000-2010. Solid line is the 45 degree line through the origin.

L. Components of Taxable Income

This section summarizes IRS Form 1040 (Federal) and CA FTB form 540 (California). Start with Federal AGI. Subtract "CA subtractions" and add "CA additions"; this gives CA AGI. Then, we

have

$$\text{CA Taxable Income} = (\text{CA AGI - CA Deductions})^{+}$$

In the following we describe how Federal AGI is constructed, from an intermediate quantity known as Total Income. Note our data contain CA Taxable Income, CA wages, Federal AGI, and CA deductions for the universe of California tax returns.

L.a. Components of Total Income

Variable	Data
Federal Wages	Partial
Interest	Full
Dividends	Full
Taxable refunds, credits, or offsets of state and local income taxes	(Not Contained)
Alimony Received	Partial
Business Income	Partial
Capital Gains (Losses)	Full
Other Gains (Losses)	Partial
IRA Distributions	Partial
Rental Real Estate, Royalties, Partnerships, S-Corps, trusts, etc.	Partial
Farm Income (Loss)	Partial
Unemployment Compensation	Partial
Social Security Benefits	Partial
Other Income	Partial

L.b. Total Income to Federal AGI: Subtractions

Variable	Data
Educator Expenses	Partial
Certain business expenses	Partial
Health savings account deduction	Partial
Moving expenses	Partial
Deductible part of self-employment tax	Partial
Self-employed SEP, SIMPLE, and qualified plans	Partial
Self-employed health insurance deduction	Partial
Penalty on early withdrawal of savings	Partial
Alimony paid	(Not Included)
IRA deduction	Partial
Student loan interest deduction	Partial
Tuition and Fees	Partial
Domestic production activities deduction	Partial