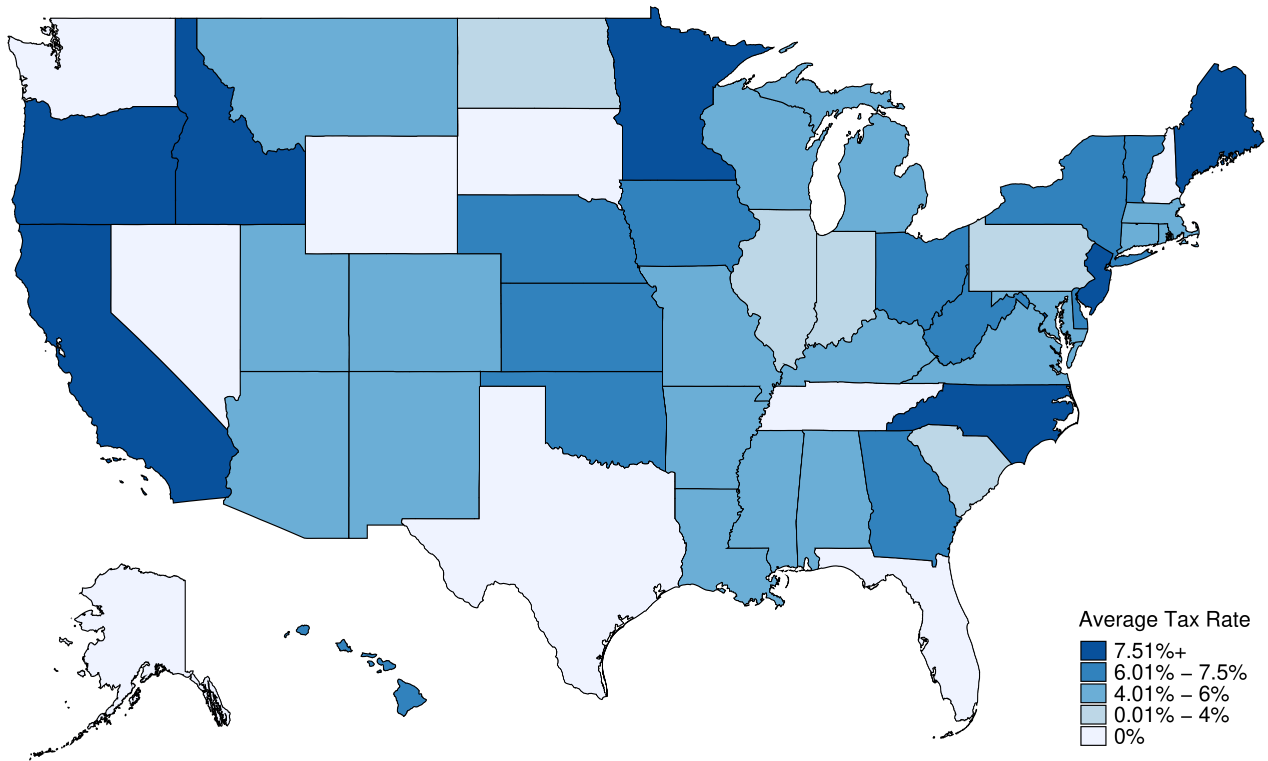
Online Appendix For
“State Taxes, Migration and Capital Gains Realizations”

February 11, 2026

A Appendix Figures

A map of US capital gains tax rates is displayed in Appendix Figure A.1 below:

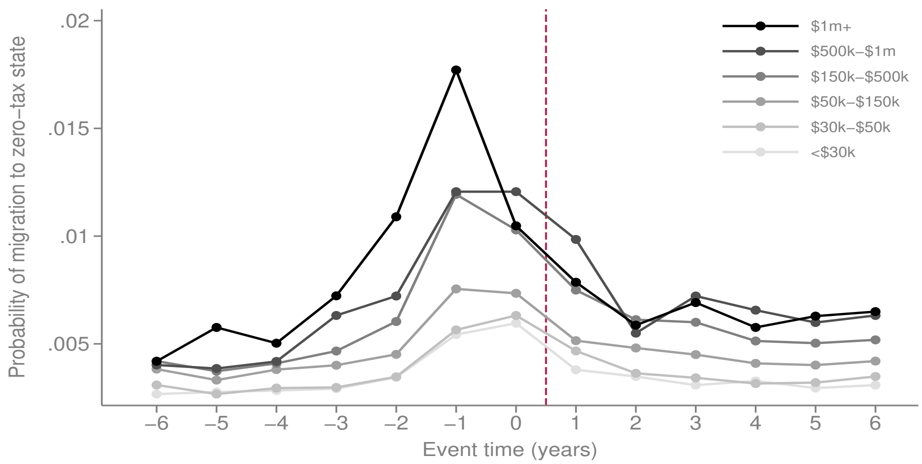
Figure A.1: US State Capital Gains Tax Rates (Average Rate 1998-2011)



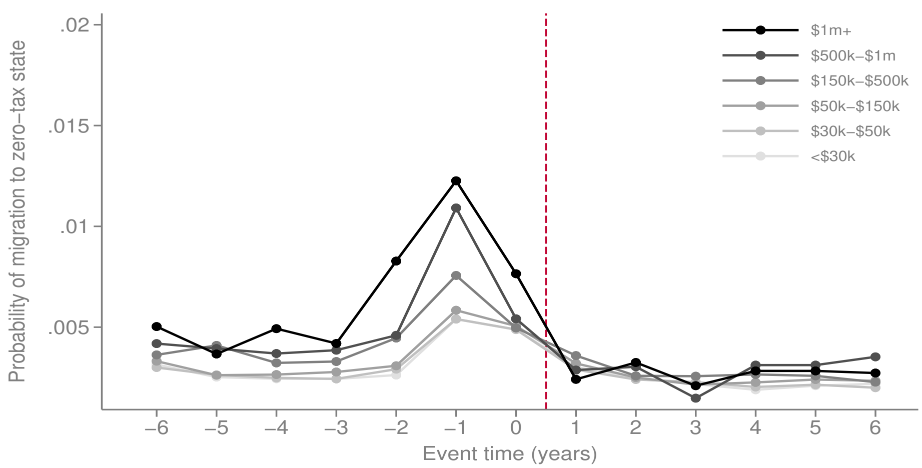
Notes: This table shows top marginal tax rates in all US states in 2011. Data is from NBER TAXSIM (Feenberg and Coutts, 1993) and Robinson and Tazhitdinova (2025). States are grouped into three broad categories: 1) High-tax states – those with top tax rates above 6%, 2) Zero-tax states – those with no personal income taxes and 3) Middle-Tax States – all remaining states.

Figure A.2: Rates of Migration to Zero-Tax States Relative to the Timing of Realization Split by Destination, Plotted by Potential Tax Savings

A. Migration to Florida



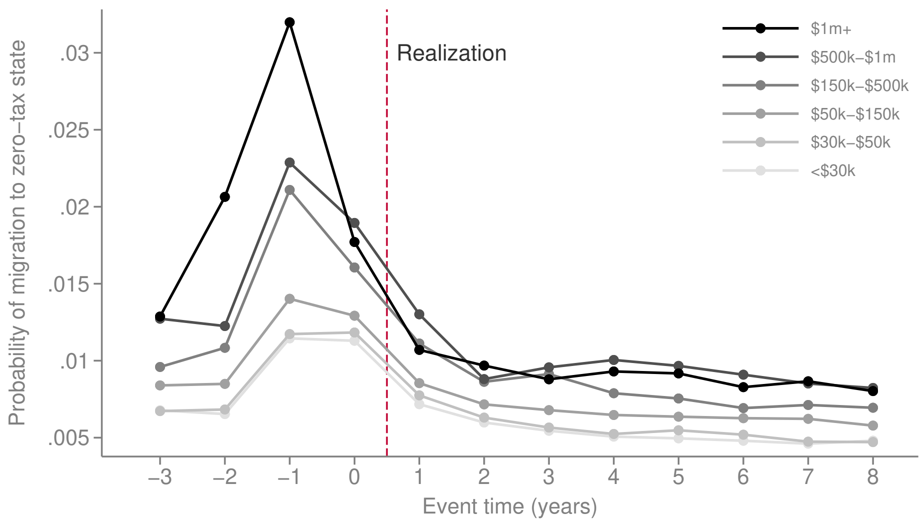
B. Migration to Zero-Tax States Excluding Florida



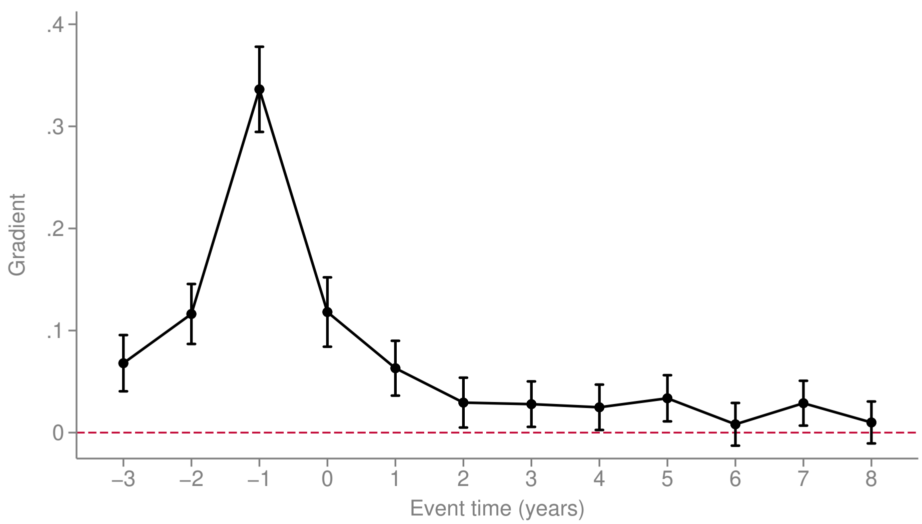
Notes: This figure shows rates of migration to zero-tax states, splitting individuals by the size of their potential tax savings. Potential tax savings is determined by the size of one's realization and the state tax rate in their origin. Panel A shows the rate of migration to Florida while Panel B shows the rate of migration to all zero-tax states excluding Florida.

Figure A.3: Migration to Zero-Tax States Relative to the Timing of Realization, with Additional Years Post-Realization

A. Migration Rate By Size of Potential Tax Savings

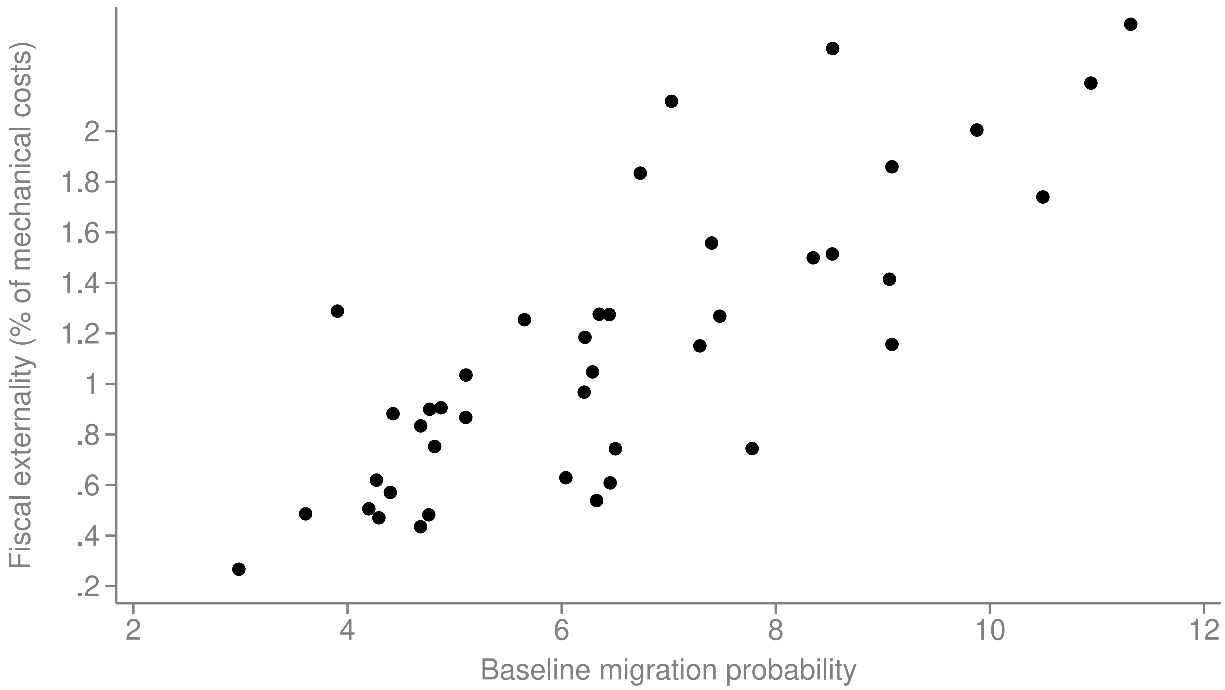


B. Gradient of Migration with Respect to Potential Tax Savings as a Share of Wealth



Notes: This figure shows rates of migration to zero-tax states. Rates of migration are plotted relative to the time of an individual's largest realization, $t = 0$. The sample is composed of all individuals who reside in a positive-tax state seven years in advance of their realization. Individuals are binned by the size of the tax bill they would owe if they realized their gains in their origin state. We refer to this as their potential tax savings. This figure differs from Figure 1 because it shows rates of migration up to 8 years after realization. In order to maintain sample size, it is drawn from a sample of individuals who reside in a positive-tax state 4 years prior to realization rather than 6 years prior to realization.

Figure A.4: Fiscal Externality Across States From Tax Rate Reduction Relative to Baseline Migration to Zero-Tax States



Notes: This figure is based on results from a counterfactual policy change that reduces top tax rates by 1% in each US state. Each dot corresponds to the effect of the policy in one US state over the full sample period. States are plotted along the x-axis based on the status quo probability that individuals with large capital gains migrate to zero-tax state in advance of realization. The probability is reported in realization-weighted terms. States are plotted along the y-axis depending on the fiscal externality produced by the policy as a fraction of the policy's mechanical cost.

Table A.1: Summary Statistics on Out-Migrants from Positive Tax States with Large Capital Gains Realizations

Panel A: Means and medians

	Mean	Median
Income	668,654	159,741
Wages	379,806	21,783
Realization amount	4,548,383	1,102,905
Age	60	60
Observations	46,457	46,457

Panel B: Common industries

Industry	*NAICS code*	*Share of obs*
Real Estate and Rental and Leasing	53	0.126
Professional, Scientific, and Technical Services	54	0.096
Finance and Insurance	52	0.092
Manufacturing	31-33	0.092
Health Care and Social Assistance	62	0.217
Retail Trade	44-45	0.050

Panel C: Common origin states

State	*Share of obs*
California	0.237
New York	0.135
New Jersey	0.081
Massachusetts	0.042
Ohio	0.042
Illinois	0.041

Notes: This table provides summary statistics on our sample of individuals with large capital gains who originate in positive-tax states and migrate to zero-tax states. Panel A provides information on realization sizes, realizer income and realizer age. Medians are the mean of the 10 observation closest to the true median. Panel B reports the 2-digit NAICS code associated with the filer's primary source of income. (NAICS codes are collected in the three years prior to realization from Form W-2, and Schedule K-1 of Form 1065 and Form 1120S.) Panel C reports the most common origin states.

Table A.2: Robustness to Alternate Specifications

	0.03*Wealth (1)	Baseline (2006-2015) (2)	Wealth using Years 5/6 (2006-2015) (3)	Baseline (2004-2013) (4)	3-Year Period (2004-2013) (5)	5-Year Period (2004-2013) (6)	6-Year Period (2004-2013) (7)
θ Coefficient	0.507	9.862	10.868	9.480	8.637	9.072	9.814
Zero-Tax Realizations	$2,298m	$1,790m	$2,204m	$1,735m	$1,391m	$1,808m	$2,048m
CA Fiscal Externality	$32.7m	$37.3m	$51.2m	$42.9m	$34.0m	$45.3m	$51.5m
Income/age controls	X	X	X	X	X	X	X
Origin controls	X	X	X	X	X	X	X
Destination controls	X	X	X	X	X	X	X
Smoothed dependent variable	X	X	X	X	X	X	X

Notes: Column (1) presents the results from an alternate specification where the value of tax savings is measured relative to the flow value of wealth, approximated as .03W rather than W. Columns (2) re-estimates our baseline results for years 2006 to 2015. This is to serve as a point of comparison for Column (3) which uses income values in Years 5 and 6 prior to realization rather than Year 2 to capitalize wealth. This examines how sensitive our wealth capitalization is to the choice of year. Years 5 and 6 are after realization rather than before. Columns (4)-(7) report estimates using the 2004–2013 realization years and examines the role of alternative period lengths. It reports lengths of 3, 5 and 6 years, relative to our baseline of 4. In each case, we report our coefficient of interest, θ. This captures the impact of potential tax savings on individual payoffs. Next, we consider a counterfactual where residents of positive-tax states cannot avoid state capital gains taxes via migration. We compare this counterfactual to the status quo and estimate the effect of the status quo on new realizations in zero-tax states. We report the quantity of new yearly realizations by former residents of positive-tax states. Finally, we consider a counterfactual where the state of California reduces its top marginal tax rate by 1%. We report the effect of reduced out-migration on capital gains realizations in zero-tax states.

B Dynamic Discrete Choice Model Details

In this section we provide further detail on the dynamic discrete choice model described in Sections III and IV.

B.I Setting up the dynamic discrete choice model

We set up the dynamic discrete choice model as follows. In each period t, individuals make two choices, they choose their state of residence and they choose whether they realize. Their choice set is:

$$C_{it} = (s_{it}, r_{it}) \tag{B.1}$$

- s_{it} captures the state that the individual chooses to live at in period t. We let $s_{it} = \{P_j, Z_j\}$, in other words, the individual can choose to be in a positive tax state H_j (here defined as any state with a non-zero tax rate) or a zero tax state Z_j.
- r_{it} captures whether the individual realizes in period t. $r_{it} = \{0, 1\}$ is an indicator variable for realization. For tractability, we require that the individual realizes at some point in time, but place no restriction on when that realization occurs. We will then examine migration relative to that realization event.

There are a number of state variables in the model, given by the vector x_{it}. We let:

$$x_{it} = (d_{it}, s_{it-1}, \tau_{s_{t-1}} Q_i) \tag{B.2}$$

- z_{it} captures exogenous demographic characteristics regarding person i. This includes indicators for 10-year age bins, and 10 decile bins for household wealth. Wealth is calculated by capitalizing income, using the approach developed in Smith et al. (2023).
- s_{it-1} captures the individuals state of residence in the previous period. This is necessary to detect whether individuals have migrated.
- Q_i captures the size of the individuals' unrealized capital gains and $\tau_{s_{t-1}}$ captures the tax rate in state s, where the individual lived in period t-1. Together this state variable captures the taxes owed on unrealized capital gains. We use the lagged state of residence because individuals who realize in one period pay capital gains based on their residence at the start of a given period.

Having established the choice set and the state variables, we set up the following flow payoff for each individual:

$$\pi_{it}(s, r) = d'_{it}(\alpha_{s,g} + \eta m_{it}(s_{it}, s_{it-1})) - \theta f(\tau_{s_{t-1}} Q_i / W_i) r_{it} \tag{B.3}$$

- $\alpha_{s,g}$ represents a vector of coefficients that can be estimated. The length of $\alpha_{s,g}$ is equal to the length of our demographic characteristics vector d_{it}. $\alpha_{s,g}$ captures the value of residing in the current state, s during tax regime g, for individuals with the various demographic characteristics captured in d_{it}. We classify tax regimes as periods of time where state tax rates do not vary by more than 1%. This is an attempt to capture variation in preferences for given locations that might vary with tax rates over time.
- $m_{it} = \mathbb{1}(s_{it} \neq s_{it-1})$ is an indicator that captures whether the individual has migrated since the previous period. η is the coefficient capturing the cost of migrating.
- $\tau_{s_{t-1}} Q_i / W_i$ captures the state capital gains taxes paid as a fraction of wealth. $\tau_{s_{t-1}}$ captures the tax rate in state s (the individual's residence at the beginning of the period) and Q_{it} captures the size of the realization and W_i is a measure of individual wealth. $f(\cdot)$ captures the fact that the individuals payoff is a function of the tax savings. (We seek to estimate that function in Appendix B.IV below.) r_{it} is an indicator for whether realization occurred. θ is our coefficient of interest.

In this set-up we allow the preference for locations to vary with demographic characteristics such as wealth. For simplicity, we omit income flows from our payoff functions. Our ultimately analysis compares the relative ordering of migration and realization for individuals with the same level of wealth. Differences in wealth will differ our in our primary regression equation and so the levels are omitted here. Having established flow payoffs, we set up flow utility:

$$u_{it}(s, r, x) = \pi_{it}(s, r) + \varepsilon_{it}(s, r) \tag{B.4}$$

- Flow utility here is equal to flow payoffs plus an error term. We make the standard assumption that $\varepsilon_{it}(s, r)$ are i.i.d across i, s, r, and t with a Type I extreme value distribution.

Given that flow utility, the individual dynamic optimization problem is given by the following value function:

$$V(x_{it}) = \max_{s,r}\{u_{it}(s, r, x_{it}) + \beta E[V(x_{it+1}(s_t, r_t))]\} \tag{B.5}$$

We also have a choice-specific (or conditional) value function given by:

$$\bar{V}(s_t, r_t, x_{it}) = \pi_{it}(s_t, r_t) + \beta E[V(x_{it+1}(s_t, r_t))] \tag{B.6}$$

This gives us the returns of an action before the realization of the error term, $\varepsilon_{it}(s, r)$.

B.II Implementing the Euler conditional choice probability approach

In order to use the Euler CCP approach in this context, we begin by drawing upon a version of Lemma 1 from (Arcidiacono and Miller, 2011):

$$V(x_{it}) = \bar{V}(s_t, r_t, x_{it}) - logPr(s_t, r_t|x_{it}) + \gamma$$

γ in this equation is Euler's Gamma. This equation is derived in the context of the Euler CCP in Scott (2013). It draws upon properties of the logit.

Once we have that lemma, we can use it to manipulate our equation for the choice-specific value function:

$$\begin{aligned}\bar{V}(s_t, r_t, x_{it}) &= \pi_{it}(s_t, r_t) + \beta E[V(x_{it+1}(s_t, r_t))] \\ &= \pi_{it}(s_t, r_t) + \beta E[\bar{V}(s_{t+1}, r_{t+1}, x_{it+1}(s_{t,}r_t)) - lnPr(s_{t+1}, r_{t+1}|x_{it+1}(s_{t,}r_t)) + \gamma]\end{aligned}$$

This equation holds for any set of choices (s_t, r_t) and any set of follow-up choices (s_{t+1}, r_{t+1}). In order to handle the continuation values that appear in this equation, we utilize the logic of renewal actions. (Scott (2013) notes that renewal actions are a special case of finite dependence.) For two sets of individuals who start in the same place and end in the same place, their value forward-looking functions can be equal even if they took different paths to get to that end point.

In our set-up we focus on two sets of individuals: those who migrate before they realize and those who realize before they migrate. For the individuals who migrate before they realize, the make the following choices: $(Z, 0)$ and then $(Z, 1)$. For the individuals who realize before they migrate, they make the following choices: $(P, 1)$ and then $(Z, 0)$. Both of these groups find themselves in the zero tax state after period 2 having realized their capital gains[1]. With that in mind we write out the choice specific value function for the initial choices along both of these paths:

$$\begin{aligned}&\bar{V}(s_t = Z_j, r_t = 0, x_{it}) = \pi_{it}(s_t = Z_j, r_t = 0) \\ &+ \beta E[\bar{V}(s_{t+1} = Z_j, r_{t+1} = 1, x_{it+1}(s_{t,}r_t)) - lnPr(s_{t+1} = Z_j, r_{t+1} = 1|x_{it+1}(s_t = Z_j, r_t = 0)) + \gamma]\end{aligned}$$

$$\begin{aligned}&\bar{V}(s_t = P_j, r_t = 1, x_{it}) = \pi_{it}(s_t = P_j, r_t = 1) \\ &+ \beta E[\bar{V}(s_{t+1} = Z_j, r_{t+1} = 0, x_{it+1}(s_{t,}r_t)) - lnPr(s_{t+1} = Z, r_{t+1} = 0|x_{it+1}(s_t = P_j, r_t = 1)) + \gamma]\end{aligned}$$

[1] The use of only two periods here is slightly stylized. In Section B.III to discuss how this maps onto our data.

We can then take the difference between these two choice-specific value functions and utilize the fact that the continuation values: $V(x_{it+1})$ are nearly identical. In particular, $V(x_{it+1}) = EV(x_{it+1}) + \epsilon_t(s_t, r_t)$. The value function is equal to the expected value function plus an expectational error. And we can substitute in this equation, cancel out the equal value functions and only be left with an expectational error. We will call that expectational error $\epsilon_t(s_t = Z_j, r_t = 0) - \epsilon_t(s_t = P_j, r_t = 1) = \Delta\epsilon_t$. Putting it together, we get:

$$\begin{aligned}
\bar{V}(s_t = Z_j, r_t = 0, x_{it}) - \bar{V}(s_t = P_j, r_t = 1, x_{it}) =& \pi_{it}(s_t = Z_j, r_t = 0) - \pi_{it}(s_t = P_j, r_t = 1) \\
&+ \beta[\pi_{it+1}(s_{t+1} = Z_j, r_{t+1} = 1) - \pi_{it+1}(s_{t+1} = Z_j, r_{t+1} = 0)] \\
&- \beta[ln\frac{Pr(s_{t+1} = Z_j, r_{t+1} = 1|x_{it+1}(s_t = Z_j, r_t = 0))}{Pr(s_{t+1} = Z_j, r_{t+1} = 0|x_{it+1}(s_t = Z_j, r_t = 1))}] \\
&+ \Delta\epsilon_t
\end{aligned}$$

From there, we can utilize the following equivalence from Hotz and Miller (1993):

$$\bar{V}(s_t = Z_j, r_t = 0, x_{it}) - \bar{V}(s_t = P_j, r_t = 1, x_{it}) = ln[\frac{Pr(s_t = Z_j, r_t = 0|x_{it})}{Pr(s_t = P_j, r_t = 1|x_{it})}]$$

We can then combine that with the previous equation to get:

$$\begin{aligned}
&ln[\frac{Pr(s_t = Z_j, r_t = 0|x_{it})}{Pr(s_t = P_j, r_t = 1|x_{it})}] + \beta[ln\frac{Pr(s_{t+1} = Z_j, r_{t+1} = 1|x_{it+1}(s_t = Z_j, r_t = 0))}{Pr(s_{t+1} = Z_j, r_{t+1} = 0|x_{it+1}(s_t = P_j, r_t = 1))}] \\
&= [\pi_{it}(s_t = Z_j, r_t = 0) - \pi_{it}(s_t = P_j, r_t = 1)] - \beta[\pi_{it+1}(s_{t+1} = Z_j, r_{t+1} = 1) - \pi_{it+1}(s_{t+1} = Z_j, r_{t+1} = 0)] + \Delta\epsilon_t
\end{aligned}$$

We can then use our previous formula for the flow payoffs to simplify the right-hand side:

$$\begin{aligned}
&[\pi_{it}(s_t = Z_j, r_t = 0) - \pi_{it}(s_t = P_j, r_t = 1)] - \beta[\pi_{it+1}(s_{t+1} = Z_j, r_{t+1} = 1) - \pi_{it+1}(s_{t+1} = Z_j, r_{t+1} = 0)] \\
&= d'_{it}(\alpha_{P_j,g} - \alpha_{Z_j,g}) + (d'_{it} - \beta d'_{it+1})\eta + \theta\left(f(\tau_P Q_i/W_i) - f(\tau_Z Q_i/W_i)\right) + \Delta\epsilon_t
\end{aligned}$$

Putting it all together we get the following equation:

$$\begin{aligned}
&ln[\frac{Pr(s_t = Z_j, r_t = 0|x_{it})}{Pr(s_t = H_j, r_t = 1|x_{it})}] + \beta[ln\frac{Pr(s_{t+1} = Z_j, r_{t+1} = 1|x_{it+1}(s_t = Z_j, r_t = 0))}{Pr(s_{t+1} = Z_j, r_{t+1} = 0|x_{it+1}(s_t = P_j, r_t = 1))}] \\
&= d'_{it}(\alpha_{P_j,g} - \alpha_{Z_j,g}) + (d'_{it} - \beta d'_{it+1})\eta + \theta\left(f(\tau_P Q_i/W_i) - \beta f(\tau_Z Q_i/W_i)\right) + \Delta\epsilon_t
\end{aligned} \tag{B.7}$$

B.III Working toward a linear regression to estimate the causal effect of tax savings

Next, we take the equation presented above and re-arrange in a way that simplifies it for direct estimation of the terms and the subsequent use of OLS.

In order to develop clearer intuition, we rearrange the left-hand side of this equation (and set $\beta = 1$)[2]:

$$\begin{aligned}
&lnPr(s_{t+1} = Z_j, r_{t+1} = 1|x_{it+1}(s_t = Z_j, r_t = 0)) + lnPr(s_t = Z_j, r_t = 0|x_{it}) \\
&- lnPr(s_{t+1} = Z_j, r_{t+1} = 0|x_{it+1}(s_t = H_j, r_t = 1) - lnPr(s_t = P_j, r_t = 1|x_{it})
\end{aligned}$$

[2] β must be calibrated in this dynamic discrete choice exercise. For the purposes of our calculations we assume that $\beta = 1$. The structure of our set-up means that small modifications to β will have a minimal impact on our results. In our primary regression the β will fall out of tax savings terms because, in Section B.IV, we impose the assumption that $f(0) = 0$. In other words, tax savings should not have an impact on an individual's behavior if they don't have any tax savings. If we were to impose the assumption that β is less than 1, we would need to alter our analysis such that individuals who migrate and then realize \$$Q$ are compared to individuals who realize slightly less than \$$Q$ before migrating. Our analysis in Section **??**, however, shows that this modification has very little impact on our results.

Which becomes:

$$
\begin{aligned}
&ln[Pr(s_{t+1} = Z_j, r_{t+1} = 1|x_{it+1}(s_t = Z_j, r_t = 0)) * Pr(s_t = Z_j, r_t = 0|x_{it})] \\
&- ln[Pr(s_{t+1} = Z_j, r_{t+1} = 0|x_{it+1}(s_t = P_j, r_t = 1) * Pr(s_t = P_j, r_t = 1|x_{it})]
\end{aligned}
$$

Here we can utilize the fact that $Pr(s_{t+1} = Z_j, r_{t+1} = 1|x_{it+1}(s_t = Z_j, r_t = 0))$ can be expressed as $Pr(A|B, C)$ and $Pr(s_t = Z_j, r_t = 0|x_{it})$ can be expressed as $Pr(B|C)$. Multiplying them together, we get $Pr(AB|C)$. Applied to this problem, we get: $Pr(s_t = Z_j, r_t = 0, s_{t+1} = Z_j, r_{t+1} = 1|x_{it})$. In other words, this is the probability of migrating in the first period and realizing in the second period, conditional on having the state variables in x_{it}. In other words, it is the probability of migrating in the first period and realizing in the second, conditional on having an initial residence in a positive tax state and having a future realization of size Q.

So, we can re-write our left-hand side as the following:

$$
ln[Pr(s_t = Z_j, r_t = 0, s_{t+1} = Z_j, r_{t+1} = 1|x_{it})] - ln[Pr(s_t = P_j, r_t = 1, s_{t+1} = Z_j, r_{t+1} = 0|x_{it})]
$$

Or more simply:

$$
ln\left[\frac{Pr(s_t = Z_j, r_t = 0, s_{t+1} = Z_j, r_{t+1} = 1|x_{it})}{Pr(s_t = P_j, r_t = 1, s_{t+1} = Z_j, r_{t+1} = 0|x_{it})}\right]
$$

This gives us the final equation:

$$
ln\left[\frac{Pr(s_t = Z_j, r_t = 0, s_{t+1} = Z_j, r_{t+1} = 1|x_{it})}{Pr(s_t = P_j, r_t = 1, s_{t+1} = Z_j, r_{t+1} = 0|x_{it})}\right] = d'_{it}(\alpha_{P_j,g} - \alpha_{Z_j,g}) + (d'_{it} - d'_{it+1})\eta + \theta\left(f(\tau_P Q_i/W_i) - f(0)\right) + \Delta\epsilon_t \tag{B.8}
$$

On the left-hand side we have the log-odds ratio, which compare the probability of migrating before realization and the probability of realizing before migration. On the right-hand side, $d'_{it}(\alpha_{P_j,g} - \alpha_{Z_j,g})$ captures individual preferences for residing in the positive tax and zero tax states; $(d'_{it} - d'_{it+1})\eta$ captures time-varying demographic differences between those taking each path, and $\theta\left(f\left(\tau_{P_j} Q_i/W_i\right) - f\left(0\right)\right)$ captures the role of potential tax savings.

B.IV Estimating a linear regression to estimate the causal effect of tax savings

In order to estimate the linear regression in Equation B.8[3], we need to take several key steps to map our model onto the data.

First, the regression in Equation B.8 is calculated conditional on the state variable x_{it}. In our primary specification we include a large number of state variables in x_{it}. We let $x_{it} = (z_{it}, s_{it-1}, \tau_{s_{t-1}} Q_i)$, we classify s_{it-1} as an indicator for whether an individual is in a positive-tax state or a zero-tax state. We draw upon a sample of individuals who have least \$20k in tax savings, $\tau_{s_{t-1}} Q_i > 20k$.[4] We measure capital gains realizations based on the size of an individual's largest realization. We use data created by NBER TAXSIM to calculate the top marginal tax rate in each state (Feenberg and Coutts, 2018). We let z_{it} represent individual specific variables and household wealth. We group individuals into 10-year age bins. We also group individuals based on the size of their household wealth, estimating using the capitalization approach developed in Smith et al. (2023).

Second, when it comes to migration we are interested in the choice to stay in a positive-tax state or migrate to a zero-tax state. That said, we observe individuals in a number of positive-tax states and a number of zero-tax states. So in our primary specification we add richness to the model by focusing on the pairwise choices to stay in or migrate to individual states. In other words, we examine $Pr(s_t = Z_j, r_t =$

[3]This is identical to Equation 4 in the body of the paper.
[4]We report tax savings in 2014 dollars.

$0, s_{t+1} = Z_j, r_{t+1} = 1|x_{it})$ where the j indicates that we are calculating the probability of migrating to a specific zero-tax state such as Florida. In this case we calculate the left-hand side probabilities for all pairwise combinations of origin and destinations. We then calculate our coefficients of interest on the pooled set of all realization and migration choices at various origins and destinations. This allow us to incorporate location-by-demographic preferences for each origin and destination location. We also look to account for differences in location preferences over time. In particular, we are concerned about changes in location preferences that are correlated with changes in tax rates. Those types of changes will impact our measure of tax savings and consequently might impact our estimate for θ. We solve this problem by examining migration choices within "tax regimes". We consider a tax regime to be any period of time in which a state does not change its tax rate by more than 1%. We allow location-specific preferences such as $\alpha_{P_j,g}$ to vary by both location and tax regime.

This version of our primary regression with a full set of controls lies in contrast to the simplest version of our regression equation where our state variables contain no demographic variables, z_{it}. Instead, individuals are merely grouped into tax-savings bins, $\tau_{s_{t-1}}Q_i$ and individuals simply choose between residing in high or zero tax states. In that case, our primary regression equation is as follows:

$$ln\left[\frac{Pr(s_t = Z_j, r_t = 0, s_{t+1} = Z_j, r_{t+1} = 1|x_{it})}{Pr(s_t = P_j, r_t = 1, s_{t+1} = Z_j, r_{t+1} = 0|x_{it})}\right] = \theta\left(f(\tau_P Q_i/W_i) - f(0)\right) + \Delta\epsilon_t \tag{B.9}$$

As discussed in Section V in the body of the paper, this regression produces very similar results to our primary regression specification.

Third, we have set up a two-period model. Individuals realize and migrate in consecutive periods. In reality, we observe individuals migrating and realizing over the course of several years. We don't want to throw out an observation simply because an individual migrated and then realized three years later. We address this problem by measuring time relative to migration or realization and then assuming that periods extend for four years. This avoids the need to incorporate complicated paths of renewal actions and also avoid complication associated with overlapping actions.[5] The choice of the four year periods is motivated by Figure I, which shows that the incentive to migrate before realization appears to occur within that time window. Limited foresight appears to attenuate the treatment effect in previous years.

Fourth, we are interested in calculating θ, our coefficient on $f\left(\tau_{P_j}Q_i/W_i\right) - f(0)$, which captures the impact of potential tax savings on individual payoffs. Thus far, we have written the expression $f\left(\tau_{P_j}Q_i/W_i\right) - f(0)$ rather than $\tau_{P_j}Q_i/W_i - \tau_{Z_j}Q_i/W_i$ in order to remain agnostic about the appropriate functional form in the context. In practice, we use the following functional form $f\left(\tau_{P_j}Q_{it}\right) = ln(1 + (\tau_{P_j}Q_{it}/W_i))$, where corresponds to the estimated wealth of individual W_i. In other words, this is designed to capture tax savings as a fraction of household wealth. As this is approximate equal to $(\tau_{P_j}Q_i/W_i)$ it reflects the fact that the value of a fixed quantity of tax savings can decline with size of one's pre-existing wealth. The log functional form here also enables a robustness checks that vary the curvature of this function by measuring savings relative to flow value of wealth rather than stock values.

We estimate W_i, using a version of the wealth capitalization approach developed in Smith et al. (2023). In particular, we compute wealth at event time -2 in the following categories:

- Pass-through wealth: This is the category that is most quantitatively important for our sample, and here we follow Smith et al. (2023) closely. In particular, using Compustat data on C corporations, we compute valuation multiples for modified EBITDA, assets, and sales, separately by four-digit industry. Then, for each S corporation or partnership owned by a member of our sample, we compute the firm's value using an equal weight on all three valuation multiples, with a 10\% illiquidity discount, as in Smith et al (2023). We then assign the wealth of these firms to their owners in proportion to their ownership share (as measured by their reported capital ownership shares, where available, on Schedule K-1 of Form 1120S or 1065).

- C corporation stock: We capitalize a composite income flow from Form 1040, consistent with the approach in Smith et al. (2023), equal to 10\% of capital gains plus 90\% of dividend income. (We

[5] If an individual migrates in year t and realizes in year t+2, we want to consider that realization that occurs after migration. If the timing of realization weren't measured relative to the timing of migration, it is possible these actions would be considered to take place in the same period.

make no distinction between qualified and non-qualified dividends.) We compute the capitalization factor based on comparing asset values in the Distributional National Accounts to the composite income flows on tax returns as measured in the Statistics of Income (SOI) cleaned cross-section samples of Forms 1040.

- Individual Retirement Accounts (IRA): We observe IRA values on Form 5498. We apply a 40\% tax rate (representing a combined state and federal rate) to traditional IRA wealth to arrive at an after-tax concept of wealth.
- Taxable debt (assets that produce taxable interest income): We use the interest rates reported in Smith et al. (2023), Figure 3, which vary by the amount of non-debt wealth held by individuals. In lieu constructing all other elements of wealth for a representative sample of individuals, we measure the more readily-observed interest income percentile of each tax unit in our sample (with the percentiles taken with respect to the distribution from the representative sample). This measure is highly correlated with wealth and so we apply the interest rates according to those percentiles.
- Tax-exempt debt: We capitalize the tax-exempt interest from Form 1040 assuming that tax-exempt bonds pay an interest rate equal to 68% of the municipal bond yield. This 68% figure comes from estimates from Wang et al. (2008), which estimates that marginal tax-exempt bond investors pay a 32-33% rate.
- Owner-occupied home equity: We compute gross home value by capitalizing property tax as deducted on Schedule A of Form 1040; following Smith et al. (2023), we compute implied property tax rates at the state-year level using a representative sample of homeowners in the American Community Survey. We compute mortgage liabilities by capitalizing mortgage interest deducted on Schedule A, where the capitalization factor compares mortgage debt in the Distributional National Accounts to total mortgage interest reported on Form 1098. We compute home equity as the excess (if any) of gross house value over mortgage indebtedness.
- Rental housing: We capitalize net rental income from Schedule E of Form 1040 using the capitalization factors reported in Table SC1 from Piketty et al. (2018).

As discussed below, for the purposes of robustness, we also calculate wealth using the average of event times -5 and -6. (This robustness exercise requires us to drop the earliest base years, as pass-through wealth is not available prior to 2000.) The results, presented in Table A.2 show this has no discernible effect on our results.

We also seek to account for the present discounted flow of labor income: that is, income that is not accounted for in the computation of wealth above. In particular, we define labor income for this purpose as the sum of wages, positive Schedule C income, pension (not IRA) income, and Social Security income. We convert each to a net-of-tax concept, accounting for the partial taxation of Social Security income. We then estimate a relationship between baseline covariates measured at time t = -2 (capitalized wealth rank, baseline labor income rank, a dummy for positive baseline labor income, age in ten-year buckets) and future labor income rank in each year through age 105. We do so using a leave-one-fold-out approach: we randomly assign each individual to one of ten folds, then we predict the future income evolution in fold i using the fits of a regression using all other folds $i \neq j$. We apply survival probabilities using mortality rates estimated within our sample, and discount to the present at a 3% real interest rate.

Finally, in order to estimate this regression, we must calculate the ratio of probabilities on the left-hand side. The left-hand side here is calculated conditional on x_{it}, and so it can produce relatively narrow bins if we use a high-dimensional set of state variables. As Almagro and Domínguez-Iino (2025) discuss, the limited number of observations in each cell can produce bias in our results. (Scott (2013) also discusses how probabilities equal to 0 or 1 create concerns when applying the Hotz-Miller inversion necessary to implement the Euler CCP approach.) For that reason, we need to find a way to produce a smoothed estimate of this log odds ratio. We follow the approach of Kalouptsidi et al. (2021) and estimate the left-hand side conditional choice probabilities using a logit model. We estimate a logit that captures the relative probability of migrating before realization relative to realizing before migrating. We add indicators for individual tax-savings bins and then add origin and destination fixed effects interacted with wealth and age bins. This allows us to predict the log odds ratio within each tax-savings bins, smoothing over wealth, ages, origin states and destination states.[6] As Table A.2 shows, this appears to have a relatively limited effect on our results. Introducing the smoothed regression with a bevy of controls produces estimates that are reasonably similar to our estimates in the case where we use no controls and estimate the left-hand side conditional choice probabilities directly.

B.V Impact of Zero-Tax Opportunities on Realizations

In Section IV.B of the paper we examine a counterfactual where residents of positive-tax states are not permitted to avoid capital gains taxation by migrating to zero tax states. In the body of the paper we refer to individuals as taking action A if they move and then realize. We refer to all other courses of action as part of a set of all paths J. For ease of explanation we now break the components of J. In particular, we split individual behavior into three potential actions.

- Individuals who take Action A move and then realize: $C_{it} = (Z_j, 0); C_{it+1} = (Z_j, 1)$.
- Individuals who take Action B realize and then move: $C_{it} = (P_j, 1); C_{it+1} = (Z_j, 0)$.
- Individuals who take any other course of action are referred to as taking Action C. For initial tractability we restrict this to the set of actions where individuals who begin in positive-tax states realize their gains within 2 periods. We discuss these various courses of action in more detail below.

We are interested in identifying how the probability of Action A changes with changes in the counterfactual change in the tax rate in the zero tax state among those migrating from positive tax states. This is given by $P(A|x, \tau_Z = \tau_2) - P(A|x, \tau_Z = 0)$. The properties of the logit tell us that we can write $P(A|x, \tau_z = 0)$ in the following manner:

$$P(A|x, \tau_Z = 0) = \frac{exp(\bar{V}(A, x_i, 0))}{exp(\bar{V}(A, x_i, 0)) + exp(\bar{V}(B, x_i, 0)) + exp(\bar{V}(C, x_i, 0))}$$

Based on the payoff functions above, we can write out the choice-specific value functions for actions A and B :

$$\bar{V}(A, x_i, \tau_Z = 0) = d_i'\alpha_Z + d_i'\alpha_Z + d_i'\eta + \theta f(\tau_P Q_i/W_i) + E[V(x_{i,t+2})]$$
$$\bar{V}(B, x_i, \tau_Z = 0) = d_i'\alpha_P + d_i'\alpha_Z + d_i'\eta + \theta f(0) + E[V(x_{i,t+2})]$$

We can write the probability of taking action A in the following manner:

$$P(A|x, \tau_Z = 0) = \frac{exp(\bar{V}(A, x_i, \tau_Z = 0))}{exp(\bar{V}(A, x_i, \tau_Z = 0)) + \lambda_{BA} exp(\bar{V}(A, x_i, \tau_Z = 0)) + exp(\bar{V}(C, x_i, \tau_Z = 0))} \tag{B.10}$$

Here, λ_{BA} is determined by the following expression: $exp(\bar{V}(B, x_i, \tau_Z = 0)) = \lambda_{BA} exp(\bar{V}(A, x_i, \tau_Z = 0))$. In order to solve for λ_{BA} we can utilize the fact that if $exp(\bar{V}(B, x_i, \tau_Z = 0)) = \lambda_{BA} exp(\bar{V}(A, x_i, \tau_Z = 0))$ then $\lambda_{BA} P(A|x, \tau_Z = 0) = P(B|x, \tau_Z = 0)$. We observe $P(B|x, \tau_Z = 0)/P(A|x, \tau_Z = 0)$.

In order to calculate the counterfactual probability $P(A|x, \tau_Z = \tau_2)$, we also need to know the relationship between $exp(\bar{V}(C, x_i, \tau_Z = 0))$ and $exp(\bar{V}(A, x_i, \tau_Z = 0))$. We write that relationship as $exp(\bar{V}(C, x_i, \tau_Z = 0)) = \lambda_{CA} exp(\bar{V}(A, x_i, \tau_Z = 0))$. We can plug $\lambda_{CA} exp(\bar{V}(A, x_i, \tau_Z = 0))$ into the denominator in equation B.10 above and solve for λ_{CA}. In our primary calculation we calculate $P(A|x, \tau_Z = 0)$ as the fraction of individuals who move to a zero-tax state and then realize amongst the full set of individuals who begin in a positive-tax state and realize within two periods.[7]

From there, we can consider the counterfactual probability $P(A|x, \tau_2)$, using updated choice-specific value functions. Following that approach, we get:

[6] We use origin and destination fixed effects instead of origin by destination fixed effects. For any given origin this allows us to smooth over the probabilities across destination and vice versa.

[7] In the discussion that follows, we explore the implications of expanding that denominator. In particular, we consider there where some individuals who have state variables x_{it} but may substantially delay their realization. We show that adjustment has no substantive impact on our results.

$$P(A|x,\tau_Z=\tau_2)=\frac{exp(\bar{V}(A,x_i,\tau_Z=\tau_2))}{exp(\bar{V}(A,x_i,\tau_Z=\tau_2))+exp(\bar{V}(B,x_i,\tau_Z=\tau_2))\ +exp(\bar{V}(C,x_i,\tau_Z=\tau_2))}$$

$$P(A|x,\tau_Z=\tau_2)=\frac{exp(\bar{V}(A,x_i,\tau_Z=0))exp(-\theta\,(f(\tau_2 Q_{it})-f(0)))}{\substack{exp(\bar{V}(A,x_i,\tau_Z=0))exp(-\theta(f(\tau_2 Q_{it})-f(0)))+\lambda_{BA}exp(\bar{V}(A,x_i,\tau_Z=0))\\ +\lambda_{CA}exp(\bar{V}(A,x_i,\tau_Z=0))}}$$

We can rearrange this equation to cancel out all instances of $exp(\bar{V}(A,x_i,\tau_Z=0))$ and get a direct estimate for $P(A|x,\tau_Z=\tau_2)$. It is worth noting that there are a few key assumptions needed in order calculate these counterfactual probabilities. First, this calculation requires that the continuation value functions across actions A and B are not impacted by the change in tax rate in the positive tax state. This allows us to re-write $exp(\bar{V}(A,x_i,\tau_Z=\tau_2))$ as a multiplicative function of $exp(\bar{V}(A,x_i,\tau_Z=0))$ as $E[V(x_{i,t+2})]$ does not change. We consider this assumption to be reasonable as individuals taking both actions have found themselves in the zero tax state and have both realized their gains by the time they arrive at period $t+2$. The only difference between these cases are that the individuals have slightly different levels of wealth, as determined by their tax savings. Second, this calculation requires the assumption that $exp(\bar{V}(C,x_i,\tau_Z=0))=exp(\bar{V}(C,x_i,\tau_Z=\tau_2))$. In other words, changes in the tax rate don't change the value function for individuals who take a course of action other than Action A and Action B. This is intuitive in cases where individuals realize in the positive tax state. Their value functions are not impacted by the policy change regardless of whether they stay in their home state after realizing or migrate to a different state after realizing. The situation gets a bit more complicated when considering the value function for individuals who migrate to a lower tax state and realize in that state. The current counterfactual assumes there is no change in the tax savings available for individuals migrating to lower but non-zero tax states. As we show Section IV.C and Table 3, these migration choices are characterized by a substitution away from lower tax states rather than a movement to lower tax states. In other words, rather than moving for a less than complete reduction in taxes, the rate of migration to lower tax falls with the size of potential tax savings.

In order to translate these estimates into a quantity of realizations, we need to sum over individuals with a range of different demographic characteristics and realization quantities. For each set of $x's$ we calculate the probability of moving and then realizing. We use this to calculate the increase in the number of individuals who move and then realize. From there, we multiply that figure by the size of the individual's initial realization quantity. We estimate the total quantity of new realizations using the following expression:

$$\sum_Q\sum_x\left(\underbrace{N_{Q,x}Q}\underbrace{(P(A|x,\tau_Z=\tau_P)-P(A|x,\tau_Z=0))}\right) \tag{B.11}$$

This is the calculation we conduct to produce the \$2.0 billion estimate reported in Section IV.A. It is also worth noting that counterfactual we evaluate here is similar, but not identical, to a policy equalizing capital gains tax rates across states. Here, we simply assume that individuals who accumulate unrealized gains in a positive-tax location must pay taxes on those gains in their positive-tax location. We believe that the counterfactual we analyze has more practical significance as changes in state tax rules could move policy in that direction. Total equalization of state taxes would produce a similar effect amongst highly mobile realizers, but such a policy change is infeasible.

B.VI Reducing Top Tax Rates – CA Example

In Section IV.C of the paper we explore the impact of reducing top tax rates in California. In that case we evaluate a new counterfactual. We are again interested in the reduction in the number of individuals who migrate and then realize in zero tax states. In that case, we examine how behavior changes if top tax rates τ_{CA} falls by 1%.

Relative to Section 5.1 above we need to modify the set of actions taken by the individual:

- Action A occurs when individuals migrate to a zero tax state and then realize, their choice-specific value is $\bar{V}(A,x_i,\tau_P=\tau_{CA})=d_i'\alpha_Z+d_i'\alpha_Z+d_i'\eta+\theta f(\tau_{CA}Q_i/W_i)+E[V(x_{i,t+2})]$

- Action B occurs when individuals realize then migrate to a zero tax state, their choice-specific value is $\bar{V}(B, x_i, \tau_P = \tau_{CA}) = d_i'\alpha_P + d_i'\alpha_Z + d_i'\eta + \theta f(0) + E[V(x_{i,t+2})]$
- Action C occurs when individuals remain in their home state and then realize, their choice-specific value function is $\bar{V}(C, x_i, \tau_P = \tau_{CA}) = d_i'\alpha_P + d_i'\alpha_P + \theta f(0) + E[V(x_{i,t+2})]$
- Action D occurs when individuals realize in their home state and then move to a different non-zero tax state, their choice-specific value function is $\bar{V}(D, x_i, \tau_H = \tau_{CA}) = d_i'\alpha_P + d_i'\alpha_O + d_i'\eta + \theta f(0) + E[V(x_{i,t+2})]$, here α_O captures the effect of residing in the other non-zero tax state.
- Action E represents all other course of action. We discuss these courses of action in more detail below. Just as in Section B.V, we restrict our focus to courses of action where individuals realizing within 2 periods.

We begin with the logit equation for $P(A|x, \tau_H = \tau_{CA})$:

$$\begin{aligned}
P(A|x, \tau_P = \tau_{CA}) &= \frac{exp(\bar{V}(A, x_i, \tau_P = \tau_{CA}))}{\begin{array}{c} exp(\bar{V}(A,x_i,\tau_P=\tau_{CA}))+exp(\bar{V}(B,x_i,\tau_P=\tau_{CA}))+exp(\bar{V}(C,x_i,\tau_P=\tau_{CA})) \\ +exp(\bar{V}(D,x_i,\tau_P=\tau_{CA}))+exp(\bar{V}(E,x_i,\tau_P=\tau_{CA})) \end{array}} \\
&= \frac{exp(\bar{V}(A, x_i, \tau_P = \tau_{CA}))}{\begin{array}{c} exp(\bar{V}(A,x_i,\tau_P=\tau_{CA}))+exp(\bar{V}(A,x_i,\tau_P=\tau_{CA}))exp(-\theta(f(\tau_{CA}Q_{it})-f(0))exp(-z_i'(\alpha_P-\alpha_Z)) \\ +exp(\bar{V}(C,x_i,\tau_P=\tau_{CA}))+exp(\bar{V}(D,x_i,\tau_P=\tau_{CA}))+exp(\bar{V}(E,x_i,\tau_P=\tau_{CA})) \end{array}}
\end{aligned}$$

Next, we can utilize the fact that we can observe the ratios between the following probabilities $P(A|x, \tau_P = \tau_{CA}), P(B|x, \tau_P = \tau_{CA}), P(C|x, \tau_P = \tau_{CA})$ and $P(D|x, \tau_P = \tau_{CA})$.[8] Based on those figures we can solve for some values of λ_1 and λ_2 such that:

$$\begin{aligned}
P(A|x, \tau_1) = \lambda_1 P(B, x, \tau_P = \tau_{CA}) &\Rightarrow exp(\bar{V}(A, x_i, \tau_P = \tau_{CA})) = \lambda_1 exp(\bar{V}(B, x_i, \tau_P = \tau_{CA})) \\
P(A|x, \tau_1) = \lambda_2 P(C, x, \tau_P = \tau_{CA}) &\Rightarrow exp(\bar{V}(A, x_i, \tau_P = \tau_{CA})) = \lambda_2 exp(\bar{V}(C, x_i, \tau_P = \tau_{CA})) \\
P(A|x, \tau_1) = \lambda_3 P(D, x, \tau_P = \tau_{CA}) &\Rightarrow exp(\bar{V}(A, x_i, \tau_P = \tau_{CA})) = \lambda_3 exp(\bar{V}(D, x_i, \tau_P = \tau_{CA}))
\end{aligned}$$

Inserting those results into the equation for $P(A|x, \tau_P = \tau_{CA})$, we get:

$$P(A|x, \tau_1) = \frac{exp(\bar{V}(A, x_i, \tau_P = \tau_{CA}))}{\begin{array}{c} exp(\bar{V}(A,x_i,\tau_P=\tau_{CA})) \\ +exp(\bar{V}(A,x_i,\tau_P=\tau_{CA}))(\frac{1}{\lambda_1}) \\ +exp(\bar{V}(A,x_i,\tau_P=\tau_{CA}))(\frac{1}{\lambda_2}) \\ +exp(\bar{V}(A,x_i,\tau_P=\tau_{CA}))(\frac{1}{\lambda_3})+exp(\bar{V}(E,x_i,\tau_P=\tau_{CA})) \end{array}} \tag{B.12}$$

We can solve that to find that $exp(\bar{V}(A, x_i, \tau_P = \tau_{CA})) = \lambda_4 exp(\bar{V}(E, x_i, \tau_P = \tau_{CA}))$, for some value of λ_4. We then plug that into the equation for $P(A|x, \tau_P = \tau_{CA} - 0.01)$ and get:

(B.13)

$$P(A|x, \tau_P = \tau_{CA} - 0.01) = \frac{exp(\bar{V}(A, x_i, \tau_P = \tau_{CA} - 0.01))}{\begin{array}{c} exp(\bar{V}(A,x_i,\tau_P=\tau_{CA}-0.01))+ \\ +exp(\bar{V}(A,x_i,\tau_P=\tau_{CA}-0.01))exp(-\theta(f((\tau_{CA}-.01)Q_{it})-f(\tau_{CA}Q_{it}))(\frac{1}{\lambda_1}) \\ +exp(\bar{V}(A,x_i,\tau_P=\tau_{CA}-0.01))exp(-\theta(f((\tau_{CA}-.01)Q_{it})-f(\tau_{CA}Q_{it}))(\frac{1}{\lambda_2}) \\ exp(\bar{V}(A,x_i,\tau_P=\tau_{CA}-0.01))exp(-\theta(f((\tau_{CA}-.01)Q_{it})-f(\tau_{CA}Q_{it}))(\frac{1}{\lambda_3})+exp(\bar{V}(A,x_i,\tau_P=\tau_{CA}-0.01))(\frac{1}{\lambda_4}) \end{array}}$$

In order to evaluate this expression, we plug in the results from our primary regression. In plugging in our value for θ, we use the coefficient derived from our evaluation of the full primary sample, rather than just individuals residing in California. That said, we estimate our choice probabilities based on those individuals

[8] In the simplest case, we observe this probability directly. In the case where we add more control variables, we need to predict these probabilities to avoid the small cell concerns documented above. In that case, we return to the logit and predict probabilities within tax-savings bins, smoothing across incomes, ages and origin and destinations.

who originate in California. Just as above, evaluating this expression requires several assumptions about the nature of the continuation value functions. First, evaluating this expression requires that across two courses of action the ratio of continuation value functions, $E[V(x_{i,t+2})]$, is not impacted by the change in the high state tax rate. It is this assumption that allows us to re-write: $\bar{V}(B, x_i, \tau_P = \tau_{CA} - .01) = exp(\bar{V}(A, x_i, \tau_P = \tau_{CA} - 0.01))exp(-\theta(f((\tau_{CA} - .01)Q_i/W_i) - f(\tau_{CA}Q_i/W_i))(\frac{1}{\lambda_1})$.[9] Given the set-up here, we should expect that these continuation value functions do not change values after a change in the tax rate. All individuals examined here have already realized their primary capital gains, and so the tax rate on capital gains should have little impact on their decision-making. Second, this calculation requires the assumption that that $exp(\bar{V}(E, x_i, \tau_P = \tau_{CA})) = exp(\bar{V}(E, x_i, \tau_P = (\tau_{CA} - 0.01))$. This is a relatively mild assumption as this group is composed of individuals who move a non-zero tax state within two periods and then realize in that location. These individuals are not faced with any California tax rates and so their payoffs should not be altered by the change in tax rates.

Given the estimate for $P(A|x, \tau_P = \tau_{CA} - 0.01)$, we calculate the following expression to estimate the impact of the policy change on total realization:

$$\sum_Q \sum_x \left(\underbrace{N_{Q,x} Q}\, \underbrace{(P(A|x, \tau_P = \tau_{CA} - 0.01) - P(A|x, \tau_P = \tau_{CA}))} \right)$$

We use values of $N_{Q,x}$ and Q based on the set of individuals who originate in California. As noted in the paper, we take the following steps to translate this realization quantity into a fiscal externality: First, we estimate impact of the 1% top tax rate reduction on total realizations by former residents of California. We find that residents of California realize $45.3 million less in zero-tax states on a yearly basis. After the policy change, the top tax rate in California would be approximately 10.3% and so a reduction in the top tax rate would increase California revenue by approximately $4.6 million due to reduced out-migration. Next, we compare that fiscal externality to the mechanical costs of the policy.

Based on the data in our sample, California collected an estimated $3.7 billion in yearly capital gains revenue from large realizations between 2005 and 2011.[10] That means that a 1% reduction in top marginal tax rates would have a mechanical cost of $360 million. Consequently, a $4.6 million increase in revenue from reduced tax avoidance by out-migrants would offset less than 1.3% of mechanical costs.

The paper notes that this 1.3% may be an upper bound because individuals may not avoid 100% of taxes in their origin state. We explore that possibility using data on the state and local tax (SALT) deduction. In Figure 5 we estimate state income tax liability as a fraction of AGI.

The graph presents results on the SALT deduction for a restricted sample for whom capital gains constituted most of their income. In particular, it is restricted to individuals with non-capital gains income (AGI - capital gains) in the year after realization that is less than 20% of the size of the individual's largest realization. The graph shows an upper and lower bound because the goal is to use SALT data to isolate the quantity of state income taxes paid after migration. The SALT deduction allows individuals to claim deductions on their property taxes paid as well as their state and local income taxes paid or their sales taxes paid. Filers must choose between claiming the deduction on income taxes or sales taxes.[11] We plot that the SALT deduction as a fraction of AGI and label that data as an upper bound on the state income tax liability as a share of AGI. For the individuals who chose to deduct their state income taxes, we observe their liability directly. For the individuals who choose to deduct their local income taxes, we can infer that their state and local income tax liability was less than their sales tax liability. So we know that their state income

[9] Our original formula above defined $exp(\bar{V}(A, x_i, \tau_H = \tau_{CA})) = \lambda_1 exp(\bar{V}(B, x_i, \tau_H = \tau_{CA}))$. The following term is included to augment the choice specific value function for Action B, $exp(-\theta(f((\tau_{CA} - .01)Q_{it}) - f(\tau_{CA}Q_{it}))$. All other terms in the choice-specific value function are fixed other than the continuation value function term, $E[V(x_{i,t+2})]$.So the ratio holds if the ratio of the continuation value functions is constant.

[10] This data on realizations in our sample is broadly consistently with published public data from the state of California. Data from California suggests that average yearly revenue from capital gains was $7.2 billion between 2005 and 2011(California Department of Finance, 2015). If ~50% of that revenue was collected by the large realizers in our sample, then this would line up with our estimated $3.56 billion figure. Moreover, data from 2017 in California suggested that the state collected 76% of it's capital gains tax revenue from individuals earning over $1 million (California Department of Finance, 2019). Given that California's tax code was more progress in 2017 as compared to 2005-2011 and given that this $7.2 billion figure includes small realizations by individuals with large realizations, these numbers appear to align quite well.

[11] The option to deduct sales taxes was introduced in 2004. For filers who do not report individual purchases, the allowable sales tax deduction is a function of their income. The deduction caps out for incomes above $300,000, limiting the size of this deduction for high income taxpayers.

tax liability is bounded above by their sales tax deduction. Using the same logic, we can estimate a lower bound on state income tax liability by assuming that all individuals who claimed the sales tax deduction has no state income tax liability. As seen in the figure, these estimate produce very tight bounds. A relatively small fraction of individuals claim the sales tax deduction and the mean sales tax deduction is very small as a fraction of total income. The results confirms to that migration to a zero-tax state results in a meaningful decrease in tax liability, but suggests that former residents of positive tax states may be unable to move all of their capital gains across state lines.

B.VII Reducing Top Tax Rates – Comparisons Across States

After reporting the fiscal externality from reducing California's top tax rate by 1%, we report that the same fiscal externality across all US states. In particular, we note that the maximum fiscal externality is less than 1% of the mechanical costs of reducing top rates. We arrive at that figure by repeating the calculation from Appendix Section B.VI above. In analyzing the state of California we focused on a time period (2005-2011) where there was a unique top tax rate that applied to individuals earning more than $1 million. (This was California's Mental Health Services Tax.) This surtax made it natural to imagine reducing tax rates by 1pp for individuals in our sample.[12] In analyzing the other states in our sample, we once again consider the impact of reducing the top tax rate by 1pp.[13] We restrict our calculation to the individuals in our sample. So the fiscal externality and the mechanical cost are both calculated based on the taxation of realizations with potential tax savings greater than $20,000.[14] This means that our fiscal externality is likely a conservative upper bound. In most US states, a reduction in top tax rates would reduce rates on smaller realizations that fall beyond the scope of our analysis. To the extent that those smaller realizations produce smaller behavioral responses, we expect that the fiscal externality rate would fall.

As noted in the text, the fiscal externality rate from a 1pp tax reduction in any given state is broadly proportional to the status quo rate of migration to zero-tax states in advance of realization and varies with the size of gains relative to wealth, Q/W. This pattern can be seen clearly in Appendix Figure A.4.

In order to understand the reason for this pattern, we can re-examine the probabilities of migration given by Equations B.12 and B.13 above. In particular, we look at the ratio of $\frac{P(A|x,\tau_P=\tau-a)}{P(A|x,\tau_P=\tau)}$ for some small tax change from $\tau_P = \tau$ to $\tau_P = \tau - a$. Simplifying that ratio gives the following:

$$\frac{1 + \frac{1}{\lambda_1} + \frac{1}{\lambda_2} + \frac{1}{\lambda_3} + (\frac{1}{\lambda_4})}{1 + exp(-\theta(f((\tau-a)Q_{it}) - f(\tau Q_{it}))(\frac{1}{\lambda_1} + \frac{1}{\lambda_2} + \frac{1}{\lambda_3}) + (\frac{1}{\lambda_4})}$$

Here, Actions B and C and D represent realizing in one's own state. Those actions occur with very high probabilities. For that reason, the three middle terms in the numerator and denominator are far larger than the remaining two terms.[15] We can therefore re-write this equation as approximately equal to:

$$\begin{aligned}&\approx \frac{\frac{1}{\lambda_1} + \frac{1}{\lambda_2} + \frac{1}{\lambda_3}}{exp(-\theta(f((\tau-a)Q_i/W_i) - f(\tau Q_i/W_i))(\frac{1}{\lambda_1} + \frac{1}{\lambda_2} + \frac{1}{\lambda_3})} \\ &\approx 1/exp(-\theta\,(f(\tau Q_i/W_i) - f((\tau-a)Q_i/W_i))))\end{aligned}$$

We can then use our functional form for $f(\cdot)$ to again simplify this expression:

$$\begin{aligned}\big(f(\tau Q_i/W_i) - f((\tau-a)Q_i/W_i)\big) =& \big(\ln(1 + (\tau Q_i/W_i)) - \ln(1 + ((\tau-a)Q_i/W_i))\big) \\ \approx& \big(\tau Q_i/W_i - (\tau-a)Q_i/W_i) \\ =& (aQ_i/W_i)\end{aligned}$$

[12] As noted in the paper, 89% of all large capital gains in our sample are dollars above the $1M AGI threshold.

[13] For consistency, we calculate this on the sample of realizers between 2005-2011. The pattern of our results remain unchanged when calculated over the full sample of available years.

[14] For a state with a 5% tax rate, this corresponds to major realizations in excess of $600,000.

[15] More formally $(\frac{1}{\lambda_1}) + (\frac{1}{\lambda_2}) + (\frac{1}{\lambda_3})$ is much larger than $1 + (\frac{1}{\lambda_3})$

When we exponentiate that expression and construct a linear approximately in a:

$$\exp\left[\theta\big(f(\tau Q_i/W_i) - f((\tau - a)Q_i/W_i)\big)\right] \approx 1 + \frac{aQ_i}{W_i}\theta$$

This tells us that our change in probabilities is approximately proportional to $\frac{aQ_i}{W_i}\theta$ or that $P(A|x, \tau_P = \tau - a) - P(A|x, \tau_P = \tau) \approx \frac{aQ_i}{W_i}\theta P(A|x, \tau_P = \tau)$. Our fiscal externality is given by the portion of revenue provided to the origin state by individuals who choose not to realize in a zero-tax location. As a result, it is proportional to $P(A|x, \tau_P = \tau - a) - P(A|x, \tau_P = \tau)$, the change in the probability that, after the tax change, individuals will migrate in advance of realizations. This change in probabilities is approximately equal to $\frac{aQ_i}{W_i}\theta P(A|x, \tau_P = \tau)$ and so the change in probability is proportional to the baseline rate of migration to zero tax states, $P(A|x, \tau_P = \tau)$. This helps explain the clear upward slope found in Appendix Figure A.4 where the fiscal externality is compared to the baseline probability of migrating before realization. The deviation from that linear relationship is given by the differential average value of Q_i/W_i across states. This captures the differences in quantity of realizations relative to baseline wealth. Intuitively, if gains are smaller as a fraction of wealth in a given state, we should expect smaller behavioral changes in response to a fixed tax rate change.

B.VIII Distinguishing Between Retiming and New Migration

In Section V.III of the main text, we explore the relative contribution of retiming and new migration to the \$2.0 billion in realization we observe in zero-tax states as a result of those zero tax opportunities. Having established that any retiming behavior is likely to occur within a four year window on either side of realization, we seek the estimate the magnitude of retiming relative to new migration. In particular, in the context of our model, we are seeking to estimate: $P(B|x, \tau_Z = 0) - P(B|x, \tau_Z = \tau_P)$. We observe $P(B|x, \tau_Z = 0)$ but need to estimate the counterfactual probability of realizing after migration if the zero-tax incentive is removed: $P(B|x, \tau_Z = \tau_P)$. As noted, the baseline model produces an estimate for $P(B|x, \tau_Z = \tau_P)$ that is determined solely by the properties of the logit – when the payoff changes for Action A, people switch to Action A in proportion to their baseline probabilities of taking all other courses of action. Here, we construct a separate estimate for $P(B|x, \tau_Z = \tau_P)$, which does not rely on the proportional switching assumption. We begin with a sample of individuals who originate in a positive tax state and realize their gains in that positive tax states. We can then consider all courses of action these individuals take in the two periods after realization. We can write out the payoffs to these actions in the following manner:

- Action L occurs when individuals migrate to a zero tax state in the first period after realization. They receive no tax savings. Their choice-specific value is $\bar{V}(A, x_i, \tau_P = \tau_{CA}) = d_i'\alpha_Z + d_i'\alpha_Z + d_i'\eta + \theta f(0) + E[V(x_{i,t+2})]$
- Action M occurs when individuals the zero tax state in the second period after realization. They receive no tax savings. their choice-specific value is $\bar{V}(B, x_i, \tau_P = \tau_{CA}) = d_i'\alpha_P + d_i'\alpha_Z + d_i'\eta + \theta f(0) + E[V(x_{i,t+2})]$
- Action O occurs when individuals remain in their home state and then realize, their choice-specific value function is $\bar{V}(C, x_i, \tau_P = \tau_{CA}) = d_i'\alpha_P + d_i'\alpha_P + \theta f(0) + E[V(x_{i,t+2})]$
- Action P occurs when individuals realize in their home state and then move to a different non-zero tax state, their choice-specific value function is $\bar{V}(D, x_i, \tau_H = \tau_{CA}) = d_i'\alpha_P + d_i'\alpha_O + d_i'\eta + \theta f(0) + E[V(x_{i,t+2})]$, here α_O captures the effect of residing in the other non-zero tax state.
- As below, Action Q represents all other course of action.

Crucially, Action M in this set-up corresponds to our Action B in our initial set-up. This is because the payoff for Action L here corresponds to the payoff for Action A above (realizing before migrating with no tax savings in the zero tax state.) And the payoff to Actions O, P, and Q also correspond to the components of Action C in our original set-up which are un-impacted by any policy change. So the observed probability of Action M here should correspond to $exp(\bar{V}(L, x_i, \tau_Z = \tau_p))$ relative to the sum of the exponentiated payoffs of all other courses of action. That is precisely the value of $P(B|x, \tau_Z = \tau_P)$ in the original model. Put another way, given that individuals do not appear to retime gains by more than four years, we can use the rate of migration in Years 5 through 8 after realization to produce a measure of the counterfactual measure of the rate of migration after realization in the absence of tax incentives.

There is one other modification we need to make to the model here to quantify the role of retiming. We need to account for the preference that individuals might have to coordinate their migration and realization. In other words, the analysis thus far has looked at rates of migration in Years 5-8 after realizaiton and used that to form a counterfactual estimate of migration in Years 1-4 after realization in the absence of tax incentives. If people have a preference to migrate close to realization, this may under-estimate the true counterfactual migration rate.

In order to account for this we measure the relative preference to migrate Years 1-4 after migration as compared to Years 5-8 after migration. Once again we begin with a sample of individuals who originate in a positive tax state and realize their gains there. We then consider the rate at which those individuals migrate to other positive tax states in the Years 1-4 versus Years 5-8 after realization. Lets call these Actions X and Y. If we compare those two sets of actions their payoff functions are nearly identical. They have two periods in high-tax states, they experience no tax savings, and they have continuation values in positive-tax states. They only differ by difference in migration cost they pay, which could change based on its proximity to the time of realization. This means that the relative probability of those two courses of Action X and Y, $P(X)/P(Y)$, is given by the exponentiated increase in migration costs from delaying migration until the second period after realization. This also means that in order to account for this difference in migration costs, we need to just multiply our original counterfactual estimate of $P(L|x, \tau_Z = \tau_P)$ above by $P(X)/P(Y)$. This approach allows us to estimate a counterfactual probability of migrating after realizing of XX%.

This approach demonstrates the role of retiming is small relative to the role of new migration. It is worth highlighting a few underlying assumptions that drive this calculation. First, this approach assumes that the relative probabilities of Action X and Action Y are solely determined by the differences in migration costs across those courses of action. That said, if individuals switch away from high-tax migration to zero-tax migration and that retiming is only present in Years 1-4 after realization, that could generate bias in our estimates. The probability of Action X could be higher in the absence of those tax incentives. This does not seem to a meaningful driver of our results as we can perform this same exercise only comparing the relative probabilities of P(X) and P(Y) among individuals with smaller realization who have less incentive to retime and the pattern remains largely the same. Second, our calculation here require starting with a sample of individuals who have originated in a positive-tax state and decided to realize there. That makes them a different population relative to our original sample. Our approach here implicitly assumes that both sets of individuals have the same sets of payoff functions. In truth, the individuals who staying the positive tax states may be a selected subset with different preferences across the various courses of action. If, for example, staying is an indication for higher origin state preferences, then the rate of migration to zero-tax states in this group could understate the migration preferences in the original sample. The fact that rates of migration to zero-tax states are relative consistent in Years 1-4 relative to 5-8 indicate that this is not a primary driver of our findings, but it is worth acknowledging the role of this assumption.

B.IX Incorporation of Discount Rates

In this section, we explore how the incorporation of discounting impacts our results. We show that using a value of β other than 1 has a minimal impact on our results. In order to explore the role of the discount rate, we begin from a modified version of B.7 in B.II above:

$$\begin{aligned} &ln[\frac{Pr(s_t = Z_j, r_t = 0|x_{it})}{Pr(s_t = P_j, r_t = 1|x_{it})}] + \beta[ln\frac{Pr(s_{t+1} = Z_j, r_{t+1} = 1|x_{it+1}(s_t = Z_j, r_t = 0))}{Pr(s_{t+1} = Z_j, r_{t+1} = 0|x_{it+1}(s_t = P_j, r_t = 1))}] \\ &= d'_{it}(\alpha_{P_j,g} - \alpha_{Z_j,g} + (1-\beta)\eta) + \beta(d'_{it} - d'_{it+1})\eta + \theta\left(f(\tau_P Q_i/W_i) - f(\tau_Z Q_i/W_i)\right) + \Delta\epsilon_t \end{aligned}$$

In this case we re-arranged the first term on the right-hand side so that it captures both the preference for the positive-tax state over the zero-tax state and for the impact of delaying moving costs for a year. (Intuitively, the choice to realize before migration could be driven by a preference to reside in the positive tax location for an additional year or by a preference to delay moving by a year.) Once again the second term captures the impact of time-varying demographic variables on moving costs and the third term captures the payoff associated with additional tax savings. There is no adjustment to the value of the tax savings as those values are measured as a static point in time. If individuals delay their realization, the size of their tax savings rises. We assume here that the increase in the size of those savings is equal to the value of the discount rate applied here. (If we were to allow a wedge between the discount rate and the rate of return, the value of $f(\tau_P Q_i/W_i)$ would be modified by β.

We have also moved the discount term, β, inside the function $f(\cdot)$ capturing the payoff to tax savings. The idea here is that individuals value the discounted flow of future tax savings, rather than discount the payoff from the flow of future tax savings.

In order to specify our final regression equation we rearrange the left-hand side of this equation. We write the left-hand side as $\beta ln\left[\frac{Pr(s_t=Z_j,r_t=0,s_{t+1}=Z_j,r_{t+1}=1|x_{it})}{Pr(s_t=P_j,r_t=1,s_{t+1}=Z_j,r_{t+1}=0|x_{it})}\right] + ln[\frac{Pr(s_t=Z_j,r_t=0|x_{it})}{Pr(s_t=P_j,r_t=1|x_{it})}]$. Putting those together, we get the following:

$$\begin{aligned} &\beta ln\left[\frac{Pr(s_t=Z_j,r_t=0,s_{t+1}=Z_j,r_{t+1}=1|x_{it})}{Pr(s_t=P_j,r_t=1,s_{t+1}=Z_j,r_{t+1}=0|x_{it})}\right] + (1-\beta)ln[\frac{Pr(s_t=Z_j,r_t=0|x_{it})}{Pr(s_t=P_j,r_t=1|x_{it})}] \\ &d'_{it}(\alpha_{P_j,g}-\alpha_{Z_j,g}+(1-\beta)\eta)+\beta(d'_{it}-d'_{it+1})\eta+\theta\left(f(\tau_H Q_i/W_i)-f(\tau_Z Q_i/W_i)+\Delta\epsilon_t\right. \end{aligned} \tag{B.14}$$

We estimate this equation into order to solve for our coefficient of interest, θ. The first term on the left-hand side is calculated in the same manner as our primary regression. It is simply multiplied by our various calibrated values of β. Inspired by the use of a 3% real rate of interest we begin with a value of $\beta = 0.94$. This is because we examine individuals who realize within a four-year window after realization. The 0.94 value accounts for the fact that the median individual delays by 2 years. We also examine alternative values of 0.9 and 0.97. The second term on the right-hand side is estimated by comparing the set of individuals who realize in their home state to the set of individuals who migrate to a zero-tax state without having realized their gains.[16]

Once we solve for the value of θ, we can examine how the presence of a zero tax opportunity impacts realizations. For a discount factor of $\beta = 0.94$, we find that realizations increase by an estimated \$1.90 billion, compared to the \$2.0 billion in our baseline specification. We also examine how realizations change for discount factors of 0.90 and 0.97. In that case, total realizations change to \$1.81 billion and \$1.97 billion, respectively. When we examine the impact on our California realizations specification, we find that the magnitude of the effect changes from \$45.3 million to \$42.3 million after the use of a discount factor of $\beta = 0.94$. These results can be found in Table 5.

[16]The key to calculating the size of this second group is to determine the set of individuals with the right set of state variables, x_{it}. We want individuals with a given quantity of unrealized gains. For that reason, this group includes any individuals who realize that quantity in the years after their migration. This is a different group of individuals than those in the numerator of our first left-hand side term because this includes individuals who realize multiple periods after their move. Here, we expand our sample using the same approach adopted in Section B.V where we look at the total population of individuals realizing from 1999 onward. In particular, the numerator is composed of individuals who resided in a positive tax state in 1998, migrated to a zero tax state in 1999-2002 and realized at some point between 2003 and 2019. The denominator is composed of individuals who resided in a positive tax state in 1998 and realized in that state from 1999-2002. Ideally, we would also want to incorporate individuals who have such unrealized gains but hold those gains until death. Unfortunately, those gains are unobserved and so those individuals cannot be incorporated here. That said, this ratio is scaled by $(1-\beta)$ and so this second term on the left-hand side of the equation is small relative to the first term. Consequently, changes to the denominator have a small impact on the total value of left-hand side of the equation.

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