# Costly Migration and the Incidence of State and Local Taxes

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**Abstract:**
This paper incorporates costly migration into the empirical literature on the incidence on wages of states and local taxes. The responsiveness of pre-tax wages to changes in state and local taxes (including income, sales and property taxes) is shown to vary by age and education. Using repeated cross-section and pseudo-panel regressions, the paper shows that the pre-tax wages of young and highly-educated workers – those facing the lowest costs of migration – are quite responsive, while wages of older highly-educated workers and young less-educated workers are generally less responsive. Results from migration regressions confirm that low migration cost households respond to state and local tax changes, while higher migration cost households do not. In addition, property taxes do not appear to be influencing shifts in pre-tax wages. Relatively small responses of both high and low-income workers suggest that redistributive effects of regressive or progressive state-level taxes may not be completely undermined by labor supply shifts. In practice, however, states with relatively progressive tax structures also impose relatively high taxes on young and highly-educated workers, whose responsiveness is likely generating considerable deadweight losses and not contributing to redistribution in after-tax wages.

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## Introduction

State and local taxes have grown considerably over the last few decades and, through cross-state migration, present households with an additional dimension of response than national taxes. The empirical literature on the incidence on wages of those taxes, however, remains quite small and in conflict. Incidence of specific state taxes, payroll taxes for example, has been explored, and there is a robust literature on the capitalization of local property taxes into land and home prices, but only a few papers consider the impact that the combined state-level tax burden has on wages.[1]

The theoretical literature predicts that cross-state differences in taxes will generate incentives for workers to migrate until after-tax wages are equalized across states. And, if migration is costless and workers are extremely mobile, labor supply shifts should alter pre-tax wages enough to leave after-tax wages and the distribution of after-tax wages unchanged even if the statutory incidence of a state-level tax change is not equally distributed across skill types. If migration is costly, however, and workers are not extremely responsive to cross-state differences in taxes, then after-tax wages may still equalize across space, but the after-tax wage distribution, at least in the short run, will not.[2] This is particularly the case if migration costs are large and heterogeneous across skill-types.

With some researchers suggesting that moving can be quite costly (Kennan and Walker, 2008; Artuc et al, 2007), and others finding that differential moving costs can have important impacts on the propensity to migrate and how wages adjust to regional shocks (Polachek and

[1] There is a large literature on the migration impacts of state taxes, with a particular emphasis on older households, and some papers addressing impacts on employment, but few papers directly studying incidence.

[2] As Wildasin (1998) shows "earnings levels would not in general be completely equalized in equilibrium due to mobility costs; arbitrage … only implies that equilibrium earnings differentials cannot exceed the level of migration costs." Krupka and Donaldson (2008) show that the inclusion of heterogeneous moving costs into a Rosen-Roback model undermines the ability to classify regional differences in gross wages as "compensating differentials." Cameron et al (2007) find that wage rates fail to equalize across sectors in the presence of large and heterogeneous moving costs.

Horvath, 1977; Topel, 1986), there is reason to think after-tax wage distributions might be affected by state-level taxes. Modeling moving costs as a function of education and age, Topel found that the wages of high mobility-cost workers (older and less educated) were not very responsive to regional demand shocks, but those of low mobility-cost workers (younger and more educed) were very responsive.

This paper incorporates heterogeneously costly migration into the state tax incidence literature following the approach of Topel, allowing me to explore the differential wage response across worker-types. I build on the approach of the most well-known empirical work in this literature, Feldstein and Wrobel (1998), which uses an effective overall state and local tax rate, including income, sales and property taxes and state fixed effects. I improve on the identification in Feldstein and Wrobel (FW) by moving from cross-sections to repeated cross-sections and pseudo panels.

This study uses multiple years of the Current Population Survey (1988 to 2002) and shows that, after allowing for heterogeneous migration costs, pre-tax wages do not adjust sufficiently to fully offset changes in the distribution of state and local taxes. The results of regressions of pre-tax wages on the after-tax share of income suggest that while pre-tax wages of the most mobile workers do offset redistributive state and local taxes, wages of other workers do not. Older high-education workers and younger low-education workers experience only partial, sometimes very little, pre-tax wage shifts to offset tax changes.

Robustness analysis suggests that changes in property taxes are not contributing to the observed changes in pre-tax wages. Also, results from migration equations are consistent with the idea that low-mobility-cost households are responding to state-level taxes, while other households are relatively unresponsive.

The paper proceeds by 1) providing some background on state and local tax systems and migration propensities; 2) briefly reviewing the previous literature on the incidence of state and local taxes, and the incidence of the distribution of those taxes; 3) offering some motivation for considering the influence of migration costs; 4) presenting the model and the estimating equations; 5) describing the data and the tax definitions used in the analysis; 6) presenting the empirical results, and; 7) discussing the findings and concluding.

**Section 2 – Background**

*State and Local Tax Systems*

For decades state and local governments in the United States have steadily grown in size and arguably the scope of their activities. The state and local share of total government "current receipts"[3] climbed from one third in the early 1960s to nearly one-half by 2005, and the share of "personal current taxes" rose from 9 percent to 23 percent over the same period.[4]

The state and local tax system is a three-legged stool based on real property taxes (one-third), retail sales and gross receipts taxes (one-third), and taxes on personal income (one-fourth). Over time, however, the composition of state and local taxes has been shifting. Property taxes are the predominant local government tax, but have declined as a share of taxes in recent decades (76 percent in 1991 to 72 percent in 2005). Income taxes are the second largest tax for state governments, after the sales tax, and have grown slightly (32 percent in 1991 to 34 percent in

[3] "Total current receipts" includes fees and other sources of revenue that are not typically considered "taxes." The state and local government share of "total current receipts" was 49.1 percent in 2004 before falling back to 47.4 percent in 2005. Economic Report of the President, 2007, table B-82.

[4] Personal Current Taxes do not include retail sales taxes or contributions to government social insurance programs. Taxes on "personal property" are included, but neither the business nor residential portions of the taxes paid on real property are. Source: Regional Economic Information System, Bureau of Economic Analysis, U.S. Department of Commerce, Table SA-50.

2005). There is considerable variation across states in the mix of taxes that are levied. Seven states do not have any personal income tax, and five do not have general retail sales taxes.[5]

The rates of these taxes also vary across states. Table 1 shows the rates of the bottom, 15th, middle, 35th and top ranked state for each of the major state and local taxes. The top income tax bracket rate, which ranges from 0, for those states without income taxes, to 9.5 percent in 1988 and 9.86 percent in 2003. The top rate in the median state rose from 5 to 5.9 percent. The "average marginal rate" in the median state increased from 4.5 percent in 1988 to 5.3 in 2003, and in the highest state it rose from 8.6 to 8.9 percent.[6] Each way of characterizing the income tax suggests considerable variation across states in the income tax burden.

The sales tax, with combined state and local rates shown for the biggest city in each state, has experienced overall increases, with higher rates – among those states with sales taxes – across the entire distribution. The statutory burden of the tax is less clear, since the base of the sales tax is acknowledged to have been declining for years, with increases in consumption of untaxed services as well as shopping over the internet (CBPP, 1998, Bruce and Fox, 2001). Sales taxes on food also complicate matters, since they tend to be lower than the general sales tax and are increasingly exempt altogether.

Property taxes on residential real estate in the biggest city in each state also vary considerably across states, ranging from $0.59 per $100 of market value in the lowest-tax state in 1988 to $4.10 in the highest. These rate differences remain, but show some signs of compression

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[5] States without income taxes include Alaska, Texas, Washington, Nevada, Wyoming, South Dakota, and Florida. Two states (New Hampshire and Tennessee) have income taxes that exempt labor income altogether and only tax capital income. States without sales taxes include Alaska, Delaware, Montana, New Hampshire, and Oregon. Some local governments in Alaska do have relatively high sales taxes, but the state's population center (Anchorage) does not tax retail sales. Of the distant second and third largest Alaskan cities, Juneau taxes retail sales, while Fairbanks does not.

[6] The average marginal rate is calculated by NBER using the TAXSIM program. The rate is simply the state-level mean of the marginal state income tax rates calculated by TAXSIM, using the 1995 national distribution of income and each state's tax code. For more information on TAXSIM, see Feenberg and Coutts, 1993.

over the last 15 years. The average rate change between 1988 and 2003 for the ten lowest rate states in 1988 was +$0.15, while it was -$0.55 for the ten highest rate states. Seven of the low tax states from 1988 raised their rates, while 8 of the highest states lowered their rates.

*Migration Propensities*

Residential mobility is quite common in the United States, with one in every seven individuals changing residences between 2004 and 2005, down slightly from 1990 to 1991 when one in six moved (Table 2). Most mobility, however, is simply a change of residence within the same narrow geographic location. Of the 13.9 percent moving in 2004, 7.9 percent stayed in the same county and 2.7 percent changed counties, but remained in the same state. Less than one-fifth of all moves in 2004 (2.6 percent) involved crossing a state line. Even fewer (1.1 percent) still involved moves out of a given Census region.

As has been previously documented in the migration literature, the propensity to migrate across state lines is lower among home owners and is positively related with the dissolution of marriage (Greenwood, 1997). Renters are more than three times as likely as homeowners to move in a given year. Those who have separated from their spouse are twice as likely to change their state of residence as those married with their spouse present.

Migration propensities have also been shown to rise with education and decline with age. While 2.2 percent of those (ages 25+) with only a high school degree changed states in 2004, 2.8 percent with a BA did. The one-year migration rate of those in their fifties is just one-third as high as those in their twenties. Working with multiple years of the Decennial Census, Rosenbloom and Sundstrom (2003) show that the relationship between age and cross-state migration has persisted over time, with the five-year migration rates between three and four times higher among those in their twenties compared to those in their fifties. In 1990, nearly 17 percent of those in their twenties were living a different state than five years earlier, compared to 5.5 percent of those in their fifties.

**Section 3 – Existing Literature on state and local tax incidence**

There have been relatively few studies of the incidence of state and local taxes, and fewer still that address the distribution of these taxes.[7] This is surprising since state and local governments are responsible for a large and growing share of taxes paid in the US, and the issue of "fairness" and distribution is typically one of the most important themes in the policy debates. In addition, there are avenues of response not possible for federal-level taxes, providing identifying variation for researchers to exploit.

*Incidence of state taxes*

In their 1989 paper, Gyourko and Tracy extend the Rosen-Roback compensating differentials model to local fiscal conditions, including taxes and some public services. They use data from the 1980 Decennial Census for 125 large cities, supplemented by external data for state and local taxes (state personal income and corporate income tax rates and local personal income tax rates), public services, and a host of amenities. Based on previous work (Gyourko and Tracy, 1989b), they assume that property taxes are capitalized into home values and do not affect wages.

Their wage regressions show that cross-city differentials in weekly wages are positively correlated with differentials in income tax rates and that the magnitudes are consistent with the net wage equalization hypothesis. The standard errors, however, are relatively large, leaving

[7] Metcalf (1994) uses standard incidence assumptions (i.e. he assumes that state income taxes are fully bourne by labor) in his discussion of lifetime incidence instead of estimating the incidence of these taxes.

Gyourko and Tracy "unable to make any firm statements about the constancy of net wages in the face of income tax differentials across cities."

Wallace (1993) also considers the extent to which cross-state differences in income tax rates are reflected in wages. She extends the general equilibrium model of tax incidence (following Harberger (1962) and McClure (1969)) to state personal income taxes. Using a cross-section of the 1985 CPS and a variety of public service and amenity controls, Wallace finds that cross-state differentials in gross hourly wages fully offset differentials in marginal income tax rates only in some cases.

Wallace considers mobility to be costly and heterogeneously so, and tries to control for this by including a host of covariates that influence mobility (what she calls "labor specificity"). Wallace's regressions use interactions between five occupation dummies with the tax rate in separate regressions for eight different industry groups. The results show that wages do not adjust for cross-state income tax differences for most of the groups. For one-fourth of the industry/occupation groups, wages did adjust to offset some of the tax difference, with the degree of adjustment ranging from 30 percent to 90 percent. Pre-tax wages of groups that were a priori expected to be more mobile, turned out to be relatively more responsive to interstate tax differentials.

*Incidence of the distribution state taxes*

The distribution of the tax burden, separate from the level of taxes, is an important topic in its own right for both policy debates and economic research, but there are only two studies (to my knowledge) that explore the extent to which differences or changes in the distribution of the burden of state and local taxes are reflected in pre-tax wages.

The most prominent paper is by Feldstein and Wrobel (FW) (1998). FW differ from previous work examining state tax differentials per se, as opposed to the distribution of state and local taxes, in a number of key respects. First, FW consider the marginal tax variables used in Gyourko and Tracy and Wallace to be conceptually incorrect, and instead favor an effective average tax rate, or "tax share" as they refer to it – simply total taxes paid divided by income. In choosing among locations, potential migrants are concerned with maximizing their after-tax consumption across potential locations, not the net return from an additional hour of work (which is implied by using a marginal rate). In their empirical analysis, FW regress the log of hourly wages on the log of the "after-tax share," which is one minus the tax share.

A second difference is that, relative the earlier papers, FW use a broader range of taxes. Instead of just focusing on income taxes, as Wallace does, FW include the sales and property tax burdens as well.[8] Measuring either of these additional tax burdens is complicated, as will be discussed in greater detail below, but FW argue that potential migrants will compare the complete tax burden associated with living and working in a place, not simply the smallest of the three major state and local taxes – the income tax. We also explore, following Gyourko and Tracy (1989a,b) excluding property taxes from the wage equation in some specifications.[9] A

[8] GT do include corporate income taxes and local income taxes in their analysis, but these taxes are both very small. They exclude local property taxes and absorb sales taxes into a cost-of-living measure, effectively measuring responsiveness to only one of the three big state and local taxes – the personal income tax.

[9] Because income and sales taxes are primarily levied by state governments, while property taxes are the domain of the thousands of local governments that exist within state boundaries, these taxes might be expected to impact location decisions in different ways. Once committed to a state (or even metropolitan region) the income and state sales tax rules are given, but there is still a choice among different property taxing districts. In principle, mobile households deciding among different states have to consider the combined effect of all three major state local taxes, but it is plausible that the property tax might not be relevant to the state decision. If states are made up of a distribution of property taxing districts that offer a range of tax-level/service-level combinations, then cross-state migrants might be able to find the desired property tax/service levels in any state. If all states have, say, metro regions with affluent suburbs with good schools and moderate property tax rates levied on relatively expensive homes, or even rural regions with low levels of public services and low property tax rates on modest property values, then the desired property-tax/service bundle might be found in every state. The geographically fixed nature of housing and property, as compared to labor, suggests further important differences in how current residents might respond to changes in different types of taxes. Mobile households fleeing a state's increased income and sales taxes

third difference is that FW include state fixed effects. The fixed effect expresses each of the variables in the regressions as relative to the state mean, which allows them to consider their research an assessment of the distribution of taxes and wages, as opposed to the levels.

In their empirical analysis, FW use a cross-section of the CPS (for 1983 and for 1989) and conclude that differences in the distribution of state and local taxes are fully offset by differences in pre-tax hourly wages.[10] The coefficients on their preferred double log specification range from -.62 to -2.08, and are not significantly different from one, which implies net wage equalization as pre-tax wages completely adjust to differences in the after-tax share (Feldstein and Wrobel 1998, 387). They also conclude that the adjustment happens very quickly, as including lagged tax variables has little impact on the results.

A prominent criticism of FW's conclusion (see Bakija and Slemrod (2004) and Reschovsky (1998)) is that their cross-section regressions leave them unable to distinguish between their interpretation and one where states with greater wage inequality adopt more progressive tax structures, consistent with Pauly's (1973) notion of redistribution as a local good. Leigh (2008) follows up on this critique by constructing a 26-year panel of states using the CPS. He regresses a gini of the state pre-tax wage distribution on a gini of the state tax distribution and finds "little evidence that more redistributive state taxes lead to a more unequal distribution of pre-tax earnings. This absence of an effect persists for up to a decade. Leigh finds that "more

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will not generally find their human capital diminished. The possibility of homeowners escaping property taxes by moving, however, is complicated by the timing of the capitalization of the tax into the market value of housing. If housing values are determined by the discounted net present value of the stream of benefits from ownership, the market price of housing should instantaneously adjust to reflect any change in property taxes once that change is announced or becomes public knowledge. Thus current homeowners suffer a capital loss in the face a property tax increase that cannot be avoided by moving. The degree to which property taxes are incident on wages is influenced not by the migration decision, but the location decision conditional upon migration. The capitalized property tax does not provide an incentive to move, but the decreased housing values make the location less desirable to potential in-migrants, as well as to current residents who are changing residences.

[10] FW also do separate regressions for men and women and include only the fully employed, those working between 35 and 70 hours per week.

redistributive taxation is also associated with slightly more equal distribution of post-tax hourly wages" and suggests that the most plausible interpretation of the evidence is that states with greater income inequality adopt more redistributive tax systems.

Leigh's use of panels seems an improvement over the cross-section by FW, but because he only includes income taxes, it is hard to know what to make of the results. If, as Leigh acknowledges, there is some correlation between state income taxes and property and sales taxes, then the results will be biased. Since income taxes only account for a quarter of state and local taxes, it is hardly clear that they are the predominant influence on location decisions. Seven states do not have an income tax and are effectively excluded from the analysis. Also, Leigh's analysis is based on gini indexes of the earnings and tax distributions, but there is no theoretical guidance on the appropriate measure of distribution. It is possible that other distributional summary statistics might yield different outcomes.

Finally, like FW, Leigh does not consider how costly migration might affect his results. As Wallace's work suggests, however, allowing groups to have different levels of mobility can reveal important differences in the influence of taxes on pre-tax wages.

**Section 4 – Why Migration Costs Matter**

Households are assumed to choose locations that maximize their lifetime utility, usually some function of traded and non-traded goods (housing primarily), leisure, location-specific amenities and possibly public services (Sjaastad, 1962). A spatial equilibrium exists when no household has an incentive to change location. If regionally-varying shocks or policy changes alter the relative attractiveness of a location, marginal households will accordingly alter their location decisions. This change in net migration results in shifts in wages which restore the spatial equilibrium.

State and local taxes are relevant to location decisions because they influence the net wage as well as the services provided by state and local governments. An increase in taxes, cet. par., will make a region less attractive to potential in-migrants as well as current residents, and will influence their location decisions, which will in turn affect pre-tax wages. The incidence of the tax depends on how large the resulting shifts in wages are relative to the tax change. If pre-tax wages are unchanged, because location decisions are not actually altered, then current residents will bear the full burden of the tax. If wages adjust by the full amount, then residents bear none of the burden. The same logic applies to tax changes with distributional impacts as well. In response to a revenue-neutral progressive tax change in a given state, higher-income households will find that state relatively less attractive and low-income households will find it more attractive.

The size of the labor supply shift is a function of the costs of migration. In the case of zero or trivial mobility costs the adjustment should be complete, and inter-state tax differentials should be completely reflected in pre-tax wages. At the other extreme, with infinite mobility costs, there is no migration, and the gross wage does not adjust at all to accommodate the tax. In the intermediate, and probably more realistic, case of moderate mobility costs there will be some change in net migration resulting in some change in the gross wage, but the size of that shift is indeterminate. The question is whether or not there is "enough" migration to equalize net wages (FW, 1998, 371).

The marginal household will be indifferent across locations (in utility), but net-earnings can fail to equalize across locations in the presence of non-trivial and heterogenous mobility costs and location-specific utility. (Cameron, et al (2007); Krupka and Donaldson (2008)). This paper explores whether these types of mobility costs and preferences make it possible for states to "redistribute through the tax code" – have progressive taxes that are not completely offset by changes in pre-tax wages.

Whether distributive changes in state and local tax system are offset through migration depends not only on the volume of migration, but on the types, relative to the income distribution, who alter their location decisions. As already discussed, the migration literature shows that propensity to migrate is decreasing in age, but increasing in education. Some previous research accounts for migration costs being a function of age and education, and suggests that pre-tax wages of older and less educated workers are less responsive to regional demand shock compared to younger and more educated workers (Topel, 1986). (See also Polachek and Horvath (1977)). It is possible that these migration cost factors have a similar impact on the responsiveness of pre-tax wages to changes in the distribution of state and local taxes.[11]

Older workers have higher mobility costs (employer-specific skills, stronger emotional ties to a specific community, home-ownership, school-aged children, etc.) and fewer years to reap the gains associated with moving across states so they are less willing to move across states in response to changes in after-tax wages (Topel, 1986) . More educated workers have lower costs of migration (education is thought to decrease the informational cost of moving) and have a considerable investment in general portable skills.

Education and age (experience) have opposite effects on migration costs, but have the same (sign) effect on skills and wages. The combined impacts of education and experience on mobility and earnings result in the highest-income groups not being the most mobile. Analysis of the CPS data shows high and low-income households appear to have relatively low propensities

[11] This result also requires that experience differences render workers of similar education levels imperfect substitutes, a result discussed and established previously by Welch (1979), Card and Lemieux (2001), Borjas (2003), and Roback (1988). If age or experience increase moving costs, but not skills and wages, then migration of the younger and more mobile factors will equalize net wages despite the moving costs of some of the factors.

to migrate across state lines (Table 3). The highest income households are older and highly educated, but have very low rates of cross-state migration. The lowest income households are young and poorly educated, and have moderate cross-state migration rates. The most mobile households are young and highly educated, and are in the middle of the income distribution.[12] With the most mobile workers being in the middle of the income distribution, and high and low-income workers exhibiting much lower mobility, it raises the possibility that cross-state migration might not be sufficient to off-set distributional changes in state taxes.

**Section 5 – Model and Estimating Equations**

This paper extends the existing literature by: 1) exploring how costly migration affects the results, 2) using all major state and local taxes, and 3) using repeated cross-sections and pseudo-panels. Our approach to including migration costs follows Topel (1986), using interaction terms to allow the tax impact to differ by age and education.[13]

*The FW Model*

The modeling approach is a simple extension of Felstein and Wrobel (1998). In their model, FW include two types of workers: high-skill ($w_h$) and low-skill ($w_l$) workers ($w_h > w_l$). With income only from earnings and proportional tax rates of $t_h$ and $t_l$, they write the spatial equilibrium conditions:

$$\left(1-t_h\right) w_h / p_h = W_h \tag{1}$$

and

$$\left(1-t_l\right) w_l / p_l = W_l \tag{2}$$

[12] Even within education and experience groups income does not play a clear or strong role on cross-state migration (Figure 2.)
[13] An alternative approach following Wallace (1993) and running separate regressions by mobility group (defined here by education and age instead of occupation and industry) yields similar outcomes.

Where $p_h$ and $p_l$ are local prices faced by high and low-skilled workers and $W_h$ and $W_l$ are the real after tax wages, and $w_h$ and $w_l$ are pre-tax wages. Land is the locally consumed good.

Assuming a Cobb-Douglas production function, and also that "property is sufficiently homogenous," (writing $p_h = p_l$ effectively assumes that tax differentials are incident on wages and not property values) FW write pre-tax wages as a function of both tax rates:

$$\mathrm{dlnw_h} = \left[b(1-a)\right]\left\{dt_h/(1-t_h) - dt_l/(1-t_l)\right\} \tag{3}$$

with an equivalent expression for $w_l$. Assuming that any tax change is revenue-neutral, they can further write:

$$\mathrm{dlnw_h} = -\left[d(1-t_h)\right]/(1-t_h) \tag{4}$$

again with an equivalent expression for $w_l$. FW then proceed to estimate the following equation in a cross-section of the CPS:

$$\ln(\mathrm{wage_{is}}) = \beta_1 \ln(\mathrm{ATS_{is}}) + \beta_2 X_{is} + \mathrm{State_s} + \varepsilon_{is} \tag{5}$$

where $X_{is}$ is a vector of worker demographic and human capital characteristics and ATS is the "after-tax share." ATS and its components are defined as follows, where Y is the taxpayer's household income:

$$\mathrm{ATS_{is}} = \left[1 - \{\mathrm{FATR_{is}} + \mathrm{SATR_{is}} + \mathrm{SLATR_{is}} + \mathrm{PATR_{is}}\}\right] \tag{6}$$

$$\mathrm{FATR_{is}} = \text{federal income tax}_{is} / Y_{is} \tag{6a}$$

$$\mathrm{SATR_{is}} = \text{state income tax}_{is} / Y_{is} \tag{6b}$$

$$\mathrm{SLATR_{is}} = \text{state sales tax}_{is} / Y_{is} \tag{6c}$$

$$\mathrm{PATR_{is}} = \text{local property tax}_{is} / Y_{is} \tag{6d}$$

Details on how each of these taxes is calculated are discussed further below in the data section.[14]

[14] The cross-deductibility of state and federal taxes is included in the TAXSIM program.

The net-wage equalization hypothesis, as stated by FW, predicts that $\beta_1 = -1$, where any change in the after-tax-share is offset by changes in the pre-tax wage. Because the tax rate (particularly the income tax rate) is endogenous, FW use predicted income as an instrument.[15]

$$Y_{is} = \text{ predicted income } \{ \text{ prediction from } \hat{y}_{is} = \hat{\beta}_1 X_{is} + \text{State}_s \ \} \tag{7}$$

Since predicted income is a linear combination of exogenous determinants of the wage rate – the same covariates ($X_{is}$) included in (5) – it is uncorrelated with the error in the wage equation. Using predicted income to calculate income, property and sales taxes leaves the ATS a function of exogenous tax rules and exogenous determinants of the wage rate, not the disturbance term.

Repeated Cross-section

To address previously mentioned limitations of using a simple cross-section, this paper uses repeated cross-section and pseudo-panels, developed from the Current Population Survey for 1989 to 2003. For some of the regressions we will be estimating:

$$\ln\left(\text{wage}_{ist}\right) = \beta_1 \ln\left(\text{ATS}_{ist}\right) + \beta_2 X_{ist} + \text{State}_s * \text{Year}_t + \varepsilon_{ist} \tag{8}$$

with the key difference from (5) being the addition of year effects.

Including Migration Costs

FW include two types of workers (high-skilled and low-skilled) in their model and assume that migration is costless. Here I am including four types of workers that differ on two dimensions of skill. Skill is assumed to be a function of both education and experience (formal and informal training).[16]

$$Skill_{ist} = f(\text{education}_{ist}, \text{experience}_{ist}) \tag{9}$$

Wages are increasing in both education and experience:

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[15] Tax rates are a function of income, which is a function of wages and hours worked. As a result, the disturbance term in the wage regression is correlated with the tax variable.
[16] Welch's (1979) career phase model is one example where this definition of skill is employed.

$$\partial(wage)/\partial(education) > 0 \quad (10)$$

and

$$\partial(wage)/\partial(experience) > 0 \quad (11)$$

The two dimensions of skill have opposite impacts on migration costs, however. Migration costs are increasing in experience, but decreasing in education:

$$\partial(migrationcost)/\partial(experience) > 0 \quad (12)$$

and

$$\partial(migrationcost)/\partial(education) < 0 \quad (13)$$

Because of higher migration costs, experienced workers will be less responsive to region-specific economic shocks and policy changes than inexperienced workers. Less educated workers will be similarly less responsive than more highly educated workers.

Allowing workers to vary on these two dimensions of skill we will allow the tax impact to differ by education and experience level, and will estimate (following Topel (1986)):

$$\begin{aligned}\ln(\text{wage}_{\text{ist}}) \ = \ & \beta_{1a}(\ln\text{ATS}_{\text{ist}}) + \beta_{1b}(\ln\text{ATS}_{\text{ist}}*\text{experience}_{\text{ist}}) + \beta_{1c}(\ln\text{ATS}_{\text{ist}}*\text{education}_{\text{ist}}) \\ & + \beta_2\text{X}_{\text{ist}} \ + \ \text{State}_{\text{s}} * \text{Year}_{\text{t}} + \varepsilon_{ist}\end{aligned} \quad (14)$$

If mobility is truly costless, as assumed by FW, then the coefficients on the interaction terms ($\beta_{1b}$ and $\beta_{1c}$) should be zero. If moving costs rise with experience, then the sign on the interaction between ATS and experience should be positive. If moving costs decline with education, then the interactions between higher levels of education and ATS should be negative.

<u>Pseudo-Panel Regressions</u>

As critiques of FW have noted, estimates from a cross-section will not be identified in the presence of time-invariant state characteristics that influence the distribution of wages and of taxes. One concern here is the possibility of state preferences for redistribution. Using a differencing estimator, however, addresses this concern, in part a motivator for Leigh's (2008) use of panels of states. To incorporate the influence of heterogenous migration costs, though, we cannot use a state panel, but instead construct a pseudo-panel of sub-state groups based on common traits, namely education, gender, and age (Deaton, 1985; Verbeek, 2007). (Details on the construction of these groups are discussed further below in the results section.)

Because we are interested in responsiveness to the distribution of taxes, we estimate (15) after first de-meaning each observation within year and state. The equation effectively regresses group means of relative wages on group means of relative ATS using the "within" estimator, where groups – indicated by the subscript "g" – are based on education, gender and age and "relative" is in relation to the state-year mean.[17]

$$\left(\overline{\ln}\overline{\text{wage}}_{gt}\right) = \beta_1\left(\overline{\ln}\overline{\text{ATS}}_{gt}\right) + \beta_2 X_{gt} + \lambda_g + \varepsilon_{gt} \qquad (15)$$

We explore the impact for specific sub-sets of the data based on our expectations of mobility costs and also using different definitions of the after-tax-share as well.

**Section 6 – Description of the data and the tax calculations**

The primary data source for this analysis is the Current Population Survey for 1988 to 2002. The March Supplement to the CPS collects income and demographic information on 60,000 households annually.[18] One quarter of these households are also asked current labor force status questions (wages, hours worked, etc.) as part of the "outgoing rotation group" (ORG). To increase size of the sample with useable wage information, respondents in the March survey who

[17] Chow "joint F" tests ($F(13, 50) = 32$; Prob > F = 0) and Likelihood Ratio tests ($chi^2(01)= 2813.23$ Prob>=$chi^2 = 0$) on the basic pseudo-panel specifications (results here presented for males) both suggest that cohort fixed effects are important, but Hausman tests reject ($chi^2(13) = 842.13$; Prob>$chi^2 = 0$) the use of random effects.
[18] During some of the years used in this analysis, the March CPS only surveyed 50,000 households.

are lacking labor force information – because they are not included in the ORG in March – are matched to their wage information from their nearest ORG month.[19] [20]

The CPS variables used in the analysis include education, experience, gender, race, Hispanic ethnicity, urban status, union status, marital status, number of children, average weekly hours worked, hourly wages, income, and cross-state migration status. Education is an indicator variable for highest level of attainment, with five possible outcomes: dropout; high school graduate; some education beyond high school, but no four-year degree; Bachelor's degree, and; some education beyond a Bachelor's degree.[21] Experience is simply age minus six minus years of education.[22] Marital status, race, Hispanic ethnicity, and urban residence are entered as indicator variables. Appendix Table 1 contains summary statistics by age and education groups.

The income, wage and demographic data from the CPS are augmented with information on income, property and sales taxes. State and federal income tax data are obtained from the National Bureau of Economic Research's TAXSIM program (Feenberg and Coutts, 1993). TAXSIM applies parameters from federal and state income tax codes and a large administrative dataset from the IRS to calculate federal and state income taxes based on income, earnings, and

[19] Each sampled household is surveyed for four consecutive months, ignored for eight months, and then surveyed for four additional consecutive months, for a total of eight surveyed months. In the fourth and the eighth months, the months that the household is "rotated" out of the sample either temporarily (4th survey month) or permanently (8th survey month), the household is asked a battery of questions about their current labor force status.

[20] The matching procedures used here were developed by Madrian and Lefgren (2000), except here we are matching respondents to adjacent months, as opposed to consecutive March surveys (the fourth and eighth month of the survey will fall in March for one quarter of CPS respondent households.) With one quarter of the households in any given ORG, this sort of matching could potentially quadruple the sample in the March survey who are asked the current labor force questions. Some matches, however, are deemed unreliable, and are not used. Adding data for matches deemed reliable by the Madrian and Lefgren technique effectively triples the number of observations with useable wage information.

[21] FW use a continuous measure of years of education, but this is no longer collected in the CPS, which switched to a measure of educational attainment in 1994. To make the educational attainment variable consistent over the entire period, I calculate educational attainment for the years prior to 1994 based on years of education and whether it was completed.

[22] The number of years in education is approximated using the educational attainment variable.

household demographics.[23] (See Tax Appendix Table 1 for top marginal state income tax rates by state, and Tax Appendix Table 2 the average marginal state income tax rate by state.[24])

*Sales Taxes*

The burden of the largest state and local taxes, the sales tax and the property tax respectively, are calculated differently. The household sales tax is calculated by applying a statewide tax rate to predicted taxable consumption. Taxable consumption is predicted for households in the CPS based on parameters from regressions using the annual Consumer Expenditure Survey (CES).[25]

Consumption is predicted separately for inside-the-home food consumption and all other "taxable" consumption.[26] In each case, the prediction is based on a simple regression of the relevant category of consumption on income, repeated each year. Predicted consumption is then multiplied by the relevant tax rate:

$$\text{state sales tax}_{ist} = \text{taxable } \widehat{\text{consumption}}_{it} * \text{tax rate}_{st} \quad (16)$$

The state and local sales tax rates for general consumption are for the biggest city in each state, and are based on the annual tax burden comparison report produced by the District of

[23] The few local income taxes are not calculated by TAXSIM.
[24] The Tax Appendix is at http://student.maxwell.syr.edu/jpthom01/appendix_tables_tax_rates_by_state.pdf.
[25] This method for calculating property taxes is used by Feldstein and Wrobel (1998). Their approach to calculate the household sales tax burden, however, is based on administrative data that are no longer available. Instead, I use basically the same approach used to calculate sales taxes as for property taxes. The approach to estimating sales tax burden was discussed in Feenberg and Rosen (1986), who ultimately preferred the approach used by FW.
[26] The CES asks specifically about food for consumption at home ("foodhome"), which is exempt or taxed at lower rates in many states. We generate a second category of taxable consumption called "non-food-taxable," which includes food eaten away from home, tobacco products, alcohol, entertainment, books and other publications, sports and other types of recreation, clothing, jewelry, toiletries, health and beauty products, home furnishings, household supplies, household utilities (electricity, gas, water, and home fuel), automobiles (including parts and car services plus gasoline and insurance), airfare. Notable exclusions to this list are most services, private school and religious expenditures, tolls, mass transit, gambling, and rent. Some econometric specifications were explored with a pared-down list of non-food-taxable items, dropping utilities and auto insurance, but this had little impact on the coefficients on the ATS variable.
Each state varies in exactly which items are taxable, but we use a single set of taxable consumption for all states.

Columbia's Chief Financial Officer.[27] See Tax Appendix Table 3 for general state and local sales tax rates and Tax Appendix Table 4 for the rate on food. [28]

*Property Taxes*

The prediction of the market value of owner-occupied housing is similar to that of consumption, using a regression of home value on income, repeated each year. FW predict home value similarly, but use the National Housing Survey (NHS). Here we opt for the CES because the NHS data are only available every other year. The state average property tax rate is calculated following FW. State level total residential property tax collections are divided by a measure of the property tax base to create a state average property tax rate:

$$\text{property tax rate}_{st} = \text{property tax collections}_{st} \,/\, \text{property tax base}_{st} \qquad (17)$$

This rate is multiplied by the predicted housing value to obtain the household's property tax burden:

$$\text{local property tax}_{ist} = \widehat{\text{housing value}}_{ist} * \text{property tax rate}_{st} \qquad (18)$$

Residential property tax collections are from the Census Bureau's State and Local Government Finance data.[29] The state-wide property tax base is calculated by summing predicted housing values within the state. See Tax Appendix Table 5 for the calculated average state property tax rates.

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[27] Determining the tax rate on food was more difficult. Many states have modified or eliminated their sales tax on food, and this information hasn't been gathered systematically covering the period of interest here (1989-2003). The food rates are based on various reports from the Center on Budget and Policy Priorities and The Tax Foundation.
[28] The Tax Appendix is at http://student.maxwell.syr.edu/jpthom01/appendix_tables_tax_rates_by_state.pdf.
[29] The Census data for state and local tax collections were accessed through the Brookings-Urban Tax Policy Center's State & Local Finance Data Query System (SLF-DQS). Total property tax collections are multiplied by the residential share of taxable property, which was calculated by the Advisory Commission on Intergovernmental Relations (ACIR). ACIR is no longer in existence, and this ratio was last calculated in 1993. Although it is possible that this ratio has changed over time, the Bureau of Economic Analysis continues to use this ratio in some of its state-level tax calculations.

In their work exploring compensating differential from local government fiscal attributes, Gyourko and Tracy (1989a,b) find that property taxes are fully capitalized in land/home prices and exclude property taxes from their wage equations.[30] Some of the regressions carried out below will follow GT by excluding property taxes.

*Relative Effective Tax Rates*

The ratio of the effective state and local tax rates for high and low-income households resulting from these calculations, and how they have changed between 1988 and 2002, is displayed in Figure 1. The figure shows the effective average tax rate of the top end of the income distribution (the 90$^{th}$ to 99$^{th}$ percentiles) divided by the tax rate of those at the bottom end of the income distribution (the 10$^{th}$ to 19$^{th}$ percentiles). As the figure suggest, most states actually have regressive tax structures, where low-income households have a higher effective tax rate than those with high incomes.

Only a few states actually have progressive structures by this measure, including Vermont, the District of Columbia, Montana, South Carolina, and Delaware.[31] Between 1988 and 2002, though, state and local taxes became slightly more progressive overall. The US average shows a ratio of .78 in 1988 and .85 in 2002. A handful of individual states, however, experienced large progressive changes, including Connecticut, Nebraska, Vermont, Maine, Kansas, Arkansas, and Montana. Some states experienced modest decreases in the progressivity of their state tax structure, including Arizona, Idaho, and Missouri.

[30] This finding of property taxes being capitalized into property values, but not wages, is also reached by Zodrow 2007, 507-509.

[31] While it differs in some respects, this depiction of the progressivity of state and local taxes is comparable to that produced by the Institute for Taxation and Economic Policy (2005).

## Section 7 – Results

*"Replicating" Feldstein and Wrobel*

Despite some differences in how sales taxes were estimated and the data used to create the property tax burden, estimating the same equation (5) as used by Feldstein and Wrobel produces generally comparable results (Table 4) that are consistent with the net-wage equalization hypothesis. Columns 1 and 2, which use an ATS that includes income, sales, and property taxes and a measure of hourly wages identical to that used by FW, show large and significant wage responses for men (-.76) and women (-.78).[32] With both the dependent variable and the independent variable of interest in logs, these coefficients are interpreted as elasticities, and they are close to negative one. Using the hourly wage reported by hourly workers instead of calculating it by dividing weekly wages by hours worked (Columns 3 and 4), which is done for weekly-paid workers, makes little difference on the results (-.76 males and -.79 for females).

Expanding the sample to include the matched wage data from adjacent months and excluding property taxes (Columns 5 and 6), following Gyourko and Tracy (1989a), results in no change in the coefficient for men and a small decline for women (-.77 for males and -.67 for females). Adding a covariate for Hispanic, though, has a relatively large impact on the results (Columns 7 and 8) for males (-.59), but not for females (-.65). Finally, using all the years of data and year fixed effects (Columns 9 to 12), estimating equation (8), produces slightly smaller coefficients hovering close to -.50 for males and females regardless of whether property taxes are included in the ATS.

[32] FW calculate hourly wages by dividing weekly wages by hours worked. Using this same definition of hourly wages, but excluding sales taxes, as FW do in one of their main specifications, yields coefficients of -.92 for males and -.74 for females.

*Considering costly migration*

Interaction regressions (Topel)

Table 5 contains regressions extending the final four columns in Table 4 by adding interaction terms between ATS and education and experience – equation (14) estimated first on a single year of data – and then on all years of data. These interactions (following the approach of Topel (1986)) allow the after-tax share to have a different impact on wages for worker types with a priori differences in expected migration costs. Results for these regressions are included in Table 5 and tend to support the hypothesized influence of age and education on migration. For both genders and groupings of years the coefficient on the interaction with experience is positive and significant. The coefficients on the education interaction terms are mixed when estimated on a single year (Columns 1 and 2), often of the "wrong" sign and generally not significant. When estimated for all years (Columns 3 through 6), however, the coefficients are mostly negative and (for women at least) quite significant. Conditional on working full-time, education plays a much stronger role for women than men in determining the responsiveness of pre-tax wages to changes in the distribution of state and local taxes. Whether or not property taxes are included in the measure of ATS (they are included in Column 3 and 4) has little impact on the results.

Using the results from Column 5 and 6, Table 6 calculates elasticities for specific education-experience groups. For females with more than a college degree and five years of potential experience, the elasticity is -.94, indicating pre-tax wages fully offset distributional tax changes for these workers. For similarly educated females with 35 years of experience, the elasticity falls to -.56. The pattern of results is much less striking for males, for whom those with "some college" (which includes those with community college degrees) are the most responsive.

Pseudo Panels

The final set of wage results are based on a pseudo panel of groups defined by age, education, gender, and state, and using the "within" estimator – estimating equation 15. With five education levels, three experience groups, two genders and 50 states and the District of Columbia, there are 1,530 groups spanning fifteen years between 1988 and 2002.[33].

Results in Tables 7 show the coefficient on the ATS (including income, sales, and property taxes) variable for females is -.71 and for males it is -.75 (Columns 1 and 2).[34] Running separate regressions for different age-education groups reveals generally similar patterns as discussed previously in the "Topel" regressions. Among those workers with high levels of education (a BA or greater) but relatively little experience (ages 20 to 33) the impact of that tax variable on pre-tax wages is greatest, greater than -1 for both males and females (Columns 3 and 4). For older workers (ages 48 to 60) with high levels of education, the coefficients on ATS are much lower, especially for females, and not significantly different from zero (effects of -.23 for females and -.49 for males) (Columns 5 and 6). Among those with low education (a high school degree or less) and little experience (Columns 7 and 8) the coefficient on the tax variable is also considerably smaller for both genders.

For older workers with low levels of education, however, the wage results are different from the repeated cross-section equations. In the pseudo-panel equations, the wages of these workers (Columns 9 and 10) are more responsive to changes in the tax distribution; the tax coefficient is -.93 for women and -1.26 for men. This group of older and less-educated workers

[33] The age groups are 20 to 33, 34 to 47, and 48 to 60, with these three selected to obtain meaningful differences between the groups in expected migration costs and to ensure that cell sizes were sufficiently large. Other age groups, as well as groups based explicitly on years of experience, were explored and did not produce substantially different results. In addition, by restricting the ages of the sample, I am hoping to exclude those more likely to move strictly for schooling and retirement, although the results are not very sensitive to variations in the cut-off points.
[34] Use of lags was explored for this and other pseudo-panel specifications. The lagged effect is small and dissipates after one year.

was expected ex-ante to have a higher cost of migration, but many in this group exhibit weak labor force attachment. The wage responsiveness could be a result of shifting labor force composition as marginal workers leave the labor force altogether as a result of distributional tax shifts – a response considered less likely among the other groups of workers with large negative coefficients on the ATS variable.

This pattern of results, showing the wages of young, highly-educated workers to be very responsive, while the wage of older, highly-educated workers and younger, less-educated workers not being responsive is robust to different definitions of "group."[35] The pattern remains and the coefficients change little when property taxes are excluded from the ATS variable.[36] Appendix Tables 2 and 3 show the results of the same within regressions based on different group definitions. The results in Appendix Table 2 are based on three education groups, combining high school dropouts with high school graduates, and also combining those with bachelor's degrees with those who have some graduate education. The estimates in Appendix Table 3 go further and combine men and women together, again producing the same basic set of outcomes.

[35] The pseudo-panel estimators used in the empirical literature have been shown to be consistent as either the number of cohorts or the average number of observations per cohort tends to infinity (Verbeek, 2007, pg. 7). In an early pseudo-panel paper, Browning et al (1985) have 16 cohorts, and 7 time periods with an average cohort size of 190. More recently, Propper et al (2001) have 70 cohorts, 19 time periods and an average cohort size of 80. In their US data, Gardes et al (2005) use 18 cohorts based on three education groups and six age groups, with an average cohort size of 65. The results presented in Tables 7of this paper are based on 1,306 cohorts, 15 time periods, and an average cohort size of 27. Results in Appendix Table 7 are based on a different "group" definition which results in 902 cohorts and an average cohort size of 40. Results in Appendix Table 8 are based on 459 cohorts and an average cohort size of 80. As Gardes et al note, consistent and efficient estimation using pseudo-panels requires having sufficiently large cohort sizes (minimizing concerns over measurement error), but it also requires minimizing the heterogeneity within the cohort. The results in these two Appendix Tables and Table 7 suggest the results are robust to the trade-offs involved in choosing larger versus more internally homogenous cohorts.

[36] The results in Table 7 also are based only on cells with more than three observations and cohorts with data in more than 10 of the 15 years of available data. These restrictions do not have a meaningful impact on the coefficients.

Labor Supply Shifts

*Net Migration Rates*

In principle, we should be able to observe the labor supply shifts – particularly migration – that are thought to restore net wage equalization (or not in the case of differential moving costs) following an economic shock or policy change. In his paper, Leigh (2008) fails to find migration shifts that correspond to cross-state differences in the distribution of income taxes. Table 8 contains a set of results for regressions of the net migration rate on the after-tax-share.[37] If we ignore the impact of costly migration, we also find no relationship between migration and taxes (Columns 1, 3, 5 and 7.)

When we allow the tax variable to interact with education and experience – estimating equation 14 using age-education-state-gender groups – however, the migration rates of the low-cost groups do seem to respond to cross-state differences in the after-tax-share. For both males and females, the coefficients on the interaction between higher levels of education and ATS is positive and generally significant, and the coefficient on the interaction with experience is negative (Columns 2 and 4). Looking only at household heads, these results persist for men, but not for women. For female household heads, the interaction with higher levels of education becomes negative, although not significant, and the interaction with experience becomes negative (Column 8). Further restricting the female sample to unmarried childless women switches the sign on interaction between college degree and ATS to positive, but the result for

[37] Net migration, which includes population in-flows less population out-flows, can only be measured for groups of people. We calculate net migration for age, education, gender and state groups, similar to what has been discussed previously. The individual-level migration data is an inflow measure – it identifies people in a given state who had resided in a different state during the previous year. Since we also know the previous state of residence for those migrants, we can construct net migration measures for states and for age, education groups within states. The key difference from the wage regressions is that they only included full-time workers, while the net migration regressions include all adults.

those with more than a college degree remains negative, and the experience coefficient is basically zero.

*Hours Worked*

In addition to moving to a different state, changes in hours of work represent another potential response to shifts in the distribution of state and local taxes. Regressions of hours worked on the after-tax-share (equations 8 and 14 using the log of average weekly hours worked instead of wages) show little or no response among men, but a large positive response among highly-educated females (Table 9). Ignoring the interactions with education and experience, the coefficient on the ATS variable for all females is .47 and highly significant (Column 3). Including these interactions (Column 4) shows that the hours of highly-educated females are more responsive, with experience having a relatively small impact, albeit significant and with a positive sign.

An additional set of regressions including only household heads (columns 5 through 8) yield a similar outcome. The results of the hours worked equations suggest that females, particularly those with high levels of education, are also responding along the intensive margin, increasing hours in states where their after-tax-share is relatively high.[38]

**Section 8 – Conclusion/Discussion**

In general, the wages of the highest and the lowest-income workers (based on education and age groups) appear to be the least responsive to distributional tax changes, while middle-income (those with high levels of education, but little experience or low levels of education, but considerable experience) workers are the most responsive. This pattern is present in the interaction (Topel) regressions, as well as the pseudo-panel regressions, and suggests that,

[38] A similar set of labor force participation/employment regressions were also run, but the results suggested no response to the after-tax-share.

contrary to the findings of FW (and also of Leigh), pre-tax wages do not fully adjust to offset distributional changes in state and local taxes. Because the tax rates for the middle-income workers who appear to be most responsive to changes in the tax distribution are also very close to the middle of the tax distribution, it suggests there may be little pre-tax wage adjustment in practice.

At the same time, however, the handful of states that actually implement some degree of progressivity in their tax schemes are generating deadweight loss by taxing highly mobile labor – young and highly educated workers – just as high as the relatively immobile labor – older highly-educated workers and young less-educated workers. Figure 3 the state effective tax rate, relative to the state mean for several worker types. In states with regressive tax systems, such as Wyoming, young and less-educated workers have relatively high effective tax rates, while older and highly-educated workers have low effective tax rates. The reverse is true for states with progressive taxes, such as Delaware. In these states, however, not only are older highly-educated workers taxed relatively high compared to the mean, but so are young and highly educated workers. These workers face low costs of migration and their responsiveness can be expected to generate deadweight loss for these states, without impacting the after-tax wage distribution.

While the overall findings suggest that pre-tax wages do not fully adjust to offset distributional tax changes, they do not necessarily indicate that states can use their tax systems to "redistribute." Two alternative explanations include: 1) the tax changes are not actually revenue neutral and the low and high-income groups value the additional public services resulting from the distributional tax change, or; 2) land and home prices capitalize the distributional tax differences that are not reflected in wages. If high-income households value the services financed with a progressive tax (say public parks, higher education, highways, etc.) then their location decisions will only be weakly impacted, and there is ultimately little or no "redistribution" involved. Public services are at least normal goods, and some might even be considered "superior" goods, suggesting that tax rates rising with income might be appropriate.[39]

It is also possible that some cross-state differences in the distribution of taxes are incident on rents and home prices. As the ultimate immobile factor, in the long-run land would be expected to bear the burden of any cross-state tax differentials, and this paper does not suggest that this will not occur. The wage results, however, might be expected to persist for some time. Pre-tax wages of the high mobility cost groups do not change to fully offset the tax changes even when including lagged values of the after-tax-share. Cameron et al's (2007) model suggests that wage differentials can persist indefinitely in the face of large and heterogenous moving costs.

Redistribution per se only becomes possible if there exist location-specific rents that accrue with tenure and are not captured by firms, but can be captured by state governments. This might be the case if older households become increasing attached to the place where they live, shop, and socialize, but a large number of competing firms are located within reasonable commuting distance. In this case, older high-income households don't alter their location decisions because the increased tax burden they face is less than the rent they were enjoying.

[39] See Quiggin (2001); Bergstrom et. al. (1982); Gramlich and Galper (1973), and; Hewitt (1985). Demand for normal goods rises as income rises. Superior goods are a type of normal good – superior goods make up an increasing share of consumption as income rises.

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**Table 1. Rates of key state and local taxes**

| | State Income Taxes | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Top Rate | | Ave. Marginal Rate* | | Combined State and Local Sales Tax Rate** | | Residential Property Tax Rate**,*** | |
| | 1988 | 2003 | 1988 | 2003 | 1988 | 2003 | 1988 | 2003 |
| Bottom | 0.00% | 0.00% | 0.0% | 0.0% | 0.0% | 0.0% | $0.59 | $0.38 |
| 15th | 3.65% | 4.00% | 3.1% | 3.9% | 5.0% | 5.6% | $1.13 | $1.17 |
| Middle | 5.00% | 5.91% | 4.5% | 5.3% | 5.5% | 6.0% | $1.48 | $1.50 |
| 35th | 6.58% | 7.09% | 5.0% | 6.1% | 6.0% | 7.0% | $1.71 | $1.79 |
| Top | 9.50% | 9.86% | 8.6% | 8.9% | 9.0% | 9.3% | $4.10 | $3.88 |

* Average marginal rate calculated by NBER TAXSIM taking means of state marginal rate net federal deductions

** For biggest city in state

*** Per $100 of market value

**Sources: NBER Taxsim for Income Tax; DC Tax Commission Report for Sales and Property Taxes**

**Table 2. One-year Migration Rates: Destinations and Basic Demographic Characteristics**

| | 1990 to 1991 | 2004 to 2005 |
|---|---|---|
| **Move by destination** | | |
| Any change of residence | 16.4% | 13.9% |
| Same County | 10.3% | 7.9% |
| Different County, Same State | 3.2% | 2.7% |
| Different State | 2.9% | 2.6% |
| Different State & Different Region | 1.4% | 1.1% |

## Demographics of Out-of-State Movers

| | 1990 to 1991 | 2004 to 2005 |
|---|---|---|
| **Marital status** | | |
| Married, spouse present | 2.6% | 2.0% |
| Married, spouse absent | 5.4% | 4.2% |
| Separated | -- | 4.0% |
| Widowed | 1.0% | 1.3% |
| Divorced | 3.4% | 3.0% |
| Never married (includes age 1-15) | 3.3% | 3.1% |
| **Housing tenure** | | |
| In an owner-occupied unit | 1.7% | 1.5% |
| In a renter-occupied unit | 5.3% | 5.5% |
| **Age** | | |
| under 18 | 2.7% | 2.7% |
| 18-19 | 3.8% | 2.8% |
| 20-29 | 5.6% | 4.9% |
| 30-39 | 3.2% | 3.2% |
| 40-49 | 2.5% | 2.0% |
| 50-59 | 1.7% | 1.6% |
| 60-64 | 1.7% | 1.8% |
| 65-69 | 1.0% | 1.5% |
| 70+ | 1.0% | 0.9% |
| **Educational attainment (of age 25+)** | | |
| Less than 9th grade | 1.2% | 1.4% |
| Grades 9-12, no diploma | 2.1% | 2.2% |
| High school graduate | 2.3% | 2.2% |
| Some college or AA degree | 3.0% | 2.2% |
| Bachelor's degree | 4.0% | 2.8% |
| Prof. or graduate degree | 3.6% | 2.7% |

Source: Census Geographic Mobility Reports based on March CPS from 1991 and 2005.

**Table 3. Migration and income by education-age groups.**

| | Moved from another state by age group | | | | Income by age group | | | |
|---|---|---|---|---|---|---|---|---|
| | **20-29** | **30-39** | **40-49** | **50-59** | **20-29** | **30-39** | **40-49** | **50-59** |
| Dropouts | 4.4% | 2.6% | 2.0% | 1.2% | $17,985 | $30,934 | $35,307 | $31,377 |
| HS Grads | 4.5% | 2.4% | 1.6% | 1.3% | $22,547 | $38,860 | $47,671 | $47,184 |
| Some College | 5.0% | 2.8% | 2.1% | 1.6% | $27,124 | $45,089 | $55,570 | $58,018 |
| BA | 9.0% | 4.1% | 2.4% | 1.7% | $42,062 | $61,983 | $75,337 | $82,475 |
| More than College | 12.2% | 5.5% | 2.5% | 1.8% | $58,360 | $76,437 | $90,562 | $102,052 |

Source: Author's calculations using CPS data for 1988-2002.

**Table 4. "Replication" regressions**

| | 1989 "narrow" | | | | 1989 "broad" | | | | 1988 to 2002 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | male | female | male | female | male | female | male | female | male | female | male | female |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| ATS | -0.762 | -0.772 | -0.758 | -0.785 | -0.773 | -0.672 | -0.592 | -0.645 | -0.499 | -0.527 | -0.453 | -0.487 |
| | (0.273)*** | (0.293)** | (0.264)*** | (0.288)*** | (0.212)*** | (0.144)*** | (0.156)*** | (0.137)*** | (0.090)*** | (0.030)*** | (0.083)*** | (0.031)*** |
| urb | -0.053 | 0.014 | -0.056 | 0.019 | -0.038 | 0.031 | -0.020 | 0.035 | -0.006 | 0.027 | -0.006 | 0.028 |
| | (0.024)** | (0.020) | (0.022)** | (0.019) | (0.014)** | (0.017)* | (0.012) | (0.017)** | (0.005) | (0.009)*** | (0.005) | (0.009)*** |
| numu6 | 0.009 | 0.072 | 0.010 | 0.075 | 0.012 | 0.061 | 0.011 | 0.061 | 0.014 | 0.050 | 0.015 | 0.051 |
| | (0.013) | (0.014)*** | (0.013) | (0.015)*** | (0.008) | (0.013)*** | (0.008) | (0.013)*** | (0.002)*** | (0.003)*** | (0.002)*** | (0.003)*** |
| numu18 | 0.008 | -0.045 | 0.007 | -0.046 | 0.002 | -0.029 | 0.003 | -0.027 | 0.015 | -0.008 | 0.014 | -0.009 |
| | (0.008) | (0.009)*** | (0.009) | (0.010)*** | (0.005) | (0.005)*** | (0.005) | (0.005)*** | (0.001)*** | (0.001)*** | (0.001)*** | (0.001)*** |
| ed_HS | 0.234 | 0.248 | 0.249 | 0.249 | 0.224 | 0.220 | 0.189 | 0.209 | 0.206 | 0.229 | 0.211 | 0.234 |
| | (0.031)*** | (0.027)*** | (0.029)*** | (0.026)*** | (0.026)*** | (0.024)*** | (0.015)*** | (0.020)*** | (0.007)*** | (0.015)*** | (0.008)*** | (0.015)*** |
| ed_SC | 0.397 | 0.441 | 0.406 | 0.441 | 0.364 | 0.417 | 0.327 | 0.406 | 0.324 | 0.381 | 0.331 | 0.388 |
| | (0.030)*** | (0.029)*** | (0.027)*** | (0.028)*** | (0.023)*** | (0.024)*** | (0.013)*** | (0.020)*** | (0.009)*** | (0.016)*** | (0.010)*** | (0.016)*** |
| ed_BA | 0.625 | 0.657 | 0.650 | 0.667 | 0.607 | 0.621 | 0.573 | 0.609 | 0.613 | 0.666 | 0.626 | 0.678 |
| | (0.038)*** | (0.026)*** | (0.037)*** | (0.025)*** | (0.028)*** | (0.023)*** | (0.020)*** | (0.020)*** | (0.009)*** | (0.014)*** | (0.010)*** | (0.014)*** |
| ed_>BA | 0.641 | 0.730 | 0.669 | 0.742 | 0.664 | 0.754 | 0.629 | 0.742 | 0.742 | 0.832 | 0.756 | 0.846 |
| | (0.033)*** | (0.040)*** | (0.033)*** | (0.039)*** | (0.035)*** | (0.024)*** | (0.026)*** | (0.022)*** | (0.009)*** | (0.013)*** | (0.010)*** | (0.014)*** |
| exp | 0.032 | 0.026 | 0.032 | 0.027 | 0.031 | 0.026 | 0.033 | 0.026 | 0.031 | 0.025 | 0.032 | 0.026 |
| | (0.003)*** | (0.003)*** | (0.002)*** | (0.003)*** | (0.002)*** | (0.001)*** | (0.002)*** | (0.001)*** | (0.001)*** | (0.000)*** | (0.001)*** | (0.000)*** |
| exp2 | -0.000 | -0.000 | -0.001 | -0.000 | -0.001 | -0.000 | -0.001 | -0.000 | -0.001 | -0.000 | -0.001 | -0.000 |
| | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** |
| _union | 0.021 | 0.076 | 0.035 | 0.085 | 0.122 | 0.127 | 0.122 | 0.129 | 0.108 | 0.093 | 0.108 | 0.095 |
| | (0.021) | (0.026)*** | (0.021)* | (0.025)*** | (0.012)*** | (0.013)*** | (0.011)*** | (0.013)*** | (0.007)*** | (0.006)*** | (0.007)*** | (0.006)*** |
| hisp | | | | | | | -0.226 | -0.080 | -0.192 | -0.108 | -0.194 | -0.109 |
| | | | | | | | (0.013)*** | (0.026)*** | (0.016)*** | (0.013)*** | (0.016)*** | (0.013)*** |
| Constant | 1.450 | 1.200 | 1.412 | 1.189 | 1.462 | 1.224 | 1.516 | 1.238 | 0.128 | -0.159 | 0.128 | -0.158 |
| | (0.059)*** | (0.075)*** | (0.054)*** | (0.074)*** | (0.045)*** | (0.037)*** | (0.028)*** | (0.033)*** | (0.002)*** | (0.003)*** | (0.002)*** | (0.003)*** |
| Obs. | 6308 | 4806 | 6308 | 4806 | 19704 | 15307 | 19704 | 15307 | 297101 | 248711 | 297096 | 248708 |
| wage_fw? | yes | yes | | | | | | | | | | |
| taxes | I,S,P | I,S,P | I,S,P | I,S,P | I,S | I,S | I,S | I,S | I,S | I,S | I,S,P | I,S,P |
| hisp? | no | no | no | no | no | no | Y | Y | Y | Y | Y | Y |

Notes: All specifications regress the log of hourly wages for full-time (35 to 70 hours worked per week) workers on the log of the after-tax-share (ATS) using state*year fixed effects. State taxes included in the ATS are I - state income tax; S - state and local sales tax, and; P - local property tax. Marital status and race dummies not shown for space. Clustered (at state level) standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%

**Table 5. "Topel" Extensions to Baseline Wage Equations**

| | 1989 | | 1988 to 2002 | | | |
|---|---|---|---|---|---|---|
| | male | female | male | female | male | female |
| | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(6)** |
| ATS | -1.025 | -0.984 | -0.504 | -0.437 | -0.48 | -0.50 |
| | (0.316)*** | (0.259)*** | (0.161)*** | (0.072)*** | (0.159)*** | (0.05)*** |
| ATS*HS | 0.254 | -0.144 | -0.048 | -0.163 | -0.09 | -0.190 |
| | (0.231) | (0.161) | (0.079) | (0.043)*** | (0.06) | (0.03)*** |
| ATS*SC | -0.216 | -0.087 | -0.290 | -0.392 | -0.42 | -0.45 |
| | (0.221) | (0.222) | (0.101)*** | (0.059)*** | (0.07)*** | (0.04)*** |
| ATS*BA | 0.228 | 0.447 | 0.235 | -0.299 | 0.08 | -0.351 |
| | (0.336) | (0.257)* | (0.088)*** | (0.083)*** | (0.15) | (0.07)*** |
| ATS*>BA | 0.601 | -0.275 | 0.084 | -0.459 | -.08 | -0.51 |
| | (0.443) | (0.233) | (0.138) | (0.084)*** | (0.15) | (0.07)*** |
| ATS*exp | 0.016 | 0.020 | 0.004 | 0.009 | 0.005 | 0.013 |
| | (0.007)** | (0.006)*** | (0.003) | (0.002)*** | (0.003)* | (0.002)*** |
| urb | -0.020 | 0.034 | -0.006 | 0.027 | -0.006 | 0.026 |
| | (0.012) | (0.017)* | (0.005) | (0.009)*** | (0.005) | (0.009)*** |
| numu6 | 0.014 | 0.067 | 0.015 | 0.054 | 0.015 | 0.054 |
| | (0.008)* | (0.014)*** | (0.002)*** | (0.003)*** | (0.002)*** | (0.003)*** |
| numu18 | 0.001 | -0.027 | 0.014 | -0.009 | 0.015 | -0.009 |
| | (0.005) | (0.005)*** | (0.001)*** | (0.001)*** | (0.001)*** | (0.001)*** |
| HS | 0.232 | 0.193 | 0.214 | 0.251 | 0.212 | 0.253 |
| | (0.038)*** | (0.027)*** | (0.007)*** | (0.015)*** | (0.007)*** | (0.015)*** |
| SC | 0.283 | 0.396 | 0.333 | 0.409 | 0.329 | 0.409 |
| | (0.041)*** | (0.038)*** | (0.009)*** | (0.016)*** | (0.008)*** | (0.016)*** |
| BA | 0.611 | 0.705 | 0.639 | 0.693 | 0.633 | 0.685 |
| | (0.071)*** | (0.055)*** | (0.010)*** | (0.015)*** | (0.010)*** | (0.015)*** |
| >BA | 0.766 | 0.677 | 0.767 | 0.847 | 0.761 | 0.837 |
| | (0.109)*** | (0.061)*** | (0.015)*** | (0.015)*** | (0.016)*** | (0.015)*** |
| exp | 0.036 | 0.030 | 0.033 | 0.028 | 0.032 | 0.027 |
| | (0.002)*** | (0.002)*** | (0.001)*** | (0.001)*** | (0.001)*** | (0.001)*** |
| exp2 | -0.001 | -0.000 | -0.001 | -0.000 | -0.001 | -0.000 |
| | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** |
| _union | 0.122 | 0.128 | 0.108 | 0.096 | 0.108 | 0.095 |
| | (0.012)*** | (0.013)*** | (0.007)*** | (0.006)*** | (0.007)*** | (0.006)*** |
| hisp | -0.224 | -0.079 | -0.194 | -0.109 | -0.192 | -0.109 |
| | (0.013)*** | (0.026)*** | (0.016)*** | (0.014)*** | (0.016)*** | (0.014)*** |
| Constant | 1.432 | 1.161 | 0.129 | -0.162 | 0.128 | -0.163 |
| | (0.055)*** | (0.055)*** | (0.002)*** | (0.003)*** | (0.002)*** | (0.003)*** |
| Obs. | 19703 | 15307 | 297096 | 248708 | 297101 | 248711 |
| R-squared | 0.38 | 0.34 | 0.34 | 0.30 | 0.34 | 0.30 |
| years | 1988 | 1988 | 1988-02 | 1988-02 | 1988-02 | 1988-02 |
| TAX | I,S,P | I,S,P | I,S,P | I,S,P | I,S | I,S |
| hisp? | Y | Y | Y | Y | Y | Y |

Notes: All specifications regress the log of hourly wages for full-time (35 to 70 hours worked per week) workers on the the log of the after-tax-share (ATS) using state*year fixed effects and including interactions between the ATS and education and experience. State taxes included in the ATS are I - state income tax; S - state and local sales tax, and; P - local property tax. Marital status and race dummies not shown for space. Clustered (at state level) standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 6. Estimated percentage change in gross hourly wages resulting from a percentage change in after-tax-share, by experience, education and gender (1989-2003)

| | Years of Potential Experience | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Males | | | | Females | | | |
| Education | 5 | 15 | 25 | 35 | 5 | 15 | 25 | 35 |
| Dropout | -0.46 | -0.41 | -0.36 | -0.31 | -0.44 | -0.31 | -0.18 | -0.05 |
| HS Degree | -0.55 | -0.50 | -0.45 | -0.40 | -0.63 | -0.50 | -0.37 | -0.24 |
| Some College | -0.88 | -0.83 | -0.78 | -0.73 | -0.89 | -0.76 | -0.63 | -0.50 |
| BA | -0.38 | -0.33 | -0.28 | -0.23 | -0.79 | -0.66 | -0.53 | -0.40 |
| More than College | -0.54 | -0.49 | -0.44 | -0.39 | -0.95 | -0.82 | -0.69 | -0.56 |

Note: Estimates based on coefficients in Columns 3 and 4 in Table 5.

Table 7. Pseudo-panel wage restuls - by age, education, gender, state groups - [Income, Sales, and Property Taxes]

| age_education: | All age_education groups | | young & high education | | older & high education | | young & low education | | older & low education | |
|---|---|---|---|---|---|---|---|---|---|---|
| gender: | female | male | female | male | female | male | female | male | female | male |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| demn_ATS | -0.710 | -0.748 | -1.262 | -1.534 | -0.234 | -0.492 | -0.233 | -0.222 | -0.931 | -1.266 |
| | (0.115)*** | (0.148)*** | (0.596)** | (0.461)*** | (0.434) | (0.499) | (0.232) | (0.141) | (0.272)*** | (0.423)*** |
| exp | 0.030 | 0.033 | 0.047 | 0.055 | 0.026 | 0.042 | 0.009 | 0.036 | 0.037 | 0.061 |
| | (0.003)*** | (0.004)*** | (0.007)*** | (0.010)*** | (0.020) | (0.022)* | (0.013) | (0.012)*** | (0.008)*** | (0.012)*** |
| exp2 | -0.001 | -0.001 | -0.001 | -0.001 | -0.001 | -0.001 | -0.000 | -0.001 | -0.000 | -0.001 |
| | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)* | (0.000)* | (0.000) | (0.000)** | (0.000)*** | (0.000)*** |
| hisp | -0.102 | -0.188 | -0.215 | -0.027 | -0.104 | -0.027 | -0.104 | -0.182 | -0.214 | -0.318 |
| | (0.036)*** | (0.025)*** | (0.086)** | (0.099) | (0.144) | (0.103) | (0.049)** | (0.045)*** | (0.062)*** | (0.080)*** |
| union | 0.091 | 0.035 | 0.106 | -0.208 | 0.138 | -0.060 | 0.291 | 0.141 | 0.180 | 0.202 |
| | (0.018)*** | (0.020)* | (0.063)* | (0.098)** | (0.054)** | (0.055) | (0.085)*** | (0.050)*** | (0.060)*** | (0.056)*** |
| numu6 | 0.044 | -0.028 | 0.091 | -0.026 | 0.003 | -0.085 | -0.066 | -0.019 | 0.035 | -0.070 |
| | (0.018)** | (0.018) | (0.050)* | (0.073) | (0.243) | (0.100) | (0.030)** | (0.033) | (0.109) | (0.080) |
| numu18 | -0.003 | 0.026 | -0.011 | 0.050 | -0.100 | 0.020 | 0.050 | 0.034 | 0.011 | 0.023 |
| | (0.011) | (0.010)** | (0.034) | (0.054) | (0.036)*** | (0.034) | (0.033) | (0.028) | (0.036) | (0.022) |
| urb | 0.047 | 0.067 | 0.061 | -0.006 | 0.049 | 0.138 | 0.021 | -0.006 | -0.003 | 0.042 |
| | (0.021)** | (0.020)*** | (0.039) | (0.054) | (0.063) | (0.050)*** | (0.041) | (0.041) | (0.045) | (0.049) |
| Constant | 0.026 | 0.024 | 0.414 | 0.288 | 0.326 | 0.219 | -0.201 | -0.316 | -0.374 | -0.413 |
| | (0.001)*** | (0.002)*** | (0.049)*** | (0.057)*** | (0.095)*** | (0.073)*** | (0.036)*** | (0.030)*** | (0.055)*** | (0.069)*** |
| Obs. | 8909 | 10129 | 896 | 935 | 686 | 1113 | 964 | 1290 | 1022 | 1172 |
| # of cohorts | 613 | 693 | 66 | 70 | 60 | 88 | 73 | 97 | 77 | 88 |
| $R^2$ | 0.06 | 0.09 | 0.16 | 0.12 | 0.05 | 0.05 | 0.11 | 0.13 | 0.09 | 0.18 |

Notes: All specifications regress the group means of relative log hourly wages on the group means of the relative log after-tax-share (ATS) with group fixed effects. Groups are based on age, education, state, and gender for full-time workers (weekly hours between 35 and 70). The three age groups are 20 to 33; 34 to 47, and; 48 to 60. "Relative" indicates that the wage and tax variables have been demeaned at the state level prior to taking the group mean. Education is based on attainment of five levels: dropout; high school graduate; some college, but no degree, a Bachelor's degree, and; some education beyond college. Marital status and race dummies not shown for space. Cells with fewer than four observations and groups with fewer than 10 time periods were dropped. Robust standard errors (clustered at the state-level) in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%

**Table 8. Net Migration Rate Equations**

| | | | | | Household heads only | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | male | | female | | male | | female | | unmarried, childless females |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| ATS | 0.009 | 0.020 | -0.008 | -0.039 | 0.001 | -0.000 | -0.030 | -0.061 | -0.079 |
| | (0.024) | (0.029) | (0.034) | (0.045) | (0.023) | (0.029) | (0.032) | (0.049) | (0.055) |
| Hsgrad*ATS | | -0.019 | | 0.070 | | -0.026 | | 0.006 | 0.092 |
| | | (0.055) | | (0.059) | | (0.054) | | (0.066) | (0.091) |
| Somecoll*ATS | | 0.007 | | 0.076 | | -0.007 | | 0.055 | 0.133 |
| | | (0.064) | | (0.065) | | (0.063) | | (0.074) | (0.084) |
| BA*ATS | | 0.109 | | 0.116 | | 0.107 | | -0.084 | 0.115 |
| | | (0.064)* | | (0.074) | | (0.063)* | | (0.082) | (0.083) |
| Beyondcoll*ATS | | 0.076 | | 0.139 | | 0.099 | | -0.095 | 0.021 |
| | | (0.058) | | (0.068)** | | (0.057)* | | (0.071) | (0.091) |
| Exp*ATS | | -0.003 | | -0.002 | | -0.002 | | 0.003 | 0.000 |
| | | (0.001)** | | (0.001) | | (0.001)* | | (0.001)** | (0.002) |
| Hsgrad | 0.002 | -0.004 | 0.000 | 0.005 | 0.002 | -0.003 | 0.001 | 0.004 | 0.011 |
| | (0.004) | (0.008) | (0.004) | (0.007) | (0.004) | (0.008) | (0.004) | (0.007) | (0.012) |
| Somecoll | 0.004 | 0.001 | -0.001 | 0.005 | 0.004 | -0.001 | -0.001 | 0.009 | 0.015 |
| | (0.004) | (0.011) | (0.004) | (0.010) | (0.004) | (0.011) | (0.005) | (0.010) | (0.012) |
| BA | 0.006 | 0.024 | -0.005 | 0.010 | 0.006 | 0.024 | -0.011 | -0.023 | 0.004 |
| | (0.005) | (0.013)* | (0.006) | (0.014) | (0.005) | (0.013)* | (0.006)* | (0.014) | (0.014) |
| Beyondcoll | 0.006 | 0.017 | -0.011 | 0.011 | 0.007 | 0.026 | -0.007 | -0.025 | -0.002 |
| | (0.006) | (0.014) | (0.007) | (0.014) | (0.006) | (0.014)* | (0.007) | (0.014)* | (0.019) |
| exp | 0.000 | -0.001 | 0.003 | 0.003 | 0.000 | -0.000 | 0.001 | 0.002 | -0.001 |
| | (0.001) | (0.001) | (0.001)*** | (0.001)*** | (0.001) | (0.001) | (0.001)* | (0.001)*** | (0.001) |
| exp2 | -0.000 | 0.000 | -0.000 | -0.000 | -0.000 | 0.000 | -0.000 | -0.000 | 0.000 |
| | (0.000) | (0.000) | (0.000)*** | (0.000)*** | (0.000) | (0.000) | (0.000) | (0.000)* | (0.000)* |
| hisp | 0.027 | 0.027 | -0.025 | -0.026 | 0.030 | 0.031 | 0.005 | 0.004 | 0.009 |
| | (0.010)*** | (0.010)*** | (0.010)** | (0.010)** | (0.010)*** | (0.010)*** | (0.012) | (0.012) | (0.013) |
| union | 0.029 | 0.028 | 0.007 | 0.006 | 0.020 | 0.018 | -0.004 | -0.002 | -0.036 |
| | (0.016)* | (0.016)* | (0.012) | (0.012) | (0.015) | (0.015) | (0.011) | (0.011) | (0.012)*** |
| numu6 | 0.000 | -0.001 | 0.006 | 0.005 | -0.002 | -0.003 | 0.016 | 0.020 | |
| | (0.007) | (0.007) | (0.006) | (0.006) | (0.007) | (0.007) | (0.008)* | (0.009)** | |
| numu18 | -0.004 | -0.001 | 0.002 | 0.002 | -0.002 | 0.000 | -0.005 | -0.007 | |
| | (0.004) | (0.004) | (0.004) | (0.004) | (0.004) | (0.004) | (0.004) | (0.004)* | |
| urb | -0.063 | -0.062 | 0.044 | 0.044 | -0.053 | -0.053 | 0.018 | 0.017 | 0.033 |
| | (0.009)*** | (0.009)*** | (0.008)*** | (0.009)*** | (0.009)*** | (0.009)*** | (0.008)** | (0.008)** | (0.008)*** |
| Constant | -0.054 | -0.045 | -0.081 | -0.079 | -0.057 | -0.053 | -0.070 | -0.079 | 0.008 |
| | (0.027)** | (0.027)* | (0.026)*** | (0.027)*** | (0.027)** | (0.028)* | (0.034)** | (0.035)** | (0.042) |
| "Observations" | 14186 | 14186 | 14206 | 14206 | 14165 | 14165 | 14004 | 14004 | 13610 |
| R-squared | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.09 | 0.09 | 0.08 |

Note: All specifications regress the net-migration rate on the log of the after-tax-share (ATS) for age-education-state-gender groups using state*year fixed effects for the years 1988 to 2002. ATS includes income, sales, and property taxes. Age is based on four groups: 18 to 28; 29 to 39; 40 to 50, and; 51 to 61. Education is based on attainment of five levels: dropout; high school graduate; some college, but no degree, a Bachelor's degree, and; some education beyond college. Marital status and race dummies are not shown for space. Robust standard errors (clustered at the state-level) are in parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%

**Table 9. Hours Regressions**

| | | | | | family heads only | | | |
|---|---|---|---|---|---|---|---|---|
| | male | | female | | male | | female | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| ATS | 0.024 | -0.222 | 0.465 | 0.151 | 0.023 | -0.211 | 0.380 | 0.120 |
| | (0.015)* | (0.044)*** | (0.025)*** | (0.035)*** | (0.015) | (0.047)*** | (0.023)*** | (0.049)** |
| Hsgrad*ATS | | 0.180 | | 0.165 | | 0.177 | | 0.129 |
| | | (0.032)*** | | (0.024)*** | | (0.040)*** | | (0.030)*** |
| Somecoll*ATS | | -0.184 | | 0.236 | | -0.258 | | 0.342 |
| | | (0.065)*** | | (0.039)*** | | (0.070)*** | | (0.045)*** |
| BA*ATS | | 0.240 | | 0.878 | | 0.225 | | 0.991 |
| | | (0.043)*** | | (0.060)*** | | (0.046)*** | | (0.089)*** |
| Beyondcoll*ATS | | -0.032 | | 0.261 | | -0.078 | | 0.317 |
| | | (0.047) | | (0.054)*** | | (0.052) | | (0.056)*** |
| Exp*ATS | | 0.012 | | 0.006 | | 0.013 | | 0.004 |
| | | (0.002)*** | | (0.001)*** | | (0.001)*** | | (0.002)* |
| exp | 0.012 | 0.015 | 0.016 | 0.018 | 0.013 | 0.016 | 0.020 | 0.021 |
| | (0.000)*** | (0.001)*** | (0.000)*** | (0.001)*** | (0.000)*** | (0.001)*** | (0.000)*** | (0.001)*** |
| exp2 | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 |
| | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** | (0.000)*** |
| Hsgrad | 0.018 | 0.017 | 0.033 | 0.022 | 0.017 | 0.017 | 0.057 | 0.044 |
| | (0.002)*** | (0.003)*** | (0.004)*** | (0.005)*** | (0.002)*** | (0.003)*** | (0.005)*** | (0.006)*** |
| Somecoll | -0.009 | -0.006 | 0.008 | -0.002 | -0.015 | -0.010 | 0.014 | -0.005 |
| | (0.002)*** | (0.003)** | (0.005) | (0.005) | (0.003)*** | (0.003)*** | (0.005)** | (0.006) |
| BA | 0.055 | 0.065 | 0.090 | 0.106 | 0.054 | 0.065 | 0.132 | 0.137 |
| | (0.003)*** | (0.003)*** | (0.005)*** | (0.006)*** | (0.003)*** | (0.003)*** | (0.006)*** | (0.006)*** |
| Beyondcoll | 0.074 | 0.071 | 0.143 | 0.135 | 0.071 | 0.068 | 0.170 | 0.161 |
| | (0.004)*** | (0.005)*** | (0.006)*** | (0.008)*** | (0.004)*** | (0.005)*** | (0.007)*** | (0.008)*** |
| Hisp | -0.022 | -0.022 | 0.038 | 0.037 | -0.019 | -0.020 | 0.024 | 0.022 |
| | (0.004)*** | (0.004)*** | (0.006)*** | (0.006)*** | (0.004)*** | (0.004)*** | (0.006)*** | (0.006)*** |
| union | -0.007 | -0.007 | 0.085 | 0.086 | -0.005 | -0.005 | 0.056 | 0.058 |
| | (0.003)** | (0.003)** | (0.007)*** | (0.007)*** | (0.003)* | (0.003)* | (0.007)*** | (0.007)*** |
| numu6 | 0.012 | 0.014 | -0.026 | -0.023 | 0.013 | 0.015 | -0.015 | -0.012 |
| | (0.001)*** | (0.001)*** | (0.004)*** | (0.004)*** | (0.001)*** | (0.001)*** | (0.004)*** | (0.005)** |
| numu18 | 0.000 | -0.001 | -0.065 | -0.066 | -0.001 | -0.002 | -0.054 | -0.056 |
| | (0.001) | (0.001)* | (0.003)*** | (0.003)*** | (0.001) | (0.001)*** | (0.003)*** | (0.003)*** |
| urb | -0.005 | -0.006 | 0.017 | 0.018 | -0.005 | -0.006 | 0.017 | 0.017 |
| | (0.002)*** | (0.002)*** | (0.004)*** | (0.004)*** | (0.002)** | (0.002)** | (0.004)*** | (0.004)*** |
| Constant | -0.021 | -0.023 | -0.043 | -0.031 | -0.019 | -0.022 | -0.062 | -0.044 |
| | (0.002)*** | (0.002)*** | (0.004)*** | (0.004)*** | (0.002)*** | (0.003)*** | (0.005)*** | (0.005)*** |
| Obs. | 395422 | 395422 | 365731 | 365731 | 340944 | 340944 | 197296 | 197296 |
| R-squared | 0.07 | 0.07 | 0.05 | 0.05 | 0.07 | 0.07 | 0.06 | 0.07 |

Note: All specifications regress the log of average hours worked per week on the log of the after-tax-share (ATS) using state*year fixed effects for the years 1988 to 2002. ATS includes income, sales, and property taxes. Marital status and race dummies are not shown for space. Robust standard errors (clustered at the state-level) are in parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%

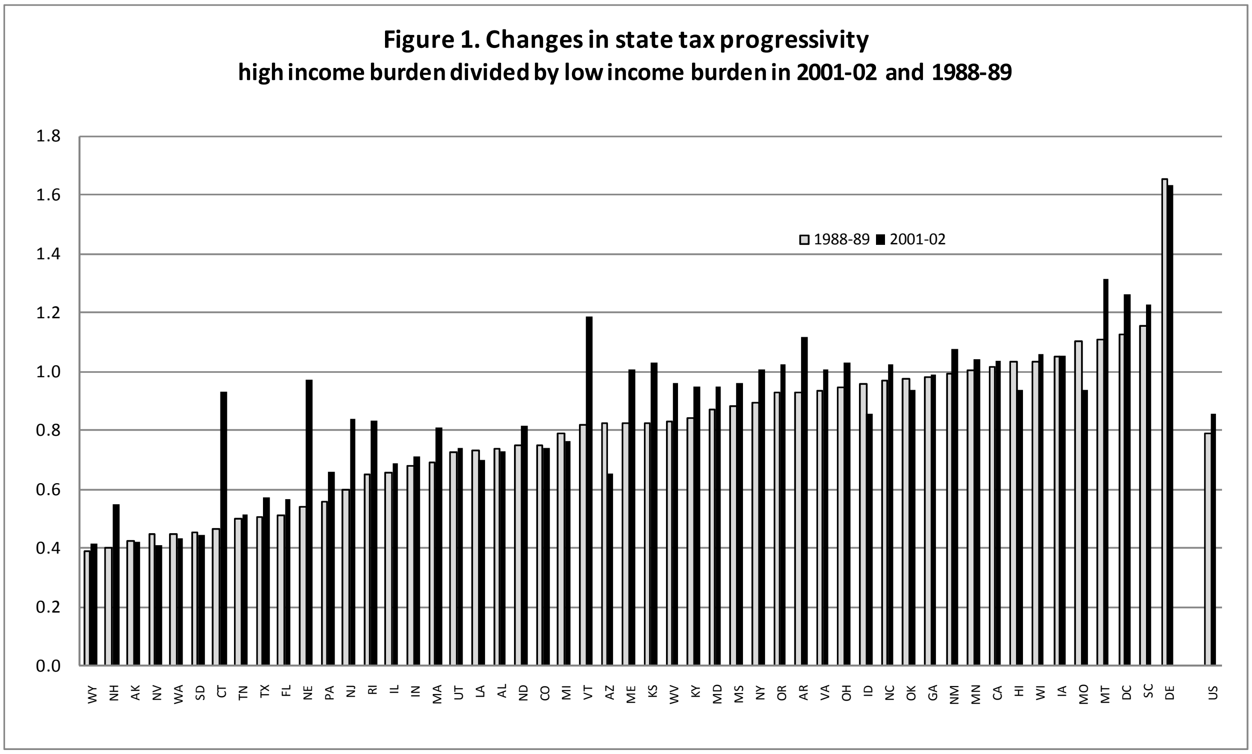


Figure 1. Changes in state tax progressivity
high income burden divided by low income burden in 2001-02 and 1988-89
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
1988-89
2001-02
WY
NH
AK
NV
WA
SD
CT
TN
TX
FL
NE
PA
NJ
RI
IL
IN
MA
UT
LA
AL
ND
CO
MI
VT
AZ
ME
KS
WV
KY
MD
MS
NY
OR
AR
VA
OH
ID
NC
OK
GA
NM
MN
CA
HI
WI
IA
MO
MT
DC
SC
DE
US

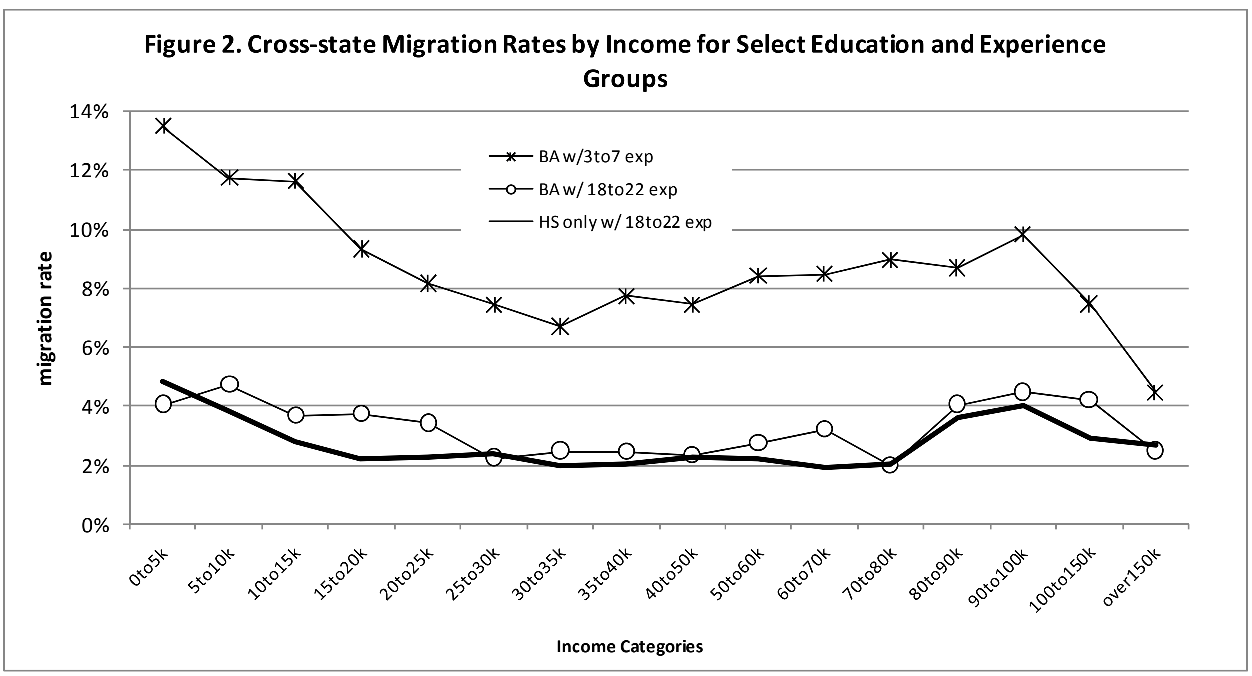
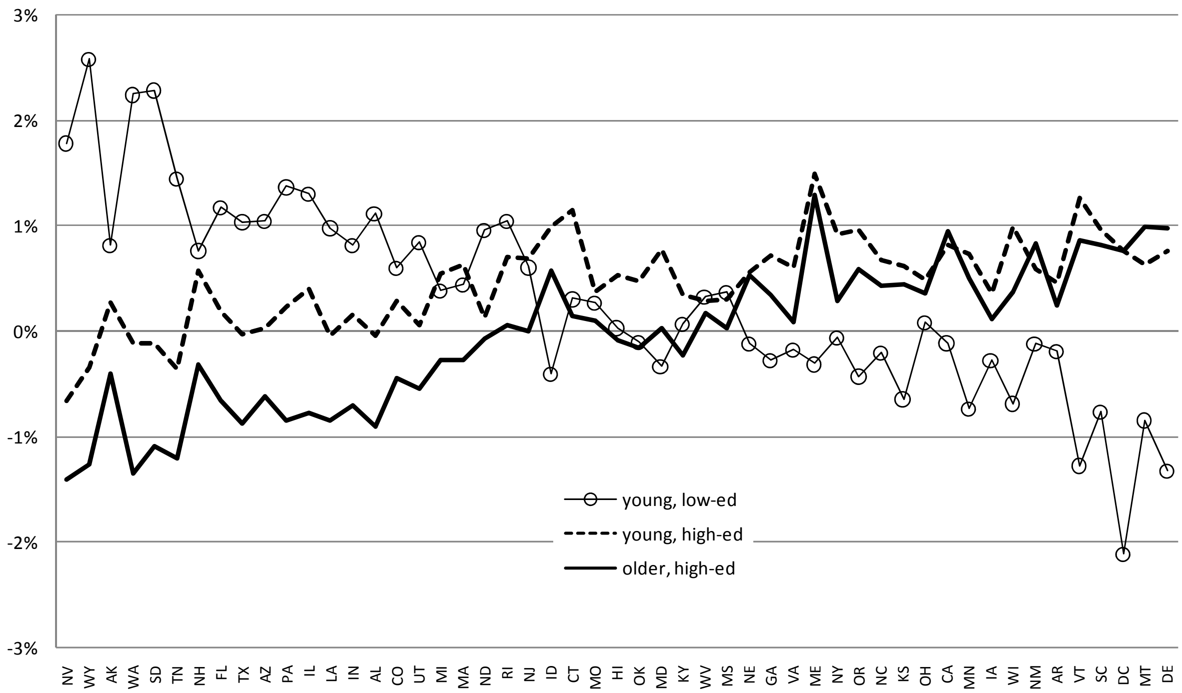


Figure 2. Cross-state Migration Rates by Income for Select Education and Experience Groups
14%
12%
10%
8%
6%
4%
2%
0%
migration rate
BA w/3to7 exp
BA w/ 18to22 exp
HS only w/ 18to22 exp
0to5k
5to10k
10to15k
15to20k
20to25k
25to30k
30to35k
35to40k
40to50k
50to60k
60to70k
70to80k
80to90k
90to100k
100to150k
over150k
Income Categories

**Figure 3. Effective State Tax Rates, Relative to State Mean, by State and Age, Education Group**



**Appendix Table 1. Demographic Profile of Full-time Workers by Age, Education**

| | Dropouts | | | | HS Grads | | | | Some College | | | | BA | | | | More than College | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **20-29** | **30-39** | **40-49** | **50-59** | **20-29** | **30-39** | **40-49** | **50-59** | **20-29** | **30-39** | **40-49** | **50-59** | **20-29** | **30-39** | **40-49** | **50-59** | **20-29** | **30-39** | **40-49** | **50-59** | **TOTAL** |
| white | 85.9% | 81.6% | 76.2% | 76.0% | 83.0% | 82.4% | 83.8% | 86.7% | 82.1% | 80.7% | 84.3% | 87.2% | 86.7% | 84.2% | 84.9% | 87.2% | 85.0% | 85.1% | 88.1% | 89.6% | 83.9% |
| black | 10.0% | 12.9% | 17.8% | 19.5% | 14.0% | 14.4% | 13.1% | 10.5% | 13.9% | 15.4% | 12.6% | 9.8% | 7.5% | 9.4% | 8.5% | 6.5% | 6.1% | 5.9% | 6.7% | 6.1% | 11.8% |
| oth_race | 4.1% | 5.5% | 6.0% | 4.5% | 3.0% | 3.2% | 3.0% | 2.8% | 4.1% | 3.8% | 3.1% | 3.1% | 5.8% | 6.4% | 6.6% | 6.4% | 8.9% | 9.1% | 5.2% | 4.3% | 4.3% |
| hisp | 33.9% | 29.5% | 21.3% | 13.9% | 8.4% | 6.0% | 4.0% | 3.2% | 6.5% | 5.1% | 3.6% | 2.9% | 2.8% | 2.9% | 2.2% | 1.8% | 2.4% | 2.4% | 1.9% | 1.6% | 6.1% |
| female | 26.9% | 33.5% | 38.8% | 36.9% | 39.8% | 40.8% | 47.1% | 49.3% | 47.9% | 45.8% | 47.0% | 47.4% | 53.1% | 43.6% | 43.1% | 41.0% | 51.4% | 41.8% | 43.4% | 40.7% | 44.0% |
| numu6 | 0.5 | 0.4 | 0.1 | 0.0 | 0.4 | 0.3 | 0.1 | 0.0 | 0.3 | 0.4 | 0.1 | 0.0 | 0.2 | 0.5 | 0.1 | 0.0 | 0.2 | 0.6 | 0.2 | 0.0 | 0.2 |
| numu18 | 0.8 | 1.4 | 0.8 | 0.2 | 0.6 | 1.2 | 0.7 | 0.1 | 0.4 | 1.2 | 0.8 | 0.2 | 0.2 | 1.0 | 1.0 | 0.3 | 0.2 | 1.0 | 1.1 | 0.3 | 0.7 |
| nevmar | 48.8% | 19.5% | 10.6% | 6.2% | 53.0% | 19.3% | 9.0% | 4.7% | 57.4% | 20.4% | 9.3% | 5.0% | 59.7% | 24.4% | 11.2% | 6.2% | 50.8% | 23.4% | 12.1% | 8.1% | 23.3% |
| widowed | 0.2% | 0.7% | 2.0% | 6.1% | 0.1% | 0.5% | 1.5% | 4.6% | 0.1% | 0.4% | 1.3% | 3.9% | 0.0% | 0.3% | 0.8% | 2.4% | 0.1% | 0.3% | 0.8% | 2.1% | 1.2% |
| divsep | 7.6% | 16.5% | 19.2% | 17.6% | 7.8% | 17.2% | 20.1% | 17.8% | 6.2% | 16.6% | 21.4% | 20.9% | 2.7% | 9.4% | 15.0% | 15.6% | 2.2% | 6.9% | 12.5% | 13.7% | 14.1% |
| married | 43.4% | 63.3% | 68.3% | 70.2% | 39.1% | 63.1% | 69.4% | 72.8% | 36.3% | 62.6% | 68.1% | 70.2% | 37.6% | 65.9% | 73.0% | 75.7% | 46.9% | 69.4% | 74.6% | 76.1% | 61.4% |
| urb | 31.3% | 28.5% | 27.1% | 24.0% | 22.2% | 20.6% | 19.2% | 18.9% | 26.2% | 24.0% | 21.3% | 20.8% | 30.5% | 25.3% | 22.4% | 20.7% | 34.7% | 29.7% | 23.7% | 22.4% | 23.3% |
| suburb | 34.0% | 34.2% | 32.8% | 32.6% | 38.0% | 39.3% | 40.5% | 42.0% | 41.6% | 43.7% | 45.1% | 45.9% | 45.6% | 49.8% | 49.2% | 52.2% | 43.3% | 47.5% | 48.7% | 49.7% | 42.9% |
| homeown | 36.4% | 49.3% | 62.2% | 73.3% | 52.1% | 67.2% | 77.9% | 84.5% | 52.8% | 68.7% | 79.4% | 84.7% | 48.6% | 72.9% | 83.9% | 88.6% | 47.6% | 71.8% | 86.7% | 88.7% | 69.7% |
| stayer | 59.6% | 75.2% | 84.7% | 90.6% | 66.4% | 81.1% | 88.8% | 92.6% | 65.2% | 80.6% | 87.8% | 91.9% | 59.4% | 79.3% | 88.5% | 91.9% | 58.7% | 77.9% | 88.5% | 92.7% | 80.5% |
| mov_stat | 4.4% | 2.6% | 2.0% | 1.2% | 4.5% | 2.4% | 1.6% | 1.3% | 5.0% | 2.8% | 2.1% | 1.6% | 9.0% | 4.1% | 2.4% | 1.7% | 12.2% | 5.5% | 2.5% | 1.8% | 3.2% |
| _union | 5.4% | 8.6% | 12.8% | 18.0% | 8.3% | 13.7% | 17.1% | 17.8% | 7.3% | 12.5% | 15.7% | 16.0% | 8.7% | 10.8% | 15.1% | 16.5% | 12.3% | 15.0% | 23.3% | 26.4% | 13.6% |
| ATS | 6.9% | 12.0% | 15.1% | 15.4% | 12.1% | 15.9% | 18.7% | 19.4% | 14.8% | 17.5% | 20.2% | 21.2% | 20.6% | 22.2% | 23.8% | 25.2% | 24.1% | 25.1% | 26.4% | 27.8% | 18.7% |
| income | 17,985 | 30,934 | 35,307 | 31,377 | 22,547 | 38,860 | 47,671 | 47,184 | 27,124 | 45,089 | 55,570 | 58,018 | 42,062 | 61,983 | 75,337 | 82,475 | 58,360 | 76,437 | 90,562 | 102,052 | 49,064 |
| wage_inc | 15,022 | 18,931 | 20,835 | 22,128 | 18,692 | 25,400 | 28,657 | 29,060 | 20,838 | 30,852 | 35,659 | 37,412 | 29,201 | 44,051 | 50,020 | 52,254 | 35,309 | 53,595 | 60,048 | 64,918 | 32,713 |
| wage | $7.84 | $9.06 | $9.74 | $10.07 | $9.24 | $11.63 | $12.79 | $13.02 | $10.28 | $13.67 | $15.36 | $16.11 | $14.29 | $19.04 | $21.01 | $21.93 | $16.88 | $21.89 | $23.98 | $25.28 | $14.44 |

Note: includes all years (1988-2002)

Appendix Table 2. Pseudo-panel wage results - by age, modified-education, gender, and state groups [Income, Sales, and Property Taxes]

| age_education | All age_education groups | | young & high education | | older & high education | | young & low education | | older & low education | |
|---|---|---|---|---|---|---|---|---|---|---|
| gender | female | male | female | male | female | male | female | male | female | male |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| demn_ATS | -0.996 | -0.783 | -2.353 | -1.201 | -0.392 | -0.104 | -0.374 | -0.004 | -0.863 | -2.016 |
| | (0.128)*** | (0.192)*** | (0.473)*** | (0.444)*** | (0.426) | (0.577) | (0.198)* | (0.215) | (0.332)** | (0.634)*** |
| exp | 0.036 | 0.036 | 0.035 | 0.037 | 0.008 | 0.048 | 0.026 | 0.023 | 0.034 | 0.046 |
| | (0.003)*** | (0.004)*** | (0.009)*** | (0.010)*** | (0.016) | (0.019)** | (0.010)** | (0.007)*** | (0.008)*** | (0.013)*** |
| exp2 | -0.001 | -0.001 | -0.000 | -0.001 | -0.000 | -0.001 | -0.000 | -0.001 | -0.000 | -0.001 |
| | (0.000)*** | (0.000)*** | (0.000)* | (0.000)*** | (0.000) | (0.000)** | (0.000) | (0.000)*** | (0.000)*** | (0.000)*** |
| hisp | -0.142 | -0.231 | -0.191 | -0.185 | -0.328 | -0.050 | -0.184 | -0.299 | -0.281 | -0.474 |
| | (0.038)*** | (0.039)*** | (0.086)** | (0.125) | (0.181)* | (0.129) | (0.072)** | (0.053)*** | (0.067)*** | (0.092)*** |
| union | 0.111 | 0.059 | 0.103 | -0.171 | 0.156 | -0.058 | 0.156 | 0.163 | 0.142 | 0.147 |
| | (0.022)*** | (0.019)*** | (0.061)* | (0.100)* | (0.052)*** | (0.062) | (0.115) | (0.064)** | (0.060)** | (0.063)** |
| numu6 | 0.043 | -0.038 | 0.035 | 0.008 | 0.166 | 0.022 | -0.005 | 0.001 | 0.054 | -0.030 |
| | (0.018)** | (0.019)* | (0.053) | (0.075) | (0.183) | (0.107) | (0.033) | (0.059) | (0.121) | (0.081) |
| numu18 | -0.003 | 0.030 | 0.036 | 0.057 | -0.032 | 0.021 | -0.018 | 0.047 | 0.005 | 0.018 |
| | (0.009) | (0.014)** | (0.045) | (0.053) | (0.033) | (0.034) | (0.025) | (0.037) | (0.032) | (0.029) |
| urb | 0.072 | 0.051 | 0.006 | 0.004 | 0.050 | 0.166 | 0.033 | -0.055 | 0.135 | 0.084 |
| | (0.031)** | (0.024)** | (0.054) | (0.061) | (0.066) | (0.069)** | (0.048) | (0.063) | (0.066)** | (0.051) |
| demn_divsep | -0.013 | -0.088 | 0.073 | 0.203 | -0.057 | -0.008 | 0.041 | -0.028 | -0.066 | -0.107 |
| | (0.019) | (0.036)** | (0.083) | (0.083)** | (0.055) | (0.112) | (0.055) | (0.088) | (0.051) | (0.072) |
| Obs. | 6752 | 6822 | 764 | 762 | 685 | 758 | 765 | 765 | 765 | 765 |
| # of groups | 456 | 457 | 51 | 51 | 49 | 51 | 51 | 51 | 51 | 51 |
| $R^2$ | 0.10 | 0.11 | 0.13 | 0.12 | 0.05 | 0.08 | 0.24 | 0.20 | 0.12 | 0.22 |

Notes: All specifications regress the group means of relative log hourly wages on the group means of the relative log after-tax-share (ATS) with group fixed effects. Groups are based on age, education, state, and gender for full-time workers (weekly hours between 35 and 70). The three age groups are 20 to 33; 34 to 47, and; 48 to 60. "Relative" indicates that the wage and tax variables have been demeaned at the state level prior to taking the group mean. Education is based on attainment of three levels: high school graduate or less; some college, but no degree, and; Bachelor's degree or higher. Marital status and race dummies not shown for space. Cells with fewer than four observations and groups with fewer than 10 time periods were dropped. Robust standard errors (clustered at the state-level) in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%

**Appendix Table 3. Pseudo-panel wage results - by age, modified-education, state groups (Income, Property, and Sales Taxes)**

| age-education | All | Young - high education | Older - high education | Young - low education | Older - low education |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| ATS | -0.811 | -1.621 | 0.153 | -0.111 | -0.918 |
| | (0.153)*** | (0.411)*** | (0.447) | (0.213) | (0.413)** |
| exp | 0.038 | 0.032 | 0.021 | 0.026 | 0.055 |
| | (0.004)*** | (0.009)*** | (0.015) | (0.011)** | (0.011)*** |
| exp2 | -0.001 | -0.001 | -0.000 | -0.000 | -0.001 |
| | (0.000)*** | (0.000)** | (0.000) | (0.000)* | (0.000)*** |
| hisp | -0.194 | -0.181 | -0.074 | -0.317 | -0.357 |
| | (0.042)*** | (0.084)** | (0.161) | (0.055)*** | (0.076)*** |
| female | -0.243 | -0.131 | -0.357 | -0.129 | -0.336 |
| | (0.020)*** | (0.039)*** | (0.057)*** | (0.049)** | (0.037)*** |
| union | 0.058 | 0.057 | -0.004 | 0.180 | 0.163 |
| | (0.020)*** | (0.060) | (0.071) | (0.078)** | (0.059)*** |
| numu6 | 0.000 | 0.081 | 0.006 | 0.052 | -0.066 |
| | (0.021) | (0.046)* | (0.132) | (0.050) | (0.075) |
| numu18 | 0.017 | 0.012 | -0.030 | -0.003 | 0.008 |
| | (0.011) | (0.030) | (0.034) | (0.034) | (0.029) |
| urb | 0.068 | 0.017 | 0.111 | 0.022 | 0.039 |
| | (0.027)** | (0.047) | (0.062)* | (0.048) | (0.059) |
| Constant | 0.143 | 0.341 | 0.512 | -0.150 | -0.167 |
| | (0.010)*** | (0.047)*** | (0.091)*** | (0.047)*** | (0.036)*** |
| Obs. | 6882 | 765 | 764 | 765 | 765 |
| # of Groups | 459 | 51 | 51 | 51 | 51 |
| $R^2$ | 0.17 | 0.15 | 0.12 | 0.26 | 0.29 |

Notes: All specifications regress group means of relative log hourly wages on group means of the relative log after-tax-share (ATS) with group fixed effects. Groups are based on age, education, and state for full-time workers (weekly hours between 35 and 70). The three age groups are 20 to 33; 34 to 47, and; 48 to 60. "Relative" indicates that the wage and tax variables have been demeaned at the state level prior to taking the group mean. Education is based on attainment of three levels: dropout or high school graduate; some college, but no degree, and; Bachelor's degree or some education beyond college. Marital status and race dummies not shown for space. Cells with fewer than four observations and groups with fewer than 10 time periods were dropped. Robust standard errors (clustered at the state-level) in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%