THE EFFECT OF STATE TAXES ON INTERSTATE MIGRATION

A study of how state income taxes affects migration of individuals and how this effect differs among people of different socio-economic levels.

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MMSS Senior Thesis
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1 INTRODUCTION

Every year, people throughout the United States make the decision to migrate from one state to another. Often, these decisions are influenced by factors such as job opportunities, family, climate, lifestyle, and affordability. A key determinant about where people live is the cost of living, and one large component of this cost is the taxes that people pay. This has led to a lot of research into how taxes affect migration with many varying conclusions. In 2016, the Internal Revenue Service, which collects data on state-to-state migration, found that 2.8% of American households moved from one state to another. Additional analysis of this data by the Cato Institute found which states have the highest and lowest net migration. They found that the regions with the highest net migration were the West and Southeast, while the regions with the lowest net migration were the Midwest and Northeast.\footnote{Net Migration in this context refers to the difference between the amount of people that move to State A and the amount of people that move out of State A. The lowest net migration will be a negative number.} In 2016, Oregon, Florida, and Washington top the list of the states with the highest net in-migration, while New York, Illinois, and Connecticut make up the states with the highest net out-migration. The net migration ratio for all states in 2016 can be found on the map in Figure 1 of the Appendix.

Attracting population is a key goal shared by all states in the US as more population equates to more wealth within the state. States attempt to achieve this goal by creating policies and an environment which encourages current residents to stay and new residents to come. State taxes is one such policy that is used to accomplish this goal. However, it is challenging to realize actual migration effects that occur because of changes in tax policy as well as how a change in taxes will affect budgets, as taxes typically differ across income levels. It is this problem that inspired this study; the importance for states to understand how tax policies will affect interstate...
migration at all income levels. With this information, states will be able to predict how changes in taxes will affect migration with increased accuracy, thus creating tax policies that are increasingly efficient.

This paper seeks to answer two key questions. First, how do state income taxes affect interstate migration throughout the United States. Second, how do state income taxes affect interstate migration for people of different income levels and how do these effects differ from one another. Considering conventional wisdom\(^2\) on this topic, I hypothesized that taxes will have a negative effect on migration, such that higher taxes will be correlated with lower net migration. Additionally, I hypothesized that taxes will have a greater effect on the migration of individuals with higher income.

After analyzing my preliminary results, I find that the conventional wisdom does not hold, state income taxes do not drive lower net migration, rather higher state income taxes drive higher net migration. However, I also find that having no state income tax greatly increases net migration. This study contributes to the existing knowledge on this topic by exploring a new dataset and how migration responds to taxes at different income levels. The results of this paper in turn differ from the results of other studies noted in the next section.

\(^2\) Conventional wisdom on this topic assumes that higher taxes do drive out-migration from a state.
2 LITERATURE REVIEW

This section provides an overview on existing literature relating to the topics of interstate migration and how taxes affect this migration. Additionally, I will describe how my research fits in among existing research.

2.1 Existing Research on Trends of Interstate Migration

Since the purpose of this paper is to examine the relationship between taxes and interstate migration, it is relevant to analyze the existing literature concerning the trends of interstate migration leading up to the time period of my sample.

Malloy, et al. (2011) finds that from 1980 through 2010, internal migration within the United States has fallen greatly, reversing trends from earlier in the 20th Century. They find that this decline has been similarly widespread across demographic and socioeconomic groups and that the economic recession and fall of the housing market had limited roles in the declining migration. This paper finds that additional research needs to be done to determine the cause of the fall in migration. Malloy et al. outlines specific migration statistics within the U.S., finding that between 5 and 6 percent of the population move across a county boundary, with 2.8 percent of the population moving across state lines. They find that adults are more likely to migrate the younger they are and the more education they have achieved. Malloy et al. cites three main sources for constructing U.S. migration rates: the U.S. Census, which collects data every ten years and recently started collecting annual data in the American Community Survey (ACS); the

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3 The breakdown of population movement found by Malloy, et al. is as follows: roughly 1.5% of the population moves between two of the four Census regions (Northeast, Midwest, South, and West); 1.3% move to a different state in the same region; and 3% move across counties within the same state.
Annual Social and Economic Supplement of the Current Population Survey; and the Internal Revenue Service (IRS), the last of which I use in this study. Malloy et al. also examines the determinants of internal migration, as studied by other academic papers. A few of many factors used in migration models include employment probabilities, expected wages, expected costs of living, local amenities and tax rates.

Kaplan and Schulhofer-Wohl (2012) continue where Malloy et al. left off, stating that the decrease in migration from 1980 through 2010 is substantially less than originally thought. They report that the decrease in interstate migration is accounted for by a statistical error, finding that the Census Bureau enacted an undocumented change to their procedure for dealing with missing data in 2006, which in turn corrected the procedure and reduced the estimated migration rate.  

The procedural change explains 90 percent of the reported decrease in interstate migration between 2005 and 2006, and 42 percent of the decrease between 2000 and 2010. After the effect of the change is removed, the annual interstate migration rate follows a constant downward trend since 1996. Kaplan and Schulhofer-Wohl analyze why migration rates in the U.S. fell between 1991 and 2011 after accounting for the effect of the procedure for missing data. They argue that the fall in migration is due to job opportunities are more similar across locations and that internet and air travel have made it easier to learn about new locations. Both of these contribute to possible migrants deciding that moving will grant small, if any, returns to overall utility. Kaplan and Schulhofer-Wohl developed a model to formalize the geographic-specificity of jobs and information mechanisms, which in turn explain at least one-third of the decline in gross interstate migration since 1991.  

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4 Before 2006, the Census Bureau’s procedure for dealing with missing data inflated the estimated interstate migration rate.
5 A calibrated version of the model shows that this effect is consistent with cross-sectional and time-series patterns of migration, occupations, and incomes.
It is important to note that my paper focuses on how taxes affect interstate migration in the U.S., not how interstate migration has changed over time. As such, the studies by Malloy et al. and Kaplan et al. provide a basic history of interstate migration in the U.S. over the past 30 years that provides context for migration in the U.S. leading up to the time period sampled in this study. The measurement error identified by Kaplan and Schulhofer-Wohl does not affect my analysis, as the data used in my analysis is post-correction, and thus does not overstate the migration as done before 2006. Thus, I did not need to account for this bias in my analysis. More relevant to my analysis is the drivers for migration laid out by Malloy et al., which identify some of the many drivers of why people migrate, including taxes, which is the focus of this paper. However, these drivers could be distorted by the statistical error identified by Kaplan and Schulhofer-Wohl and may not be entirely reliable.

2.2 Existing Research on Taxes and Interstate Migration

As tax policies are some of the most debated topics in state politics and have led to many state politicians focusing their platforms around such policies, many studies have tried to determine how taxes affect interstate migration in order to better understand the benefits and costs of certain tax policies. However, each study comes to a different conclusion based on how they constructed their model.

Sally Wallace (2002) looks at how state income tax and tax treatments affect the location decision of individuals.\(^6\) She uses a basic investment model of migration to investigate if and

\(^6\) Tax treatments include allowances, credits and caps for certain groups. She specifically cites tax reductions for the elderly in Georgia, which qualifies as a tax treatment.
how taxes play a role in the migration decision. In her model, she specifically looks at the probabilities of people moving between the four census regions\(^7\) and how taxes affect that probability. Wallace finds that if taxes are capitalized into wage differentials\(^8\), taxes do not appear to be significant in migration decisions. She comes to this conclusion by using imputed expected wages to calculate effective state income tax rates. Her conclusion would explain why state income taxes may not explain migration in previous papers. The conclusion by Wallace could answer the questions that I raise, however, she reaches this conclusion without income level specific data. Since the IRS only started collecting income level specific data in 2011, I am answering these questions again to update her analysis with more specific data that can better account for income differentials.

Chris Edwards (2018) analyzes how state income taxes affect interstate migration, especially after the Tax Cuts and Jobs Act of 2017 increased the amount individuals would pay in state income taxes.\(^9\) Edwards hypothesizes that this change will prompt an outflow of higher-earning households from higher-tax states to lower-tax states. Using IRS migration data, he analyzes migration flows between states in 2016 and finds almost 600,000 people with an aggregate income of $33 billion moved, on net, from the 25 highest-tax states to the 25 lowest-tax states. In Figure 1 in the Appendix, Edwards maps out the migration ratio\(^10\) for each state in 2016. By comparing this ratio to state and local taxes as a percentage of personal income, Edwards finds a clear negative relationship between tax levels and migration.\(^11\) Edwards and Wallace seem to come to different results. This occurs because Edwards uses more modern data

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\(^7\) These regions are found in Table 2 of the Appendix.
\(^8\) This refers to accounting for different wages across states in her analysis of taxes.
\(^9\) The Tax Cuts and Jobs Act of 2017 imposed a $10,000 cap per return on the state and local tax (SALT) deduction, which increases the amount of taxes some households in the U.S. would pay.
\(^10\) The ratio of in-migration to outmigration.
\(^11\) This relationship can be seen in Figure 2 in the Appendix.
and does not account for states with no income tax, which is something that Wallace does. Because of this, I use a dummy variable to account for states with no income tax, similar to Wallace, to avoid the possibility of an overstated effect of taxes.

Lai et al. (2011) looks at the effects of tax policy on interstate migration in the U.S. using IRS migration data from 1992 to 2008. Lai et al. conducted this study for the New Jersey Department of the Treasury in order to measure how the 2004 New Jersey “millionaires’ tax” affected migration out of the state and to estimate the state’s cumulative financial losses from the tax. They measured this effect by using two models, an ordinary least squares and a logit model. These models can be found in Figure 3 of the Appendix. Using these models, their results indicated that marginal tax increases have small but significant effects on net out-migration from a state. Since a focus of the study was to determine the effect of the “millionaires’ tax”, the authors focused on members of the highest income levels. From this study, they found that the effect of the tax increase led to roughly 20,000 taxpayers and $2.5 billion in income leaving New Jersey. In the conclusion, the authors mention limitations to the IRS data. Specifically, Lai states “Since migration flows are aggregated, it is impossible to determine how different groups of taxpayers react to tax policy.” This limitation that the authors find is erased in my paper as I am using the new IRS data that has migration flows broken up by income level, allowing me to determine how different groups of taxpayers react to tax policy.

This paper contributes to the existing literature by calculating the direct effect of state tax policy, especially at different income levels, on interstate migration. To the best of my knowledge, this is the first attempt to study the income tax effects on different income levels using IRS migration data since the IRS started recording the income levels of the migrants.12

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12 The IRS began collecting this data starting in 2011 and has data up until 2016, which is the 5-year sample of this paper.
Considering that this data is relatively new, this is a unique opportunity to look at how income
taxes specific to certain income groups affects the migration of those groups. This paper also
differs from other studies in its use of U.S. JOLTS data in order to measure the climate of a
state’s economy. All this combined, the goal of this paper is to contribute to the knowledge of
how taxes affect the migration of different tax payers.
3 DATA AND METHODOLOGY

This paper focuses on migration within the United States and how taxes affect this migration, especially for those of different income levels. Specifically, the paper analyzes the migration of peoples in and out of all 50 states over a 5-year time period from 2011 to 2016. The migration data is split among 7 income levels for each state, each recording the amount of people from that income level who migrate to and from the state. These income levels can be found in Table 1 of the Appendix. This timeframe was chosen because starting in 2011, the Internal Revenue Service (IRS), which provided the migration data for this paper, changed their data collection methodology to include additional information on those who migrate between states. Specifically, the IRS began recording the income levels of those migrating between states. The IRS collects and publishes migration data each year by flagging the tax returns of tax payers who reported a state of residence that was different than the year before. From this, the IRS records the amount of people who move out from each state and who move in to each state. These data sets are published for public knowledge each year; the most recently published year being 2016. Since the IRS migration data comes from tax filings, those who do not file taxes will be underrepresented in the analysis. However, Malloy et al. (2011) found that the IRS migration data does not have significant differences from other contemporaneous migration data sets, such as the Current Population Survey data. The omission of non-filers from this data set will mostly affect the smallest of the 7 income levels, as non-filers are typically comprised of the poor and college students.
This IRS data was compiled into one dataset, such that each data point has an associated year, state and income level.\textsuperscript{13} In this dataset, both in-migration and out-migration are measured. However, the statistic used in the analysis is the ratio\textsuperscript{14} of in-migration to out-migration. The other option for measuring migration, while accounting for population differences between states, was to use net migration\textsuperscript{15} as a percentage of total state population. Net migration as a percentage of total population ended up as the worse statistic because its values were too low to produce a meaningful effect, thus the ratio was chosen to better understand the analysis.

Data on states’ income tax rates for each income level was collected from the Tax Foundation, a non-profit organization that collects and compiles tax policies from all 50 states. Income tax data was matched with migration data as they both changed with income level, state, and year. Tax policies across states often differ, as such, the tax brackets for each state did not always match the income level for each bracket. Thus, the marginal tax associated with the highest tax bracket within each income level was chosen to be matched to the migration statistic. For example, if a state in a certain year has two tax brackets in an income level, the marginal tax rate for the higher tax bracket would be the tax rate included in the data for that income level.\textsuperscript{16} This may lead to a small bias of the income tax effect to have a stronger magnitude, as some of the tax rates applied to the highest income level were intended as “millionaire taxes”.

States’ sales tax data for each year was also collected from the Tax Foundation, which accounts for and measure the sales tax rate each state levies as well as the average local sales

\textsuperscript{13} The dataset used for this paper was created by merging data from many different sources. The migration data is measured across 5 years, 7 income brackets, and 50 states, totaling 1750 lines of total data to use for the analysis.

\textsuperscript{14} The migration ratio is calculated as follows: \[
\frac{\text{# of people who migrate into a state}}{\text{# of people who migrate out of a state}}
\]

\textsuperscript{15} Net migration refers to the difference between in-migration and out-migration.

\textsuperscript{16} E.g. for tax brackets “$200,000 - $300,000” and “More than $300,000”, both obviously in the income level “$200,000 or more”, the marginal tax rate for “More than $300,000” would be used as the income tax rate for the income level “$200,000 or more” for that state and year.
These two statistics were then added to create the combined sales tax rate, which is used to measure how sales tax affects interstate migration in this paper. Sales tax is only measured across state and year and thus is a slightly weaker determinant for migration in this paper.

To account for other factors in the migration decisions of individuals, this paper also looks at climate and employment data. For climate data, I look at annual temperature and precipitation rates over the 5-year period for each state. This data was collected from the National Centers for Environmental Information run by the National Oceanic and Atmospheric Administration (NOAA). Climate data of 49 of the 50 states was readily available on the NOAA website, with Hawaii being excluded for having a different data collection process. The temperature and precipitation data for Hawaii was accessible, however it did not provide averages for all of Hawaii but instead averages for each island. Thus, this paper used the annual temperature and precipitation data from only the main island. Therefore, the climate data for Hawaii does not contain true average for the whole state but rather just for the main island. However, this should not have a large effect on the analysis. Similar to sales taxes, climate data is only measured across state and year and thus is a slightly weaker variable in this paper.

The United States Bureau of Labor Statistics (BLS) supplied the employment data, with this paper looking at the unemployment rate for each state and year and the Jobs and Labor Turnover Survey (JOLTS) data for each region and year. The unemployment rate has multiple definitions and so the definition this paper uses, as supplied by the BLS, is U-3, which defines the unemployment rate as the total number of unemployed people as a percentage of the civilian labor force. The JOLTS data used in this paper specifically looks at the rate of job

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17 The average local sales tax takes the average of the sales tax rates from all municipalities within each state.
18 The BLS JOLTS program produces data on job openings, hires, and separations.
19 The BLS collects JOLTS data by region instead of by state because the sample is too small to support data for each state. These regions and the states within them are documented in Table 2.
openings as a percentage of total jobs, occupied or unoccupied. This data is seasonally adjusted and is published for each year and by each region. These regions can be found in Table 2 of the Appendix. Another variable was generated using the unemployment rate and JOLTS rate, this statistic is the market tightness.\textsuperscript{20} Market tightness in this study is calculated by dividing the JOLTS rate by the unemployment rate. I use rates instead of actual figures (which is how market tightness is typically calculated as defined in Footnote 19) since each state’s JOLTS data applies to a whole region, thus overstating the total jobs if actual figures were used. This statistic was included in the paper to give a better indication of the strength of the economy. However, it is also currently a weak statistic because the U.S. does not publish JOLTS data at the state level, thus the only differentiator for market tightness between states is the states’ unemployment rate. In the future, this statistic will be more important as the BLS improves the JOLTS program and publishes results at the state level.

Overall, this dataset was created for this paper to provide the means for a cross-sectional analysis of the data. Specifically allowing for a unique look at how taxes are associated with the income levels from each state and how they affect the migration of those groups.

\textsuperscript{20} Market tightness is a statistic that signals how tight an area’s economy is; in other words, comparing the total jobs in the economy, filled or unfilled, with the number of unemployed peoples.
4 REGRESSION

Two sets of regressions were used to analyze the effect of state income taxes on migration. The first set of regressions (1.1 – 1.3) used the entire dataset created for this paper with the intent of analyzing how taxes, as well as other variables, affect migration throughout all of the U.S. and people of all income levels. This set of regressions changed the variables analyzed in each regression in order to see how the effect of taxes changes when other drivers of migration are accounted for. This set used ordinary least squares regressions to analyze the data. Each of the specific regressions can be seen below.

\[ Y_{n,i,t} = \beta_1 * Taxr_{n,i,t} + \beta_2 * Staxr_{n,t} + \alpha \]

(1.1)

\[ Y_{n,i,t} = \beta_1 * Taxr_{n,i,t} + \beta_2 * Staxr_{n,t} + \beta_3 * Temp_{n,t} + \beta_4 * Precip_{n,t} + \beta_5 * Unemp_{n,t} + \beta_6 * Mtight_{n,t} + \alpha \]

(1.2)

\[ Y_{n,i,t} = \beta_1 * Taxr_{n,i,t} + \beta_2 * Staxr_{n,t} + \beta_3 * Temp_{n,t} + \beta_4 * Precip_{n,t} + \beta_5 * Unemp_{n,t} + \beta_6 * Mtight_{n,t} + \partial * Notax_{n,t} + \alpha \]

(1.3)

Where:

- \( Y_{n,i,t} \) represents the migration ratio for a given state \( n \), income level \( i \), and year \( t \);
- \( Taxr_{n,i,t} \) represents the income tax rate for a given state \( n \), income level \( i \), and year \( t \);
- \( Staxr_{n,t} \) represents the sales tax rate for a given state \( n \) and year \( t \);
- \( Temp_{n,t} \) represents the average temperature (°F) for a given state \( n \) and year \( t \);
- \( Precip_{n,t} \) represents the average precipitation (inches) for a given state \( n \) and year \( t \);
- \( Unemp_{n,t} \) represents the unemployment rate for a given state \( n \) and year \( t \);
- \( Mtight_{n,t} \) represents the market tightness for a given state \( n \) and year \( t \);
Notax_{n,t} is a dummy variable set equal to 1 if a state has no income tax in state n and year t, 0 otherwise.

From my initial evaluation of my dataset, I expect these regressions to show a low magnitude, negative and significant effect of state income taxes on the migration ratio. As other variables are added to the regression, I hypothesize that this magnitude will decrease but remain significant.

The sales tax variable was included in these regressions in order to observe how other taxes within the state may affect migration and change the income tax effect. The sales tax variable also adds another determinant that affects the cost of living in each state. I expect it to have a similar effect to the income tax effect, as both sales and income taxes in a state contribute to the cost of living.

The temperature and precipitation variables were included in these regressions in order to account for the driver of climate in an individual’s migration decision. As some of the states with the highest migration ratio are in warmer climates, I found it important to account for these variables in the regression. I expect that the temperature and precipitation variables will have low magnitude and significant effects, with temperature being positive and precipitation being negative.

The unemployment and market tightness variables were included in these regressions to account for the effect of a state’s economy on the migration decision of individuals. Unemployment is expected to have a negative effect on migration whereas market tightness is expected to have a positive effect on migration. However, I expect market tightness to not be a significant variable as it relies on the JOLTS data, which is not state specific as described in the previous section.
Finally, the dummy variable for no income tax was included in the last regression in order to see how the income tax effect changes when the states with an income tax of 0% are accounted for. I expect this final effect to be positive, as states with no income taxes should draw people in. However, I expect the inclusion of this dummy variable to lower the magnitude of the income tax effect.

The second set of regressions used in this paper focus on the income levels, with each specific income level being regressed separately. Thus, this regression (2) will be done 7 times, once for each income level, across 50 states and 5 years of data. The intent of these regressions is to analyze if and how state income taxes affect income levels differently.

\[ Y_{n,t} = \beta_1 * \text{Taxr}_{n,t} + \beta_2 * \text{Staxr}_{n,t} + \beta_3 * \text{Temp}_{n,t} + \beta_4 * \text{Mtight}_{n,t} + \delta * \text{Notax}_{n,t} + \alpha \]  \hspace{1cm} (2)

Where:

- \( Y_{n,t} \) is the migration ratio for a given state \( n \) and year \( t \);
- \( \text{Taxr}_{n,t} \) is the tax rate for a given state \( n \) and year \( t \);
- Each other variable is the same as the regression in (1.3).

I expect the effect of the income tax rate to be similar to the overall regression in (1.3) but differ among each income level such that the effect grows in magnitude with the larger the income level. This hypothesis also extends to the effect of the no income tax dummy variable, such that it will have the greatest magnitude for the highest income level. Lastly, I expect all other included variables to have similar effects between income levels.
5 RESULTS

After combining all the data from the Internal Revenue Service on migration and income level with the tax, climate, and economic data from the other sources, the dataset had 1750 unique observations over 5 years of data. Descriptive statistics for the variables in the overall model can be found in Table 3 in the Appendix. From Table 3, we see that the migration ratio among all income levels ranges from 0.48 to 2.75. The smallest ratio coming from Alaska in 2012 from the income level of “$200,000 or more”, and the largest ratio coming from Florida in 2014 from the income level of “$200,000 or more”. Between all income levels, Alaska has a migration ratio range of 0.69 from 0.48 to 1.17, the former mentioned before and the latter coming from the income level of “$10,000 under $25,000” in 2011. Florida has a migration ratio range of 1.85 from 0.90 to 2.75, the former coming from the income level of “$1 under $10,000” in 2011 and the latter mentioned before. The migration ratio has a mean of 1.0086 or approximately 1. Also, from Table 3, the income tax rates in the U.S. ranged from 0 to 13.3%, 0 being represented by the 7 states that have no income tax\(^{21}\) and 13.3% being the income tax rate for California’s highest income group. Accounting for states with no income tax, 1.22% is the lowest state income tax rate in the U.S. for North Dakota’s lowest income group. California’s income tax rates have a range of 11.3% from 2% for the lowest income level through all 5 years of the sample, to 13.3% in 2013, 2014, and 2015 for the highest income level. North Dakota’s income tax rates have a range of 3.64% from 1.22% in 2014 and 2015 for the lowest income level, to 4.86% in 2011 for the highest income level.

Table 4 in the Appendix presents the results of our analysis from regressions (1.1), (1.2), and (1.3), being shown in the table in that order. The first regression (1.1), which solely regresses

income tax and sales tax on the migration ratio, finds a small but significant relationship between the income tax rate and the migration ratio. From **Table 4**, we find the income tax effect from (1.1) to be -0.0101 and significant at the 0.1% level (p<0.001). This implies, for every one percent increase in the income tax rate, the migration ratio is expected to decrease by 0.01. Similarly, there is also a small but significant effect of the sales tax rate on the migration ratio. We find that the sales tax rate has an effect of -0.0107, significant at the 0.1% level. Lastly, regression (1.1) yields a constant of 1.126, above the average migration ratio of the sample.

When adding additional variables in regression (1.2), the income tax effect increases magnitude slightly to -0.0108, again significant at the 0.1% level. The effect from the sales tax rate doubled in magnitude to -0.0267, while the constant decreased significantly to 0.712. Lastly, the precipitation effect is negligibly small but significant, while the temperature effect is large at 0.0108, especially considering the average annual temperature across all 50 states is 52.78°F. Thus on average, the temperature increases the migration ratio by .57, which is a very significant amount, considering the constant is 0.712. All variables have significant effects on the migration ratio besides the unemployment rate and the market tightness.

**Table 4** shows what happens to the analysis when a dummy variable for no income tax is added to the regression as in (1.3). When this addition occurs, all variables remain relatively unchanged besides the income tax rate and the constant. When accounting for states with no income tax, the income tax effect flips to become positive, while remaining significant at the 0.1% level. In regression (1.2), the income tax effect is -0.0108 but changes to 0.0142, a 0.025 flip, when the no income tax dummy variable is introduced in regression (1.3). The no income tax effect is 0.240 and is also significant at the 0.1% level. This implies that if a state has no
income tax, its migration ratio is increased by 0.24. Finally, the constant decreased again to 0.538 with the added variable.

Since this paper also focuses on how the income tax effect differs between income levels, Table 5 in the Appendix displays the second regression analysis (2) of all 7 income levels side by side. Each income level has 250 observations and vary in four notable ways. First, the income tax effect differs in magnitude and significance between each income level. Of the 7 income levels, only “$1 under $10,000”, “$50,000 under $75,000”, and “$75,000 under $100,000” are significant, their effects are 0.0225, 0.0183, and 0.0214 respectively. Each of these effects are positive, similar to the overall regression with the dummy variable in (1.3).

Second, the sales tax effect also differs in magnitude and significance among the income levels. All but three of the income levels have a sales tax effect that is significant at the 0.1% level, with the lowest two income levels\textsuperscript{22} being insignificant and the “$25,000 under $50,000” income level being significant at the 1% level. Of the significant income levels, the effect of state sales taxes strictly increases in magnitude with the income level, the lowest being -0.0104 for the “$25,000 under $50,000” income level and the highest being -0.0461 for the “$200,000 or more” income level. The sales tax effect for each income level can be found in Table 5.

Third, the temperature variable yields a similar effect to the sales tax effect. All but the lowest two income levels have a significant temperature effect at the 0.1% level with the lowest two being significant at the 1% level. This effect is very similar to the sales tax effect because it strictly increases with income level. For the lowest income level, temperature have an effect on migration ratio of 0.00286 while the highest income level has an effect of 0.0185.

\textsuperscript{22} These two income levels are “$1 under $10,000” and “$10,000 under $25,000”. 
Finally, the effect of no state income tax on the migration ratio increases with the income level with one exception. The no income tax effect for each income level is significant at the 0.1% level. The range of this effect among income levels is 0.236 from 0.165 at the “$10,000 under $25,000” level, to 0.401 at the “$200,000 or more” level. There is one point when this effect actually decreases. This occurs between the “$10,000 under $25,000” and “$25,000 under $50,000” levels with the effects being 0.224 and 0.212 respectively. After the “$25,000 under $50,000” level, the effect strictly increases with income level.
6 CONCLUSION

This paper sought to answer two key questions. First, how do state income taxes affect interstate migration throughout the United States at the overall level. Second, how do state income taxes affect interstate migration for people of different income levels and how do these effects differ from one another. The previous analysis answered both of these questions.

For the first question, I hypothesized that the migration ratio would decrease with an increase in state income taxes and state sales taxes. From my analysis, I was incorrect in the first part of my hypothesis once the no income tax dummy variable was incorporated in the regression. Before that, there was a negative effect, however once states with 0 income tax were accounted for, that effect flipped signs to be positive. The reason for this flip may be that once the lowest marginal income tax rates are accounted for, higher income taxes actually increase the amount of people who migrate to a state. This seems like an especially strong reason because once the dummy variable was included, the flipped income tax effect actually had a higher magnitude than before the dummy was added. However, I find it is more likely that there is omitted variable bias that has led to this greatly positive effect. Since state income taxes are typically correlated with more amenities in the state, my guess is that once accounted for, the income tax effect would either become negligibly small or flip signs again. If I were to continue this study at a later time, I would add a variable for state services and amenities to test this hypothesis. However, the no income tax dummy variable did yield a large effect, meaning that although individuals are not repelled from states because of higher income taxes, they are drawn to states with no income taxes at all. Although I was incorrect about state income taxes, sales taxes effected migration according to my hypothesis. This makes sense as sales taxes directly increase the cost of living in a state. In a future study, I would add a variable for property taxes in
order to measure the financial burden that these taxes put on people and in turn affect how they affect migration. I interpret the direction of causation of this paper the way it is because of the differing results between the income tax variable and the no income tax dummy variable. Since the coefficient for income tax is positive, the reverse causation would be that migration drives up income taxes. I do not find this to be confidently viable as increases in migration already increase the tax base for a state, and thus increasing taxes because of more people would not make sense as the amount of taxes collected already increases. Additionally, if reverse causation were in effect, then migration would also drive states dropping their state income tax. Thus, migration would paradoxically increase taxes and decrease taxes (what occurs when states get rid of their income taxes). Therefore, I am confident the direction of causality that I interpret in this paper.

For my second research question, I hypothesized that taxes would have greater effects on the migration of those from higher income levels. In this case I was correct for sales tax effect and the no income tax effect. However, I was incorrect again about the income tax effect, as all values were positive instead of negative, while most were not significant at all. I would be interested to see how these results would change given another few years of data to support stronger coefficients. The increasing effects of sales taxes and the no income tax dummy as income levels increase on the migration ratio were stronger than I had imagined. The increasing income level effect led to the sales tax effect for the highest income level being more than four times as strong as the lowest significant income level. This increasing income effect also led to the highest income level to have a no income tax effect over twice as large as the smallest income level. This confirmed my hypothesis that those who bring in larger incomes are more
sensitive to tax policy, though only for sales taxes. However, again states with no income tax
drew in more high-income people than state with income taxes.

The climate data was unsurprising in the significance and signs of its effects. However, I
was still surprised to see just how strong the data is overall, especially for the higher income
levels. Since retiring to warmer weather is a trend for retirees in the U.S., it would be interesting
to further analyze the effects age would play in this study, as the elderly who retire to warmer
weather are often a part of higher income groups.

I was surprised with the insignificance of the unemployment rate and disappointed with
the market tightness. Both of my variables for measuring the climate of a state’s economy were
insignificant and thus did not yield useful results. I am not ready to conclude that the economy
does not play a role in where people migrate. Instead, if I were to redo this study or improve
upon it in the future, I would include other variables to represent the state of the economy such
as housing prices. The use of JOLTS data, though unique to this study, was a disappointment
because of how unspecific it is in the U.S. as it is measured solely by region. This of course is
the case because of the nature of the data coming from a survey where an insufficient amount of
companies complete the survey to support state level data. Hopefully, the future of JOLTS data
in the U.S. will yield more detailed information as it becomes more important to and used by
economists.

Some of the limitations of this paper include the fact the IRS migration data with income
level breakdowns only has 5 years of data currently available. I believe that this limitation led to
fewer significant effects when looking at the effect of income taxes on migration at the separate
income levels. Another limitation is not having state specific JOLTS data, as mentioned before,
leading to insignificant results for the effect of the economy on migration. The largest limitation
is determining the direction of causality. Since this is a non-experimental paper, it is challenging to determine which direction the effect is really going. One could make a viable argument that migration to states could drive up income taxes and, at the same time, lead to states dropping their income tax altogether.

The knowledge of how state taxes affect the migration of different income levels will continue to evolve over time, especially as the IRS continues to produce migration data broken down at the income level. With time and further study, this data could truly address how policymakers should craft their tax policy in order to efficiently raise money in their states as well as maintain their population. This would allow for the states to be more efficient with their policies and would greatly benefit the United States as a whole. On top of this, more information collected by the IRS in the future could lead better tax targeting and treatment as states and economists will be able to measure the sensitivity of certain subpopulations to tax changes.


## APPENDIX

### Table 1 – Migration Data Income Levels

<table>
<thead>
<tr>
<th>Income Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1 under $10,000</td>
</tr>
<tr>
<td>$10,000 under $25,000</td>
</tr>
<tr>
<td>$25,000 under $50,000</td>
</tr>
<tr>
<td>$50,000 under $75,000</td>
</tr>
<tr>
<td>$75,000 under $100,000</td>
</tr>
<tr>
<td>$100,000 under $200,000</td>
</tr>
<tr>
<td>$200,000 or more</td>
</tr>
</tbody>
</table>

*Source: Internal Revenue Service Migration Data*

### Table 2 – JOLTS Data Regions

<table>
<thead>
<tr>
<th>JOLTS Data Regions</th>
<th>Northeast</th>
<th>South</th>
<th>Midwest</th>
<th>West</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Connecticut</td>
<td>Alabama</td>
<td>Illinois</td>
<td>Alaska</td>
</tr>
<tr>
<td></td>
<td>Vermont</td>
<td>Mississippi</td>
<td>North Dakota</td>
<td>New Mexico</td>
</tr>
<tr>
<td>Maine</td>
<td>Arkansas</td>
<td>North Carolina</td>
<td>Indiana</td>
<td>Arizona</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>Delaware</td>
<td>Oklahoma</td>
<td>Ohio</td>
<td>Oregon</td>
</tr>
<tr>
<td>New Hampshire</td>
<td>Florida</td>
<td>South Carolina</td>
<td>Iowa</td>
<td>California</td>
</tr>
<tr>
<td></td>
<td>Georgia</td>
<td>Tennessee</td>
<td>South Dakota</td>
<td>Utah</td>
</tr>
<tr>
<td>New Jersey</td>
<td>Kentucky</td>
<td>Texas</td>
<td>Kansas</td>
<td>Colorado</td>
</tr>
<tr>
<td>New York</td>
<td>Louisiana</td>
<td>Virginia</td>
<td>Wisconsin</td>
<td>Washington</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>Maryland</td>
<td>West Virginia</td>
<td>Michigan</td>
<td>Hawaii</td>
</tr>
<tr>
<td>Rhode Island</td>
<td></td>
<td></td>
<td>Minnesota</td>
<td>Idaho</td>
</tr>
</tbody>
</table>

*Source: Bureau of Labor Statistics*
Table 3 – Descriptive Statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Observations</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Migration Ratio</td>
<td>1750</td>
<td>1.0086</td>
<td>0.2296</td>
<td>0.48</td>
<td>2.75</td>
</tr>
<tr>
<td>Income Tax Rate</td>
<td>1750</td>
<td>4.89%</td>
<td>2.57%</td>
<td>0</td>
<td>13.30%</td>
</tr>
<tr>
<td>Sales Tax Rate</td>
<td>1750</td>
<td>6.35%</td>
<td>2.31%</td>
<td>0</td>
<td>9.45%</td>
</tr>
<tr>
<td>Temperature</td>
<td>1750</td>
<td>52.7788°F</td>
<td>8.781°F</td>
<td>24.3°F</td>
<td>73.4°F</td>
</tr>
<tr>
<td>Precipitation</td>
<td>1750</td>
<td>38.3038&quot;</td>
<td>15.3755&quot;</td>
<td>7.46&quot;</td>
<td>67.31&quot;</td>
</tr>
<tr>
<td>Unemployment Rate</td>
<td>1750</td>
<td>6.63%</td>
<td>1.88%</td>
<td>2.70%</td>
<td>13.10%</td>
</tr>
<tr>
<td>Market Tightness</td>
<td>1750</td>
<td>0.5147</td>
<td>0.2146</td>
<td>0.2022</td>
<td>1.3981</td>
</tr>
</tbody>
</table>

Source: Author’s analysis
Note: This table contains descriptive statistics of the variables used in this paper’s overall model.
### Table 4 – Overall Regression Analysis (1.1), (1.2), (1.3)

<table>
<thead>
<tr>
<th>Source: Author’s analysis</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th></th>
<th>(1) Migration</th>
<th>(2) Migration</th>
<th>(3) Migration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income Tax Rate (%)</td>
<td>-0.0101***</td>
<td>-0.0108***</td>
<td>0.0142***</td>
</tr>
<tr>
<td></td>
<td>(0.00214)</td>
<td>(0.00203)</td>
<td>(0.00306)</td>
</tr>
<tr>
<td>Sales Tax (%)</td>
<td>-0.0107***</td>
<td>-0.0267***</td>
<td>-0.0223***</td>
</tr>
<tr>
<td></td>
<td>(0.00237)</td>
<td>(0.00244)</td>
<td>(0.00240)</td>
</tr>
<tr>
<td>Temperature (°F)</td>
<td></td>
<td>0.0108***</td>
<td>0.0105***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.000682)</td>
<td>(0.000662)</td>
</tr>
<tr>
<td>Precipitation (in)</td>
<td>-0.00354***</td>
<td>-0.00305***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.000355)</td>
<td>(0.000347)</td>
<td></td>
</tr>
<tr>
<td>Unemployment (%)</td>
<td></td>
<td>0.00566</td>
<td>0.00385</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.00605)</td>
<td>(0.00587)</td>
</tr>
<tr>
<td>Market Tightness</td>
<td></td>
<td>0.0907</td>
<td>0.0888</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.0518)</td>
<td>(0.0502)</td>
</tr>
<tr>
<td>No Income Tax</td>
<td></td>
<td></td>
<td>0.240***</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.0225)</td>
</tr>
<tr>
<td>Constant</td>
<td>1.126***</td>
<td>0.712***</td>
<td>0.538***</td>
</tr>
<tr>
<td></td>
<td>(0.0201)</td>
<td>(0.0670)</td>
<td>(0.0669)</td>
</tr>
<tr>
<td>Observations</td>
<td>1750</td>
<td>1750</td>
<td>1750</td>
</tr>
</tbody>
</table>

Standard errors in parentheses

* p<0.05, ** p<0.01, *** p<0.001
### Table 5 – Regressions by Income Level Analysis (2)

<table>
<thead>
<tr>
<th></th>
<th>&lt;$10,000</th>
<th>&lt;$25,000</th>
<th>&lt;$50,000</th>
<th>&lt;$75,000</th>
<th>&lt;$100,000</th>
<th>&lt;$200,000</th>
<th>$200,000+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income Tax Rate (%)</td>
<td>0.025***</td>
<td>0.00954</td>
<td>0.00844</td>
<td>0.0183**</td>
<td>0.0214**</td>
<td>0.0184</td>
<td>0.00647</td>
</tr>
<tr>
<td></td>
<td>(0.00542)</td>
<td>(0.00629)</td>
<td>(0.00583)</td>
<td>(0.00671)</td>
<td>(0.00812)</td>
<td>(0.0105)</td>
<td>(0.0122)</td>
</tr>
<tr>
<td>Sales Tax (%)</td>
<td>0.00363</td>
<td>-0.00065</td>
<td>-0.0104**</td>
<td>-0.0166***</td>
<td>-0.0224***</td>
<td>-0.0346***</td>
<td>-0.0461***</td>
</tr>
<tr>
<td></td>
<td>(0.00379)</td>
<td>(0.00434)</td>
<td>(0.00392)</td>
<td>(0.00448)</td>
<td>(0.00548)</td>
<td>(0.00766)</td>
<td>(0.0105)</td>
</tr>
<tr>
<td>Temperature (°F)</td>
<td>0.00266**</td>
<td>0.00313**</td>
<td>0.00465***</td>
<td>0.00734***</td>
<td>0.0101***</td>
<td>0.0148***</td>
<td>0.0185***</td>
</tr>
<tr>
<td></td>
<td>(0.000967)</td>
<td>(0.00111)</td>
<td>(0.00102)</td>
<td>(0.00117)</td>
<td>(0.00143)</td>
<td>(0.00199)</td>
<td>(0.00278)</td>
</tr>
<tr>
<td>Market Tightness</td>
<td>0.0544</td>
<td>0.109**</td>
<td>0.0763*</td>
<td>0.0599</td>
<td>0.0715</td>
<td>0.122</td>
<td>0.106</td>
</tr>
<tr>
<td></td>
<td>(0.0361)</td>
<td>(0.0413)</td>
<td>(0.0381)</td>
<td>(0.0434)</td>
<td>(0.0535)</td>
<td>(0.0741)</td>
<td>(0.104)</td>
</tr>
<tr>
<td>No Income Tax</td>
<td>0.165***</td>
<td>0.224***</td>
<td>0.212***</td>
<td>0.255***</td>
<td>0.293***</td>
<td>0.330***</td>
<td>0.401***</td>
</tr>
<tr>
<td></td>
<td>(0.0322)</td>
<td>(0.0411)</td>
<td>(0.0406)</td>
<td>(0.0473)</td>
<td>(0.0564)</td>
<td>(0.0787)</td>
<td>(0.101)</td>
</tr>
<tr>
<td>Constant</td>
<td>0.699***</td>
<td>0.743***</td>
<td>0.699***</td>
<td>0.554***</td>
<td>0.428***</td>
<td>0.259*</td>
<td>0.240</td>
</tr>
<tr>
<td></td>
<td>(0.0605)</td>
<td>(0.0714)</td>
<td>(0.0672)</td>
<td>(0.0758)</td>
<td>(0.0945)</td>
<td>(0.129)</td>
<td>(0.175)</td>
</tr>
<tr>
<td>Observations</td>
<td>250</td>
<td>250</td>
<td>250</td>
<td>250</td>
<td>250</td>
<td>250</td>
<td>250</td>
</tr>
</tbody>
</table>

Standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001

**Source:** Author’s analysis
Figure 1 – United States Interstate Migration Flows, 2016

Source: Chris Edwards
Figure 2 – Tax Levels and Net Migration ratios, 2016

Source: Chris Edwards

Figure 3 – OLS and Logit Models Used

\[
\begin{align*}
\text{OUTMIGRATION}_{i,t} &= \beta_1 \text{HOUSING\_PRICE}_{i,t} + \beta_2 \text{PERCAP\_INC}_{i,t} + \beta_3 \text{UNEMP}_{i,t} + \\
& \quad \beta_4 \text{AVG\_MTR}_{i,t} + \beta_5 \text{POP}_{i,t} + \beta_6 \text{DISTANCE}_{ij} + \beta_7 \text{DISTANCE}^2_{ij} + \\
& \quad \beta_8 \text{AVG\_MTR}_{i,t} \times \text{DISTANCE}_{ij} + \beta_9 \text{ZERO\_TAX\_STATE}_i + \\
& \quad \sum \alpha_{i} \text{state}_i + \sum \alpha_{j} \text{state}_j + \epsilon_{i,t} \\
& \quad \text{for } i,j = 1...51; \ i \neq j; \ t = 1...\tau
\end{align*}
\]

Source: Andrew Lai et al.
Note: HOUSING\_PRICE is the median home sales price; PERCAP\_INC is the per capita disposable income; UNEMP is the unemployment rate; AVG\_MTR is the average marginal tax rate; POP is the origin state’s population from the 2000 Census; DISTANCE is the geographic distance between centers of population of states i and j; and ZERO\_TAX\_STATE is a dummy variable for states with no income tax.