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# Total State In-Migration Rates and Public Policy in the U.S.: A Comparative Analysis of the Great Recession and the Pre- and Post-Great Recession Years

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**Abstract.** This study adopts state-level data to empirically investigate the Tiebout hypothesis (as extended by Tullock) of “voting with one’s feet” for the period referred to in the U.S. as the “Great Recession” (2007-2009). As compared to previous studies, we use more recent data and provide estimates for three time periods: the “Great Recession” (from July 1, 2007 through June 30, 2009), the pre-Great Recession period (July 1, 2004 through June 30, 2006) and the post-Great Recession period (July 1, 2009 through June 30, 2011). This analysis also differs from most previous literature by including a separate cost of living variable and a variable measuring effective state personal income tax rates. After allowing for various economic factors and quality of life/climate variables, migrants (consumer-voters) over the 2007-2009 period appear to prefer states with *lower* effective state personal income tax rates and *higher* levels of “fiscal surplus,” defined in this study for each state as the total outlay *per pupil* on primary and secondary public education minus the *per capita* property tax level. The three empirical estimates all demonstrate that the Tiebout/Tullock hypothesis was operational not only during but also both before and after the Great Recession since for all three time periods migrants (consumer-voters) manifested a preference for lower effective state personal income tax rates and higher levels of fiscal surplus.

JEL Classifications: D72, H71, H72

Keywords: total in-migration; effective state income tax rates; fiscal surplus

## *Introduction*

Determinants of human migration, especially within the U.S. but elsewhere as well, have been and continue to be a topic of research interest (Renas, 1983; Vedder, et al, 1986; Percy, Hawkins, & Maier, 1995; Carrington, Detragiache, and Vishwanath, 1996; Saltz, 1998; Nechyba, 2000; Conway & Houtenville, 2001, 2003; Rhode & Strumpf, 2003; Chi & Voss, 2005; Partridge & Rickman, 2006; Francis, 2007; Ashby, 2007; Landry, et al., 2007; Fu & Gabriel, 2012; Peters, 2012; Plantinga, et al., 2013). The nature of issues considered within the context of *internal* migration determinants is extremely diverse;

indeed, it has (naturally) become increasingly diverse over time as a consequence of increasingly more complex research by multiple researchers and in a variety of disciplines over time. One of the areas receiving the greatest attention involves the so-called Tiebout (1956) hypothesis (Cebula, 1978; Renas, 1980; Cebula, 1990; Rhode & Strumpf, 2003; Cebula & Alexander, 2006; Banzhaf & Walsh, 2008), also *sometimes* referred to as the Tiebout (1956)-Tullock (1971) hypothesis.

According to Tiebout (1956, p. 418), "...the consumer-voter may be viewed as picking that community which best satisfies his preferences for public goods...the consumer-voter moves to that community whose local government best satisfies his set of preferences." As Tullock (1971, p. 917) further observes, this hypothesis can effectively be extended such that it holds that, *ceteris paribus*, the "...individual deciding where to live will take into account the private effects upon himself of the bundle of government services and taxes..." Thus, Tullock (1971) more explicitly than Tiebout (1956) emphasizes that the consumer-voter evaluates *both* the government goods and services *and* the tax burden at the relevant locations of choice.

Most studies on the impact of public policy on migration in the U.S. have effectively involved migration prior to the Great Recession, which is identified by the NBER as the period between December of 2007 and the end of June of 2009. A modest number of recently published studies have addressed the economic response of regions to a major recession (Connaughton & Madsen, 2012; Hassink, 2010; Martin, 2012; Walden, 2012).

Hassink (2010) studies the linkage of regional economic resilience to regional economic adaptability under major recessionary circumstances, whereas Martin (2012)

further develops the idea of regional economic resilience and investigates its usefulness, especially when combined with the notion of hysteresis, in understanding the response of regional economies to a major recessionary shock or (simply major recessions) in the U.K.

Connaughton & Madsen (2012) identify states in the US that suffered the greatest job losses and those that experienced the least job losses during the Great Recession. They find large differences between states in terms of the negative consequences (job losses and higher unemployment rates) from the Great Recession. Connaughton & Madsen (2012) also find that the industrial composition within each state contributed to its economic resilience to and its adaptability to the shock of the Great Recession and hence to the magnitude of job losses and to the extent that unemployment rates were elevated. Walden (2012) finds *preliminary* evidence that in a large percentage of cases during Great Recession in the U.S., *migrants* who moved into states with lower unemployment rates were themselves unemployed; hence, they were more strongly motivated by the need to find employment and secure an income than they were to seek lower state and local tax burdens and higher public school outlays *per se*. Thus, Walden (2012) raises the idea that the motivations underlying state in-migration *during* the Great Recession were rather different from those prior to the Great Recession and that the linkage between migration and public policy may have been weakened by the economic experience of the Great Recession. Although an interesting idea, the *ad hoc* model and empirical evidence regarding this proposition in his single OLS estimate are limited, leaving the issue open for further investigation.

Interestingly, the Tiebout (1956)/Tullock (1971) hypothesis has not been empirically studied for the U.S. for the period of the Great Recession and the years immediately prior to and following the Great Recession. Accordingly, the present study seeks to help fill this void by empirically investigating this hypothesis using contemporary state-level data for the U.S. Conducting this study also provides an opportunity to investigate empirically the *preliminary* hypothesis by Walden (2012) as summarized above.

The present empirical study first addresses the determinants of the state-level total in-migration rate during the Great Recession (2007-2009). During this period it is estimated that approximately 14,136,246 persons in the U.S. moved their principal residence from one state to another. “The total state in-migration rate” for each time period studied is defined in this study as the *ratio* of the total number of domestic migrants moving into each given state from all of the remaining 49 states during a given study period relative to the beginning-of-period total population in each state. This study seeks to shed light on whether fiscal factors such as outlays *per pupil* on public primary and secondary education, *per capita* property tax liabilities, and state personal income tax rates influenced consumer-voters’ mobility decisions during this Great Recession study period. In addition, this study seeks to demonstrate whether these same factors, i.e., outlays per pupil on public primary and secondary education, per capita property tax burdens, and state personal income tax rates, influenced state total in-migration rates in the pre-Great Recession (2004-2006) and post-Great Recession years (2009-2011).<sup>1</sup>

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<sup>1</sup>During the pre-Great Recession period (2004-2006), it is estimated that approximately 14,999,128 persons in the U.S. moved their residence from one state to another; the corresponding figure for the post-Great Recession period (2009-2011) was 13,730,645 persons.

Thus, three sets of empirical findings are provided, each with the same explanatory variables, although reflecting values for different years, depending upon the study period. We use lagged values of explanatory variables in all estimates to address issues of potential endogeneity.

Numerous previous studies have empirically addressed determinants of internal migration within the United States. A number of these studies emphasize the migration impact not only of economic and fiscal factors but also of non-economic factors, including “quality-of-life” factors, especially climate (Vedder 1976; Renas, 1978; 1980; 1983; Clark & Hunter, 1992; Cebula & Belton, 1994; Saltz, 1998; Conway & Houtenville, 1998, 2001, 2003; Gale & Heath, 2000; Milligan, 2000; Davies, Greenwood, & Li, 2001; Cebula & Alexander, 2006). As demonstrated in these studies, the omission of non-economic factors, especially climate-reflecting variables, from an empirical migration analysis constitutes an omitted-variable problem that generally compromises the integrity of that analysis. As a consequence, this empirical study will include not only fiscal factors and economic factors but also purely quality-of-life factors.

#### *The Basic Migration Decision Framework*

We follow the economic path of most migration studies in the U.S. since the contributions by Sjaastad (1962) and Riew (1973), among others, and treat the consumer-voter’s overall migration decision as an investment decision such that the decision to migrate from area  $i$  to area  $j$  requires that his/her expected net discounted present value of migration from area  $i$  to area  $j$ ,  $DPV_{ij}$ , be both (a) positive and (b) the maximum net

discounted present value that can be expected from moving from area  $i$  to *any other* known and plausible alternative area.

Following in principle the models in Tiebout, (1956), Sjaastad (1962), Tullock (1971), Riew (1973), Vedder (1976), Cebula (1978), Renas (1983), Vedder, Gallaway, Graves, & Sexton (1986), and Cebula & Alexander (2006), among others,  $DPV_{ij}$  consists in this study of three broad sets of considerations, namely:

1. Economic conditions in those areas;
2. Fiscal factors in those areas; and
3. Environmental characteristics of the areas.

According to this investment framework, it follows that migration will flow from area  $i$  to area  $j$  only if:

$$DPV_{ij} > 0; DPV_{ij} = \text{MAX for } j, \text{ where } j = 1, 2, \dots, z \quad (1)$$

where  $z$  represents all of the plausible known alternative locations to area  $i$ . Given the focus in this study on state migration, area  $j$  is actually state  $j$ . Clearly, although the framework is an investment model, either a carefully crafted constrained-utility maximization model or a carefully constructed cost-benefit model (Cebula, 1978) could have been adopted and used to introduce the same categories of variables.

The total state in-migration rate for the Great Recession,  $MIG_j$ , is the total number of domestic in-migrants to state  $j$  over the period July, 1, 2007-June 30, 2009, expressed as a *percent* of the year 2007 population in state  $j$ . This specification *in percentage terms* allows comparisons of each state's total in-migration rate with those of the other states. The only available data on state total in-migration in the U.S. follow this July 1<sup>st</sup> to June 30<sup>th</sup> time frame pattern; thus, for roughly the first five months of the Great Recession

study period, the economy was not officially/technically in recession, although it was materially slowing down prior to December, 2007 (Council of Economic Advisors, 2009, Table B-2).

We use three variables to measure the economic conditions in state  $j$ . The first of these purely economic variables is the per capita personal income in state  $j$ ,  $PCPERSINC_j$ . Conventional wisdom suggests that the higher the per capita personal income in a state, the higher the expected income in that state and hence the more appealing it would be to move to that state. Thus,  $MIG_j$ , the total domestic in-migration rate to state  $j$  is hypothesized to be an increasing function of  $PCPERSINC_j$ , *ceteris paribus*. This variable constitutes an average measure of *expected* income/wage prospects in state  $j$  if one were to actually have a job in that state.

The second purely economic variable included in the model is the *percentage* unemployment rate in state  $j$ ,  $UR_j$ , which is the average unemployment rate of the civilian labor force over the course of the year in state  $j$ . The higher the unemployment rate in a state, the less promising are the job prospects in the state and hence the less appealing that state is as a place of residence (Riew, 1973; Sommers & Suits, 1973; Cebula, 1979; Walden, 2012). Clearly, then, the total domestic in-migration rate to state  $j$  is expected to be a decreasing function of  $UR_j$ , *ceteris paribus*.

The third purely economic variable is  $COST_j$ , the overall cost of living in state  $j$  for the average four-person family, expressed as an index, with  $COST_j = 100.00$  being the theoretical mean value of this indexed variable. In the absence of money illusion, the total domestic in-migration rate to state  $j$  is hypothesized to be a decreasing function of  $COST_j$ , *ceteris paribus*, because the higher the cost of living, the lower one's real income



and the lower one's standard of living. The adoption of a variable such as  $COST_j$  in migration studies is becoming more common (Renas, 1978, 1980, 1983; Cebula, 1979; Conway & Houtenville, 1998, 2001, 2003; Gale & Heath 2000; Cebula & Alexander, 2006).

We adopt three variables to measure fiscal factors, although two of them are eventually merged into one to avoid multi-collinearity. The first fiscal factor variable considered in this study is  $AVSTINCTR_j$ , the *average effective percentage state personal income tax rate* in state  $j$ . This variable is the average *state* personal income tax paid by residents of state  $j$ , expressed as a percentage of the average family income in state  $j$ . Such a variable has usually been overlooked in studies of a Tiebout-type framework, although it has been considered on a limited basis, i.e., by a few studies (Cebula, 1990; Conway & Houtenville, 2001; Cebula & Alexander, 2006). It is hypothesized here that the total domestic in-migration rate to state  $j$  is a decreasing function of  $AVSTINCTR_j$ , *ceteris paribus* (Tullock, 1971) because a higher effective state personal income tax implies a lower disposable income. Since nine states do not have a state income tax, for these states, the value of  $AVSTINCTR_j = 0$ . The nine states in question are Alaska, Florida, Nevada, New Hampshire, South Dakota, Tennessee, Texas, Washington, and Wyoming.

The variable  $PCPROPTX_j$  is defined as the total local (city plus county) per capita nominal property tax liability on residential property in state  $j$ . Such a variable has often been considered in studies of a Tiebout-type framework (Pack, 1973; Barsby & Cox, 1975; Greene, 1977; Liu, 1977; Renas, 1980; Conway & Houtenville, 1998, 2001; Gale & Heath, 2000; Rhode & Strumpf, 2003; Cebula & Alexander, 2006). It is expected that

the total domestic in-migration rate to state  $j$  is a decreasing function of  $PCPROPTX_j$ , *ceteris paribus*, because a higher property tax burden implies a lower disposable income. The principal outlay financed by property taxes is of course public primary and secondary education. Continuing, the variable  $ANNUALPERPUP_j$  is the nominal outlay in state  $j$  *per pupil* on primary and secondary *public* education from all sources, federal, state, and local. The variable  $ANNUALPERPUP_j$  is to be distinguished from the very commonly adopted variable *per capita* public education outlays found in many previous studies (Pack, 1973; Greene, 1977; Hinze, 1977; Cebula, 1979; Renas, 1980; Conway & Houtenville, 1998, 2001; Gale & Heath, 2000; Rhode & Strumpf, 2003). Indeed, it is stressed in this study, as hypothesized in a prior study by Cebula & Alexander (2006), that higher *per pupil* outlays on public education are a more direct measure of a commitment to better quality education than higher *per capita* outlays on public education. In any event, it is hypothesized here that, *ceteris paribus*, the total domestic in-migration rate to state  $j$  is an increasing function of  $ANNUALPERPUP_j$  because a greater outlay on public education *per pupil* arguably implies a greater commitment to the pursuit of a better quality public education system in the state, as well as a reduced inclination or perceived need to choose private education (with its accompanying pecuniary costs, especially tuition) over public education.

Not surprisingly, the variables  $PCPROPTX_j$  and  $ANNUALPERPUP_j$  are highly correlated ( $r = 0.63$ ). Accordingly, we construct a “fiscal surplus” variable labelled  $FISCSURP_j$ , which is the value of  $ANNUALPERPUP_j$  minus the value of  $PCPROPTX_j$ . The variable  $FISCSURP_j$  is a measure of the average excess of the value received from *per pupil* outlays on primary and secondary public education in state  $j$  minus the *per*

*capita* property tax associated with paying most of those outlays in state  $j$ . According to Tiebout (1956) and Tullock (1971), as well as Buchanan (1950), the consumer-voter seeks to maximize fiscal surplus. Thus, it is hypothesized in this study that the total domestic in-migration rate to state  $j$  is an increasing function of  $FISCSURP_j$ , *ceteris paribus*.

Finally, there are three quality-of-life variables included in the model. Two of these are climatic in nature. The first of these climatic variables is  $JANTEMP_j$ , defined here as the mean January temperature in state  $j$  (1971-2000), as a measure of warmer climatic conditions. As in so many migration studies (Renas, 1978; 1980; 1983; Clark & Hunter, 1992; Cebula & Belton, 1994; Saltz, 1998; Conway & Houtenville, 1998, 2001, 2003; Gale & Heath, 2000; Milligan, 2000; Davies, Greenwood, & Li, 2001; Cebula & Alexander, 2006), this variable is treated as a quality-of-life control variable. As is typically the case in these studies, it is hypothesized that a warmer climate is likely to increase the inflow of migrants as a reflection of their typical preference for warmer weather, especially during the winter months. Thus, it is hypothesized that the total domestic in-migration rate to state  $j$  is an increasing function of  $JANTEMP_j$ , *ceteris paribus*.

As a supplemental measure of climate, one which arguably reflects elevated summer-time heat and elevated humidity, the model includes the variable  $CDD_j$ , the average annual number of cooling degree days in state  $j$  (1971-2000). In this case, the focus is upon the discomfort typically associated with climates having much higher summer temperatures and higher humidity. Given that a higher number of annual cooling degree days reflects conditions of greater summer heat and humidity, it is hypothesized,

given presumed migrant preferences for (higher valuation of) physical comfort (Cebula & Vedder, 1973; Renas, 1978; 1983; Clark & Hunter, 1992; Saltz, 1998), that the total domestic in-migration rate to state  $j$  is a decreasing function of  $CDD_j$ , *ceteris paribus*.

The third and final expressly quality-of-life variable is population density,  $POPDEN_j$ , defined as the number of people per square mile in state  $j$ . Arguably, greater population density *per se* can be associated with greater roadway congestion, greater congestion on public transit facilities, and in the general conduct of life, such as more crowded grocery stores, theatres, restaurants, shopping malls, and the like. To the extent that such congestion and crowding adds travel-time to work or other destinations or simply creates discomfort in the form of waiting lines and delays, it follows that greater population density would act as a deterrent to in-migration (Cebula & Vedder, 1973; Cebula, 1979; Renas, 1978; 1983; Saltz, 1998). Hence, it is hypothesized that the total domestic in-migration rate to state  $j$  is a decreasing function of  $POPDEN_j$ , *ceteris paribus*.

*The Initial Estimate: The Great Recession Years, 2007-2009*

The reduced-form equation *initially* to be estimated is given by (2):

$$\begin{aligned}
 MIG_{j2007-2009} = & a_0 + a_1 PCPERSINC_{j2005} + a_2 UR_{j2006} + a_3 COST_{j2006} \\
 & + a_4 AVSTINCTR_{j2005} + a_5 FISCSURP_{j2005} + a_6 JANTEMP_{j1971-2000} \\
 & + a_7 CDD_{j1971-2000} + a_8 POPDEN_{j2005} + u
 \end{aligned} \tag{2}$$

where  $a_0$  = constant term and  $u$  = stochastic error term. The time period following each variable in equation (2) indicates the adoption of the value of that variable during the

specified time period. As noted earlier, the explanatory variables are lagged to avoid potential endogeneity problems.

The study includes all 50 states but excludes Washington, D.C. as an outlier; indeed, its inclusion altered the results for several variables. Moreover, it can be argued as a legitimate omission since it is in fact *not* a state. In fact, inclusion of Washington, D.C. could well raise the question of whether Puerto Rico should have been included in the study. Finally, omission of Washington, D.C. is consistent with most previous migration studies of the U.S.

The data source for the variable *MIG<sub>j</sub>* was the U.S. Census Bureau (2012, Table 33; 2011, Table 33). The source for variable *PCPERSINC<sub>j</sub>*, was the U.S. Census Bureau (2010, Table 665), while the data source for variable *COST<sub>j</sub>* was the Council for Community and Economic Research (2013). The data source for variable *UR<sub>j</sub>* was the U.S. Census Bureau (2009, Table 609). The source for variable *JANTEMP<sub>j</sub>* was the U.S. Census Bureau (2010, Table 378), whereas the data source for variable *CDD<sub>j</sub>* was the U.S. Bureau of the Census (2010, Table 384) and that for *POPDEN<sub>j</sub>* was U.S. Census Bureau (2012, Table 14). The data for the policy variables *AVSTINCTR<sub>j</sub>*, *PCPROPTX<sub>j</sub>*, and *ANNUALPERPUP* were obtained to compute *FISCSURP<sub>j</sub>* from the U.S. Census Bureau (2010, Table 13) and U.S. Census Bureau (2012, Table 555; 2010, Table 242); the latter two variables are used to construct the fiscal surplus variable, *FISCSURP<sub>j</sub>*. For the convenience of the reader, the full definitions of all the variables in this analysis are provided in the Appendix. For the interested reader, descriptive statistics in the forms of means, standard deviations, maximum values, and minimum values are provided in Table 1.

Based on the arguments provided above and the “conventional wisdom” as expressed by Tiebout (1956), Tullock (1971), and Riew (1973), and more recently by Conway & Houtenville (2001) and Cebula & Alexander (2006), among others, the following coefficient signs (each case assumes *ceteris paribus*) are hypothesized:

$$a_1 > 0, a_2 < 0, a_3 < 0, a_4 < 0, a_5 > 0, a_6 > 0, a_7 < 0, a_8 < 0 \quad (3)$$

Formal testing for the presence of heteroskedasticity suggests that it is a problem; indeed, this problem was found to be present in all three of the estimations in this study.

Accordingly, the White (1980) heteroskedasticity correction is adopted in all three cases.

Interestingly, an examination of the correlations among the explanatory variables for multi-collinearity reveals that it does *not* seem to be a problem, given the use of the fiscal surplus variable.

The results of estimating equation (2) by OLS are provided in column (a) of Table 2. All eight of the estimated coefficients exhibit the expected signs, with three being statistically significant at the 1% level and three being statistically significant at the 5% level. The estimated coefficients on two of the explanatory variables,  $UR_j$  (the *percentage* unemployment rate in state  $j$ ) and  $CDD_j$  (the average annual number of cooling degree days in state  $j$ ), fail to be statistically significant at the 10% level.<sup>2</sup>

Let us first consider the expressly economic variables.  $PCPERSINC_j$ , the variable that provides a measure for income expectations from residence in state  $j$  (the per capita personal income in state  $j$ ) exhibits a coefficient that is positive and statistically significant at the 1% level. Hence, for the years of the Great Recession, this result

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<sup>2</sup> The coefficient of determination ( $R^2$ ) is 0.68, whereas the adjusted coefficient of determination ( $adjR^2$ ) is 0.62, so that the model explains approximately two-thirds of the variation in the dependent variable,  $MIG_j$ . Finally, the  $F$ -statistic is statistically significant at the 1% level, attesting to the overall strength of the model.

suggests that the total state in-migration rate was positively associated with higher levels of per capita personal income in that state, i.e., with higher expected income in that state. More specifically, over the 2007–2009 period (i.e., during the Great Recession), a one-unit increase (\$1 in current U.S. dollars) in a state’s personal income per capita would be associated with an increase in that state’s total in-migration rate of 0.0002 or 0.02%. Alternatively stated, if a state’s personal income per capita were to increase by \$1,000, its increased per capita income would in theory be associated with a 20% increase in its total in-migration rate, everything else held the same.

Next, the cost-of-living variable exhibits a negative coefficient that is statistically significant at the 5% level. Not surprisingly perhaps, given the economic hardships imposed by the Great Recession, this result suggests that the total in-migration rate was *negatively* associated with higher cost-of-living levels in that state. As the estimated coefficient implies, over this time period, a one-unit increase in a state’s overall cost-of-living *index* would be associated with a decrease in the total in-migration rate to that state of 0.014, or 1.4%.

Next, we consider the purely quality-of-life variables. The coefficient on the *JANTEMP<sub>j</sub>* variable is positive and statistically significant at the 5% level; thus, this result suggests, as anticipated, that *higher* total in-migration rates were positively associated with a higher average January temperature, i.e., states with warmer climates (Renas, 1983; Clark & Hunter, 1992; Saltz, 1998; Conway & Houtenville, 1998, 2001; Gale & Heath, 2000). Thus, during the Great Recession, a one-unit increase in a state’s 30-year average January temperature, e.g., from the sample average of 32.7 degrees

Fahrenheit to 33.7 degrees Fahrenheit, would be associated with an increase in that state's total in-migration rate of 6.9%, everything else constant.

The estimated coefficient on the population density variable is negative and statistically significant at the 5% level. This result suggests that the total in-migration rate in this study period was negatively associated with population density. More specifically, a rise in the population density of a state by one person per square mile would be associated with a reduction in the total in-migration rate to that state of 0.0022, i.e., 0.22%. Hence, over this study period, a ten-person rise in a state's population density would be associated with a 2.2% reduction the total in-migration rate to that state, other things held the same. The other quality-of-life variable, ( $CDD_j$ ), does not have a coefficient statistically significant at even the 10% level.

Finally, we focus on the public policy variables.  $AVSTINCTR_j$ , the average effective state personal income tax rate in state  $j$ , has a negative coefficient that is statistically significant at the 1% level. Thus, this result suggests that as hypothesized, *lower* total in-migration rates were associated with *higher* average effective state personal income tax rates. In this case, other things held the same, a one-unit *increase* in a state's average effective percentage state personal income tax rate, e.g., from 3% to 4%, would be associated with a *decrease* in that state's total in-migration rate of nearly 36% since the coefficient is -0.357. This variable appears to be a potent Tiebout (1956)/Tullock (1971)-type variable, implying that state policy-makers should be especially circumspect about using this taxing tool as a source of revenue enhancement.

As for the fiscal surplus variable,  $FISCSURP_j$ , the estimated coefficient on this variable is positive and statistically significant at the 1% level; hence, this result suggests,



as hypothesized, that *higher* total in-migration rates were positively associated with *higher* levels of fiscal surplus (Tiebout (1956), Tullock (1971); Pack, 1973; Cebula & Alexander, 2006). Regarding this variable, a one-unit (\$1) increase in a state's fiscal surplus would be associated with an increase in that state's total in-migration rate equal to 0.000261 or 0.0261%. Hence, an increase in the fiscal surplus (as defined) in a state equal to \$100 would be associated with an increase in the total in-migration rate equal to 2.61%, on average, other things held the same.

In sum then, for the Great Recession period 2007-2009, the total state-in-migration rate was positively associated with per capita personal income, warmer January temperatures, and higher levels of fiscal surplus. For the same study period, the total state in-migration rate was negatively associated with higher levels of the average overall cost of living, the average effective state personal income tax rate, and population density.

*The Pre- and Post-Great Recession Estimates: 2006-2006 and 2009-2011*

We also estimate reduced-form equations (4) and (5), which parallel equation (2), for the periods 2004-2006 and 2009-2011 respectively:

$$\begin{aligned}
 MIG_{j2004-2006} = & a_0 + a_1 PCPERSINC_{j2003} + a_2 UR_{j2003} + a_3 COST_{j2003} \\
 & + a_4 AVSTINCTR_{j2002} + a_5 FISCSURP_{j2002} + a_6 JANTEMP_{j1971-2000} \\
 & + a_7 CDD_{j1971-2000} + a_8 POPDEN_{j2000} + u
 \end{aligned} \tag{4}$$

$$\begin{aligned}
 MIG_{j2009-2011} = & a_0 + a_1 PCPERSINC_{j2008} + a_2 UR_{j2007} + a_3 COST_{j2008} \\
 & + a_4 AVSTINCTR_{j2007} + a_5 FISCSURP_{j2007} + a_6 JANTEMP_{j1971-2000}
 \end{aligned}$$

$$+a_7 CDDj1971-2000 + a_8 POPDENj2005 + u \quad (5)$$

The data source for the variable *MIGj2004-2006* was the U.S. Census Bureau (2008, Table 33; 2009, Table 32), and the data sources for the variable *MIGj2009-2011* were the U.S. Census Bureau American Community Survey (2010; 2011) and the U.S. Census Bureau (2012, Table 19). The remaining data were also obtained from the U.S. Census (2001; 2009; 2010, 2011; 2012) and from the Council for Community and Economic Research (2013). The White (1980) heteroskedasticity-corrected estimations of equations (4) and (5) are provided in columns (b) and (c), respectively, of Table 2.

In column (b), all eight of the estimated coefficients exhibit the hypothesized signs, with four statistically significant at the 1% level, two statistically significant at the 5% level, one statistically significant at the 10% level (*URj*) and only one statistically insignificant at the 10% level (*CDDj*).<sup>3</sup>

The variable per capita personal income exhibits a coefficient that is positive and statistically significant at the 5% level. Hence, during the 2004-2006 timeframe, this result suggests that the total state in-migration rate was *positively* associated with higher levels of per capita personal income. Next, the cost-of-living variable exhibits a negative coefficient that is statistically significant at the 5% level. This result suggests that the total state 2004-2006 in-migration rate was *negatively* associated with *higher* cost-of-living levels. Finally, there is weak evidence of an association between the total state in-migration rate and the unemployment rate for this period at the 10% level of significance.

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<sup>3</sup> The coefficient of determination ( $R^2$ ) is 0.64, whereas the adjusted coefficient of determination is 0.57, so that the model explains approximately three-fifths of the variation in the dependent variable, *MIGj*. Finally, the *F*-statistic is statistically significant at the 1% level, attesting to the overall strength of the model.

Among the quality-of-life variables, the coefficient on the warm weather variable,  $JANTEMP_j$ , is positive and statistically significant at the 1% level. This result suggests that *higher* total in-migration rates were positively associated with a higher average January temperature (Renas, 1983; Clark & Hunter, 1992; Saltz, 1998; Conway & Houtenville, 1998, 2001; Gale & Heath, 2000). The estimated coefficient on the population density variable,  $POPDEN_j$ , is negative and statistically significant at the 1% level, suggesting a negative association between the 2004-2006 total state in-migration rate and population density.  $CDD_j$  (the average annual number of cooling degree days in state  $j$ ) was not statistically significant even at the 10% level.

Finally, we focus on the public policy variables. The coefficient on  $AVSTINCTR_j$ , the average effective state personal income tax rate in state  $j$ , is negative and statistically significant at the 1% level. This result suggests, as hypothesized, that *lower* total state in-migration rates were associated with *higher* average effective state personal income tax rates. The coefficient on the fiscal surplus variable,  $FISCSURP_j$ , is positive and statistically significant at the 1% level. This result suggests, as expected, that *higher* total state in-migration rates were associated with *higher* levels of fiscal surplus (Tiebout, 1956; Tullock, 1971; Pack, 1973; Cebula & Alexander, 2006).

The results for the period 2009-2011 are very similar to those for the other two study periods. Overall, as shown in column (c) of Table 2, all eight coefficients exhibit the expected signs, with three statistically significant at the 1% level and four statistically significant at the 5% level. Only the coefficient on the  $CDD_j$  variable fails (again) to be statistically significant at the 10% level.

In sum, for the 2009-2011 study period, the total state in-migration rate was positively associated with per capita personal income, warmer January temperatures, and higher levels of fiscal surplus. Furthermore, for this same study period, the total state in-migration rate was negatively associated with the average overall cost of living, population density, the unemployment rate [as suggested by Walden (2012)], and the effective state personal income tax rate.

### Conclusions

This empirical study has investigated fiscal, as well as economic and non-economic (quality-of-life) determinants of total state in-migration in the U.S. over three time periods: the Great Recession period, 2007-2009; a pre-Great Recession time period, 2004-2006; and a post-Great Recession time period, 2009-2011. The principal intent of investigating these three different time periods has been to provide evidence regarding whether there continues to be empirical support for the Tiebout (1956)/Tullock (1971) hypothesis, be it during, before, or after the Great Recession.

The findings provided in this study support the Tiebout (1956)/Tullock (1971) hypothesis in terms of the contemporary mobility of consumer-voters. For all three of these study periods, the model specification has allowed for five purely economic factors, three quality of life variables, and two fiscal factors, one of which, *FISCSURP<sub>j</sub>*, embodies, i.e., is the arithmetic difference between two fiscal factors, the annual *per pupil* outlay on public primary and secondary education minus the *per capita* property tax. For each of the three study periods, it appears that the following is the case: the total state in-migration rate was positively associated with per capita personal income, warmer

January temperatures, and higher levels of fiscal surplus. In addition, for these same study periods, the total state in-migration rate was also negatively associated with the average overall cost of living, population density, and the average effective state personal income tax rate. The results for both the effective state personal income tax rate variable and the fiscal surplus variable imply that the search for “fiscal surplus” appears to be ongoing (Buchanan, 1950) and that the search was not effectively altered by the various experiences of the Great Recession.

Moreover, as observed in the above analysis, the average state personal income tax rate appears to be a potent Tiebout (1956)/Tullock (1971)-type variable, implying that state policy-makers should be especially circumspect about raising this tax rate as a source of revenue enhancement, since such a policy could very well have perverse effects on their state revenues.

## *APPENDIX*

The purpose of this APPENDIX is to provide a clear and simple definition for each of the variables considered in this study. The definition excludes years and focuses on what each variable represents.

*MIG<sub>j</sub>* = the total state in-migration rate to state *j*, defined as the total number of in-migrants to each state (*j*) over a specified time period divided by the total population of each state (*j*) at the beginning of the study period; this number is converted from a decimal to a percent, as is standard in nearly all of the migration literature

*PCPERSINC<sub>j</sub>* = the personal income *per capita* earned in a specified year in each state (*j*); this number is expressed in current dollars

*UR<sub>j</sub>* = the average unemployment rate of the civilian labor force in each state (*j*) over the course of a specified year; this number is expressed as a percent

*COST<sub>j</sub>* = an index of the overall cost of living for the “average” four-person family residing in each state (*j*) during the course of a given year; this number is expressed as an index, with a higher index value indicating a higher overall cost of living

*AVSTINCTR<sub>j</sub>* = the *average effective percentage state personal income tax rate* in each state (*j*); this variable is the average *state* personal income tax paid by residents of each state (*j*) expressed as a percentage of the average family income in each state (*j*)

*PCPROPTX<sub>j</sub>* = the total local (city plus county) property tax liability (in current dollars) on residential property *per capita* in each state (*j*)

*ANNUALPERPUP<sub>j</sub>* = the annual nominal outlay (in current dollars) in each state (*j*) *per pupil* on primary and secondary *public* education from *all* sources, i.e., federal plus state plus local

*FISCSURP<sub>j</sub>* = *ANNUALPERPUP<sub>j</sub>* – *PCPROPTX<sub>j</sub>*, the average level of fiscal surplus in each state *j*, i.e., the annual nominal outlay (in current dollars) in each state (*j*) *per pupil* on primary and secondary *public* education from *all* sources, i.e., federal plus state plus local, minus the total local (city plus county) property tax liability (in current dollars) on residential property *per capita* in each state (*j*)

*JANTEMP<sub>j</sub>* = the average January temperature in degrees Fahrenheit in each state (*j*); this average was computed over the 30 year period from 1971 through 2000

*CDD<sub>j</sub>* = the average *annual* number of cooling degree days in each state (*j*); this average was computed over the 30 year period from 1971 through 2000

*POPDENS<sub>j</sub>* = the average number of people residing in each state (*j*) per square mile in any specified year

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Table 1. Descriptive Statistics on Variables, 2007-2009 Estimation

Variable	Arithmetic Average	Standard Deviation	Maximum	Minimum
<i>MIG<sub>j</sub></i>	5.958	2.055	11.9	2.5
<i>PCPERSINC<sub>j</sub></i>	29,951	4,425	43,047	22,092
<i>COST<sub>j</sub></i>	96.298	17.305	138.2	81.5
<i>EMPLGRR<sub>j</sub></i>	7.291	3.597	19.82	0.749
<i>AVSTINCTR<sub>j</sub></i>	2.898	1.962	7.851	0.00
<i>FISCSURP<sub>j</sub></i>	2,522	3,486	5,005	-1,849
<i>JANTEMP<sub>j</sub></i>	32.7	12.65	73.0	10.2
<i>CDD<sub>j</sub></i>	1,283.5	984.49	4,561	0.0
<i>POPDEN<sub>j</sub></i>	188.82	256.45	1,170	1.15

Table 2. Empirical Results for Total State In-Migration Rate  
 Dependent Variable: *MIG<sub>j</sub>*

Study Period	2007-2009	2004-2006	2009-2011
Variable/Column	(a)	(b)	(c)
<i>PCPERSINC<sub>j</sub></i>	0.0002*** (2.62)	0.00015** (2.20)	0.00012*** (2.66)
<i>UR<sub>j</sub></i>	-0.29 (-1.08)	-0.417* (-1.88)	-0.525** (-2.23)
<i>COST<sub>j</sub></i>	-0.014** (-2.14)	-0.019** (-2.40)	-0.008** (-2.09)
<i>AVSTINCTR<sub>j</sub></i>	-0.357*** (-2.72)	-0.374*** (-3.33)	-0.29** (-2.60)
<i>FISCSURP<sub>j</sub></i>	0.000261*** (7.41)	0.00024*** (6.77)	0.00021*** (6.68)
<i>JANTEMP<sub>j</sub></i>	0.069** (2.53)	0.119*** (3.78)	0.069** (2.61)
<i>CDD<sub>j</sub></i>	-0.00055 (-1.57)	-0.0009 (-1.63)	-0.00055 (-1.53)
<i>POPDEN<sub>j</sub></i>	-0.0021**	-0.0026***	-0.0024***

	(-2.17)	(-3.10)	(-2.63)
Constant	1.81	4.34	3.54
$n$	50	50	50
$R^2$	0.68	0.64	0.68
adj $R^2$	0.62	0.57	0.62
$F$	10.96***	9.18***	10.99***

\*\*\*statistically significant at 1% level; \*\*statistically significant at 5% level;  
 \*statistically significant at 10% level. T-values are in parentheses.

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