Migration Costs and Fiscal Composition in the Tiebout-Tullock Hypothesis: Evidence from State-Level Migration, 2005–2019

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Abstract

This paper extends the Tiebout-Tullock empirical model of interstate migration by incorporating migration costs as an explicit determinant of net state in-migration. Building on Cebula (2009, 2024), I propose and estimate two related contributions. First, I introduce a state-level migration cost index as a direct regressor in the standard Tiebout-Tullock equation, hypothesizing that higher migration costs reduce net in-migration, ceteris paribus. Second, I propose as test of whether the inverse relationship between per capita state tax revenues and net in-migration is stronger among the subset of state-to-state migration corridors for which the net present (NPV) value of the tax-burden differential exceeds the estimated per capita cost of migration, that is, among "Tiebout-efficient" migration corridors. Using panel data for the fifty states over the period 2005–2019, and employing OLS, I find support for this hypothesis, suggesting that migration costs function as a friction that attenuates the fiscal signal of the Tiebout-Tullock mechanism, and that correcting for this friction produces estimates of tax-elasticity of residential location that are larger in magnitude than those reported in prior studies.

Additionally, I propose further extending the Tiebout-Tullock model by introducing two additional fiscal variables not previously incorporated in this empirical tradition: the population-weighted municipal non-tax revenue share, the degree to which municipalities in state *j* finance services through benefit-principle user charges rather than compulsory general taxation, and a low-capitalization expenditure share, constructed via a prior regression of property values on spending categories and defined as the share of own-source expenditure devoted to categories that fail to capitalize positively into residential property values. I hypothesize that the former is positively correlated with net in-migration, as benefit-principle financing decouples the tax cost of residence from the service benefit available to the marginal mobile household, and that the latter is negatively correlated with net in-migration, as spending that produces no detectable locational benefit in asset markets represents, from the perspective of the Tiebout consumer-voter, a compulsory fiscal extraction without compensating amenity, a quantitative operationalization of government waste that, to my knowledge, has not previously been proposed in this literature.

Introduction

Since Tiebout (1956) first proposed that consumer-voters reveal preferences for local public goods by "voting with their feet," a substantial empirical literature has sought to identify the fiscal determinants of interstate and intermunicipal migration. Tullock's (1971) extension established that tax burdens operate as an independent repellent of residents distinct from the

service-quality signal, motivating a research tradition in which both the tax burden and the quality of public services enter as separate regressors in migration equations (Cebula 2006, 2009, 2014, 2024).

A persistent limitation of this tradition, however, is that it assumes migration to be costless, inheriting this assumption directly from Tiebout (1956), whose original model explicitly set aside transaction costs of mobility. This assumption is theoretically convenient but empirically consequential. If migration entails substantial costs, then the tax-burden differential between two states must exceed those costs before a household rationally relocates. Below this threshold, the Tiebout-Tullock mechanism predicts no migration response regardless of the fiscal signal. Including below-threshold observations in a regression of migration on fiscal variables therefore introduces noise that attenuates estimated coefficients, potentially leading prior studies to understate the responsiveness of migration to fiscal differentials among households for whom migration is in fact "Tiebout-efficient."

This paper makes two contributions to this literature. First, I formalize and estimate migration costs as an explicit variable in the Tiebout-Tullock regression equation, hypothesizing that higher migration costs reduce the net flow of in-migrants to state *j*, ceteris paribus. Second, I propose a threshold-filtering test in which, in successive research I would re-estimate the baseline specification on the subsample of origin-destination state pairs for which the tax-burden differential exceeds the estimated per capita migration cost, testing whether the estimated fiscal elasticity of migration is larger in this subsample than in the full sample.

Because my proposed measure of migration costs (*MCOST*) rises in proportion to the distance between the origin and destination jurisdictions, it naturally falls below a de minimus threshold for the inter-municipal moves within a given metropolitan region that Tiebout and the bulk of his followers have traditionally studied. *MCOST*, I suggest, is thus a relevant addition to the Tiebout-Tullock intergovernmental competition model only at the interstate and international level. Though Cebula has pioneered quantitative empirical applications of the Tiebout-Tullock model to U.S. interstate migration, the moving cost element has been missing from this line of research. Stated another way, this paper ultimately aims to overcome a difficulty involved in *scaling* the Tiebout model to a geographic level that Tiebout himself never contemplated. The hypotheses described in this paper formalize the intuition that movers tend to select for states whose population centers are nearer to their own than those whose population centers are farther from their own, all else equal.

Part I: The Cebula Model + Migration Cost Estimate

Following Cebula (2009), let MIG_j denote the net in-migration rate to state *j* in period *t*, defined as gross in-migrants minus gross out-migrants as a percentage of state *j*'s beginning-of-period population. The Tiebout-Tullock hypothesis implies that MIG_j is a function of the net fiscal attractiveness of state *j* relative to alternative states of residence, quality-of-life amenities, and economic conditions.

I extend the baseline model as follows:

$$MIG_j = \alpha_0 + \alpha_1 ITAX_j + \alpha_2 PTAX_j + \alpha_3 EDU_j + \alpha_4 PCPI_j + \alpha_5 CRIME_j + \alpha_6 SUN_j + \boldsymbol{\alpha_7 MCOST_j} + \mu_j$$

where:

- $ITAX_j$ = per capita state personal income tax revenue in state *j*, expressed in constant dollars, as a measure of the income tax component of the tax burden of residence (Cebula 2009). I hypothesize $\alpha_1 < 0$.
- $PTAX_j$ = per capita state property tax revenue in state *j*, as a measure of the property tax burden of residence (Cebula 2009). I hypothesize $\alpha_2 < 0$.
- EDU_j = per capita state *and local* government expenditures on elementary and secondary education in state *j*, as a measure of the expected benefit of the most significantly capitalized local public good (Bradbury, Mayer and Case 2001). I hypothesize $\alpha_3 > 0$.
- $PCPI_j$ = per capita real GDP growth (constant 2017 dollars) in state *j* since the prior year, as a measure of economic opportunity. I hypothesize $\alpha_4 > 0$.
- $CRIME_j$ = violent crime rate per 100,000 residents in state *j*, as a quality-of-life disamenity. I hypothesize $\alpha_5 < 0$.
- SUN_j = mean annual number of days of sunshine in state *j*, as a climate amenity following Cebula (2009). I hypothesize $\alpha_6 > 0$.
- $\boldsymbol{MCOST_j}$ = the estimated per capita cost of interstate migration *into* state *j*, described in Section 3 below. I hypothesize $\boldsymbol{\alpha_7 < 0}$: higher migration costs reduce net in-migration by raising the threshold at which migration becomes individually rational for potential in-migrants.
- μ_j = stochastic error term.

The variable $MCOST_j$ is the novel contribution of this paper. Its inclusion formalizes the observation that mobility costs "hobble" Tiebout voters by introducing a friction between the fiscal signal and the migration response. To my knowledge, no prior paper in the Tiebout-Tullock OLS empirical tradition has included an explicit migration cost regressor.

In addition to the distance between the population centers of origin and destination states, MCOST also rises in proportion to the weight or bulk of goods transported. Though the weight or bulk of households' goods in interstate moves is difficult to measure, it may be approximated by the size of households. A comparative application of the same methodology applied here to subsets of interstate migrants by household size could be a fruitful line of future research.

The Migration Cost Measure and the Threshold Filtering Test

I measure $\boldsymbol{MCOST_j}$ as a distance-weighted average of estimated per capita moving costs into state *j*, derived from moving industry estimates of the cost of shipping a household's goods.

To arrive at $MCOST_j$ I employed moving industry pricing structures. I first took the geographic "great circle" miles between the population-weighted center of state *j* and that of each other state, multiplied them by a circuity factor of 1.28 to estimate the number of driving miles from the population centroid of state *i* to that of state *j*, then applied a $2.25 per mile distance cost, which is calibrated to include both rental truck mileage fees and fuel, adjusted it with a flat 2.6% per year price deflator (baseline 2019 dollars), added a scaled labor and equipment fee based on which of three distance categories the driving miles between centroid i and centroid j fell into (if distance < 100 driving mi., $600 fee; > 100 mi. and < 1000 mi., $1,500 fee; > 1500 mi., $3000 fee). Adding this scaled fee to the mileage cost produced a cost per

household, and then divided that cost by 2.588 to estimate the per capita moving cost between each state. (Admittedly, using a combined multiplier of $2.88 per geographic mile does bias the cost of moving to Alaska, or, especially, Hawaii significantly upward). Also, I did not vary the mileage fee per year to account for variation in fuel prices over the 2005-2019 period, though doing so would produce a more accurate moving cost estimator.

$MCOST_j$ is the most difficult regressor in this model to calculate because there is not simply one average household's cost to migrate into a given state per year; at least, such a measure would not be useful. Rather, there are *49 average household's costs to migrate into each state*, each year, for a total of 2,401 state-state pairings. My dataset thus reproduces all the other regressors besides $MCOST_j$ 49 times for each state-state pairing, yielding 36,750 lines of data.

Taking the average of these pairings for each destination state *j*, I derived the average cost per capita of moving into the destination state from another state. Including this $MCOST_j$ measure in the above multivariate regression yields a model with a slightly higher R^2 (0.4256) than the same model without the *MCOST* measure (0.4181).

Let $\boldsymbol{MCOST_{i-j}}$ be the cost of moving from state *i* to state *j*. I compiled a matrix of the tax differentials between every state ($\boldsymbol{\Delta TAX_{ij}}$) and the moving costs between every state ($\boldsymbol{MCOST_{i-j}}$). $\boldsymbol{MCOST_j}$ is the unweighted average cost of moving from each of the other 49 states into state *j*. Unlike prior studies that have either ignored migration costs or absorbed them into structural model parameters (Kennan and Walker 2011), this measure is observable, state-specific, and varies cross-sectionally in a manner consistent with the geographic and demographic heterogeneity of migration flows.

In addition to the baseline OLS specification above, I propose a threshold-filtering test motivated by the theoretical prediction that migration between any origin-destination pair should respond to the fiscal signal only when the tax-burden differential between those states exceeds *MCOST*. Formally, for each origin-destination state pair (*i*, *j*) in period *t*, I define the tax differential as:

$$\Delta TAX_{ij} = TAX_i - TAX_j$$

where TAX_s denotes the state tax burden per capita in state *s*. I define a migration corridor (*i*, *j*) as "Tiebout-efficient" if the NPV(ΔTAX_{ij}) > $MCOST_j$, i.e., if the fiscal gain from relocating from state *i* to state *j* is sufficient to recover the estimated cost of the move. Stated formally, the threshold condition is

$$\text{MCOST} < \Sigma\ [\Delta\text{TAX\_t} / (1+\text{r})\text{^t}] \text{ for t = 1 to T}$$

where T is expected years of residence and r is the discount rate. I assume a fixed expected tenure of 15 years and a standard discount rate of 4%, to compute a single NPV multiplier to apply to the annual tax differential data.

To simply compare MCOST against the annual tax differential would be to compare a stock (a one-time upfront cost) to a single year's flow (annual tax saving). Instead, the correct

threshold condition is MCOST < NPV(ΔTAX_{ij}), where the NPV is calculated over the expected remaining years of residence at a discounted rate. For example, if the average interstate migrant expects to remain in their destination state for 15 years and discounts future savings at 5%, the NPV of an annual tax differential of $1,000 is $10,380, which is more than 10 times the annual tax savings. Thus, the migration cost threshold, if calculated against *annual* tax differentials, would dramatically overstate the number of state-state corridors where the migration cost exceeds the fiscal incentive. Many corridors would fall below the threshold where migration seems fiscally irrational on an annual comparison that should in reality exceed the threshold after taking into account movers' multi-year horizon. This affects which observations to filter out in the subsample test.

I estimate the baseline Tiebout-Tullock specification with and without the *MCOST* regressor on the full sample. I then describe how the next step in research would be to test whether α_1 and α_2 are larger in absolute magnitude in the restricted subsample. A finding that the fiscal coefficients are significantly larger in the restricted sample would constitute evidence that below-threshold migrations attenuate fiscal elasticity estimates in the full sample, consistent with the hypothesis that migration costs function as a threshold below which the Tiebout-Tullock mechanism is effectively suspended.

Data

Net in-migration data are from the Census Bureau's annual American Community Survey and are available for the full period 2005–2019. Per capita education expenditures and property tax revenues are from the Census Bureau's Annual Survey of State and Local Government Finances. Per capita personal income growth data are from the Bureau of Labor Statistics. Violent crime rates are from the FBI Uniform Crime Reporting / Crime Data Explorer. Sunshine data are from the National Oceanic and Atmospheric Administration. The panel of 50 states spans 15 years (2005-2019), yielding 750 state-year observations. Moving costs are from CrossCountryMovingCost.com which aggregates pricing from many long-distance moving companies.

Expected Findings and Limitations

I expect $\alpha_7 < 0$: states that are costlier to migrate into, whether due to distance from major population centers, higher housing transaction costs, or other measured frictions, should receive fewer net in-migrants, holding fiscal and amenity variables constant. I further expect that the estimated fiscal elasticity of migration will be larger in absolute value in the Tiebout-efficient subsample than in the full sample, consistent with the hypothesis that migration costs suppress the fiscal signal below the threshold.

The primary limitation of this study is that the migration cost measure is estimated rather than directly observed for individual households, and variation in time preference rates and non-pecuniary moving costs across households is not captured. Future work might address this by using individual-level migration data matched to household moving expenditures.

In my migration cost threshold condition, **T** is not fixed and is itself likely correlated with the other variables. For example, younger migrants tend to have longer expected tenures in their

destination state than older migrants and therefore face a higher NPV(ΔTAX_{ij}), meaning they should be more sensitive to interstate tax differentials at the margin than older migrants.

This heterogeneity in T predicts that the Tiebout-Tullock fiscal signal should be stronger for younger migrants, but I cannot test with state-level aggregate data that does not break down migration flows by age cohort. NPV(ΔTAX_{ij}) varies not only with the age, but also with the occupation status and homeownership status of a household's members because, for example, retired homeowners may not consider interstate income tax differentials but may be very sensitive to property tax differentials, whereas working-age renters may have the inverse sensitivities.

Empirical Results

My reconstruction of the Cebula model without the addition of *MCOST* explains 41.8% of the variance in net in-migration ($R^2 = 0.418$), with an adjusted R^2 of 0.413 and a predicted R^2 of 0.385. This is weaker than the adjusted R^2 of 0.56 reported by Cebula 2009, due probably to his inclusion of local property tax data which my reconstruction neglects to include.

Income Tax Revenue Per Capita ($\alpha = -4.87E\text{-}6$, $p < 0.0001$): Higher state income tax burdens are associated with lower net in-migration. This finding is highly significant. The correlation coefficient (Beta) of -0.434 makes it the single most influential variable in the model. This replicates and confirms Cebula's central result.

Violent Crime Rate ($\alpha = -1.55E\text{-}5$, $p < 0.0001$): Negative and highly significant, as expected. Higher violent crime rates are associated with lower net in-migration. The Beta of -0.229 makes this the model's second strongest predictor. This is consistent with the quality-of-life disamenity logic and mirrors Cebula's findings.

Sunshine Days Per Year ($\alpha = 8.37E\text{-}5$, $p < 0.0001$): Positive and highly significant, as expected. More sunshine attracts net in-migrants, consistent with Cebula's climate amenity variable. Beta = 0.225, making it the third strongest predictor and nearly equal in magnitude to the crime variable.

Real GDP Growth Per Capita ($\alpha = 5.47E\text{-}7$, $p = 0.006$): Positive and significant, consistent with the prediction that economic opportunity attracts migrants. Though the model's weakest significant variable (Beta = 0.078), it nevertheless achieves conventional significance with the correct sign.

Property Tax Revenue Per Capita ($\alpha = 1.08E\text{-}6$, $p = 0.433$): This is the only variable that fails to achieve statistical significance; the null hypothesis is accepted. The great majority of property tax revenue is raised at the municipal rather than the state level, and my reconstructed Cebula model fails to include municipal property tax revenue. Including exclusively state-level property tax data in my regression failed to capture the most relevant disincentive for in-migration.

Education Spending Per Capita ($\alpha = -3.01E\text{-}6$, $p < 0.0001$): The model shows a negative coefficient at a highly significant level, implying that higher per capita education spending is associated with *lower* net in-migration, which is the opposite of what Tiebout theory predicts.

Education spending should attract migrants as a valued local public good. This result is very likely a case of reverse causality. States suffering net out-migration see an increase in per-capita spending on the remaining students. This may perhaps be corrected by employing a time delay by including the prior year's spending level rather than the current year's level.

Variable	**Sign**	**Significant?**	**Matches Theory?**
Income tax burden	−	Yes (strongly)	Yes
Violent crime rate	−	Yes (strongly)	Yes
Sunshine days	+	Yes (strongly)	Yes
GDP growth per capita	+	Yes (weakly)	Yes
Education spending	−	Yes (strongly)	No
Property tax burden	+	No	No

Including MCOST in the Model:

Metric	Without MCOST	With MCOST	Direction
R^2	0.41810	0.42564	↑ +0.0075
Adjusted R^2	0.41340	0.42022	↑ +0.0068
Predicted R^2	0.38466	0.39026	↑ +0.0056
AIC	−6.8415	−6.8519	↑ Better
BIC	−6.7984	−6.8026	↑ Better
Log likelihood	2572.58	2577.47	↑ +4.89
PRESS RMSE	8.0579E-3	8.0211E-3	↓ Better
Durbin-Watson	1.951	1.987	↑ Closer to 2

Every fit statistic improves when including MCOST. The improvement in Predicted R^2 is particularly meaningful. The fact that MCOST improves predicted as well as in-sample fit confirms that it is contributing genuine explanatory power rather than overfitting.

Interpreting the MCOST Coefficient

α_7 = −1.0449E−5, SE = 3.348E−6, t = −3.121, p = 0.00187

The MCOST coefficient is negative, statistically significant at the 1% level, and in the direction my hypothesis predicted. The null hypothesis is rejected. A one-unit increase in average migration cost (in dollars) into state *j* is associated with a decrease in net in-migration of approximately 1.04E-5 percentage points of the 2005 population, holding all other variables

constant. If the average cost of migrating into a state rises by $1,000, net in-migration falls by approximately 0.0104 percentage points of population, a small but statistically detectable effect.

With a VIF = 1.044, *MCOST* is almost perfectly uncorrelated with the other six regressors. This confirms that migration cost is capturing genuinely independent variation not already absorbed by income taxes, sunshine, crime, or any other variable in the model. The near-zero multicollinearity suggests this concern does not apply here.

With a Beta = -0.0887, *MCOST* ranks fifth among seven predictors, behind income tax (−0.437), crime (−0.238), sunshine (0.227), and education spending (−0.180), but ahead of GDP growth (0.073) and property tax (0.029). This is a moderate effect, which is appropriate: migration costs are a friction on the Tiebout mechanism, not the driver of the mechanism itself. When MCOST is added, the coefficients on the other variables are stable:

Variable	**Without MCOST**	**With MCOST**	**% Change**
Income tax	−4.867E−6	−4.903E−6	+0.7%
Violent crime	−1.546E−5	−1.603E−5	+3.7%
Sunshine	+8.373E-5	+8.468E-5	+1.1%
GDP growth	+5.473E-7	+5.105E-7	−6.7%
Education spending	−3.011E−6	−3.268E−6	+8.5%
Property tax	+1.079E-6	+1.277E-6	+18.4%

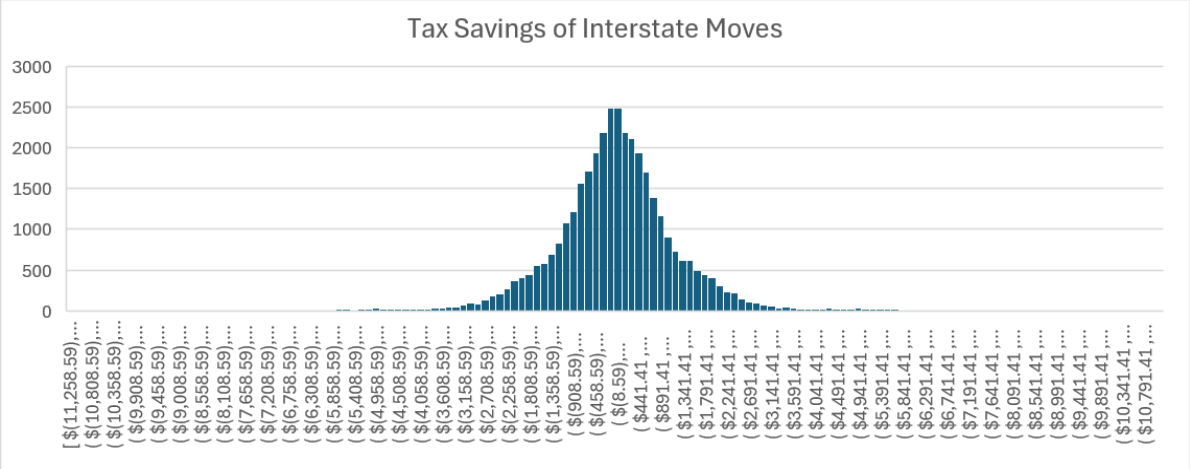
The income tax coefficient, the most important variable in any Tiebout-Tullock model of interstate migration, is essentially unchanged (+0.7%), confirming that *MCOST* is not competing with or absorbing the fiscal signal. The two variables are complementary rather than substitutes. The property tax coefficient increased by 18.4% when *MCOST* was added, though it remains insignificant ($p = 0.351$), suggesting a weak interaction between property tax burden and migration costs.

The intercept changed dramatically, from 0.01119 to 0.03556, as expected. The intercept now represents the predicted net in-migration rate for a state with zero average migration cost and all other variables at zero, a hypothetical but internally consistent baseline that includes the positive contribution of the *MCOST* variable being "switched off."

The coefficient on average migration cost is negative and significant at the 1% level (α = -1.045E-5, p = 0.002), consistent with the hypothesis that migration costs function as a friction on the Tiebout-Tullock sorting mechanism. The inclusion of this variable does not attenuate the estimated coefficient on income tax burden, which remains stable at -4.903E-6 ($p < 0.001$), suggesting that migration costs and fiscal differentials operate as independent and complementary determinants of net state in-migration rather than as collinear proxies for the same underlying phenomenon.

Threshold Filter:

Of the 36,750 state-state corridors over the 15-year period studied (49 x 50 = 2,450 per year), 18,868 corridors yield positive tax savings. Of those, however, 86.9% yield very small tax savings of less than $1000 per year. Thus, the vast majority of the tax savings associated with a given corridor are less than their associated MCOST. Only 2,466 corridors yield tax savings greater than my estimated MCOST measure in the first year.



However, given that tax savings compound annually while MCOST is a one-time expense, the long-run tax savings of a given interstate move exceed MCOST for many of these corridors. Specifically, 15,760 are Tiebout-efficient if the consumer-voter remains in the destination state for 10 years, assuming unchanged tax policy. That 3,198-corridor difference between the 18,867 corridors that are Tiebout-efficient only under conditions of costless migration and the 15,669 that I estimate are efficient (after 10 years) despite facing MCOST, captures the bias toward overestimation of migrations in a traditional Tiebout-Tullock model of interstate migration. My threshold filter test thus removes these 3,198 corridors that bias the blackboard Tiebout model because they yield tax savings too small to incentivize movers to overcome migration costs, ($\Delta TAX > 0$ and ($\Delta TAX * 10$) - $MCOST < 0$). On the basis of only the remaining 33,642 corridors (36,750 - 3108) that can overcome migration friction, I would rerun the regression described above.

Part II: Potential Further Model Specifications: Revenue and Expenditure Composition

Following Cebula (2009, 2024), let MIG_j denote the net in-migration rate to state *j*, defined as gross in-migrants minus gross out-migrants as a percentage of state *j*'s beginning-of-period population. The standard Tiebout-Tullock hypothesis holds that MIG_j is a positive function of the expected net fiscal benefit of residence in state *j* relative to the available alternatives, and a positive function of quality-of-life amenities and economic opportunity. I propose extending this baseline model by incorporating three novel fiscal variables: the migration cost measure already discussed, as well as a municipal non-tax revenue ratio, and a low-capitalization expenditure share. The full specification is:

$$MIG_j = \alpha_0 + \alpha_1 ITAX_j + \alpha_2 PTAX_j + \alpha_3 EDU_j + \alpha_4 PCPI_j + \alpha_5 CRIME_j + \alpha_6 SUN_j + \alpha_7 MCOST_j + \boldsymbol{\alpha_8 NTREV_j + \alpha_9 LCAP_j} + \mu_j$$

where $ITAX_j$, $PTAX_j$, EDU_j, $PCPI_j$, $CRIME_j$, SUN_j, and $MCOST_j$ are defined as in Part I, and the two novel variables are defined as follows.

$\boldsymbol{NTREV_j}$ = the population-weighted average share of own-source general revenue derived from service charges and miscellaneous non-tax revenues across municipalities with population of 25,000 or greater in state *j*, excluding all intergovernmental transfers from the denominator, constructed from the Census Bureau's Annual Survey of State and Local Government Finances.

$NTREV_j$ may operationalize the degree to which the municipal fiscal environment of state *j* is financed according to the benefit principle of public finance, that is, the degree to which residents pay for public services through voluntary user charges tied to individual consumption rather than through compulsory general taxation levied on all residents regardless of consumption. Following the theoretical tradition of Wicksell (1896), jurisdictions that finance a larger share of services through benefit-principle mechanisms can provide a given quantity and quality of public services at a lower compulsory tax cost to the general resident. This increases the net fiscal attractiveness of state *j* to a potential in-migrant who will pay user charges only insofar as she chooses to consume the corresponding services, while bearing the full general tax burden regardless of preference.

The expected sign on $NTREV_j$ is positive: $\alpha_8 > 0$. States whose municipalities finance a larger share of services through current charges should attract more net in-migration, ceteris paribus, because they decouple the tax cost of residence from the service benefit in a manner that is unambiguously welfare-improving from the Tiebout perspective. That this effect is theoretically expected to be larger at the municipal level than at the state level, where non-tax revenue shares are more compressed in cross-sectional variation; the state-level test proposed here therefore represents a conservative estimate of the underlying mechanism, and a null finding should be interpreted as motivating municipal-level replication rather than as evidence against the hypothesis.

$\boldsymbol{LCAP_j}$ = per capita state and local government expenditure in state *j* on the subset of spending categories identified empirically as exhibiting low or negative capitalization into residential property values, expressed as a share of total per capita own-source expenditure.

$LCAP_j$ operationalizes the concept of fiscally wasteful expenditure within the Tiebout-Tullock framework. I define low-capitalization spending as expenditure in categories for which a separate hedonic regression of median residential property values on per capita spending, controlling for state income, population density, and other standard covariates, yields a coefficient that is either statistically insignificant or negative at conventional levels. This definition is grounded in the established fiscal capitalization literature (Oates 1969; Brueckner 1982; Bradbury, Mayer and Case 2001), which holds that spending on genuinely valued local public goods should capitalize positively into property values as households bid up the price of residence in jurisdictions that provide superior services. Spending that fails this test either does not produce resident benefits detectable in asset markets, produces benefits that accrue to non-residents or non-property-owning residents, or is provided at a level beyond the welfare-maximizing quantity. In all three cases, from the perspective of the marginal mobile household making a location decision, such spending represents a tax cost without a corresponding locational benefit, the operational meaning of waste in the Tiebout model.

The expected sign on $LCAP_j$ is negative: $\alpha_9 < 0$. States that devote a larger share of expenditure to low-capitalization categories impose a higher tax cost per unit of locational benefit on potential in-migrants, reducing net fiscal attractiveness relative to states that concentrate spending in high-capitalization categories, ceteris paribus. This hypothesis generates an additional testable implication: the magnitude of α_9 should be larger in absolute value than the coefficient on high-capitalization spending entered separately, since the Tiebout mechanism predicts that households penalize jurisdictions for wasteful spending more strongly than they reward equivalent amounts of valued spending, the asymmetry arising because valued spending is already priced into housing costs and therefore partially anticipated by in-migrants, whereas wasteful spending represents a pure extraction.

Two-Step Identification Strategy

The construction of $LCAP_j$ requires a prior empirical stage in which the capitalization hierarchy of spending categories is estimated. This two-step procedure introduces a generated regressor problem: if the first-stage capitalization estimates are measured with error, the second-stage coefficient on $LCAP_j$ will be attenuated and its standard error will be understated. Though beyond the empirical scope of this paper, I would address this by constructing $LCAP_j$ using a binary classification, a spending category is either low-capitalization or not, based on whether its first-stage coefficient achieves statistical significance with the expected sign, rather than using the continuous first-stage coefficients directly as weights. This reduces sensitivity to first-stage estimation error relative to a continuous weighting scheme. I would then report standard errors for α_9 to account for the two-stage sampling variation.

On the Conceptual Boundary Between Low Capitalization and Redistribution

One interpretive limitation of $LCAP_j$ warrants explicit acknowledgment. Certain categories of public expenditure, including welfare assistance, Medicaid, corrections, and public housing, may exhibit low or negative capitalization into property values not because they are wasteful in the allocative sense, but because their benefits accrue primarily to low-income or non-property-owning residents whose demand does not express itself in property markets, and because high spending in these categories may signal a fiscal environment that is unattractive to

higher-income in-migrants on grounds unrelated to efficiency. To the extent that redistributive categories enter $LCAP_j$, the estimated coefficient α_9 conflates allocative waste with redistributive intent, and the negative correlation with in-migration reflects fiscal sorting by income as much as a response to inefficiency per se. I would address this by reporting results both for the full $LCAP_j$ measure and for a restricted measure $LCAP^{**}_j$ that excludes expenditure categories whose low capitalization is plausibly attributable to redistribution rather than allocative inefficiency. The difference between the two estimates provides an informal decomposition of the migration response into a sorting-by-income component and an efficiency-response component, and is itself a contribution to the empirical literature on the Tiebout mechanism.

Initial Results of Expenditure Composition Regression:

Though I did not conduct the two-step capitalization test described above, my linear regression model of seven categories of public spending, as grouped by the Urban-Brookings Tax Policy Center, explains approximately 31 percent of the variation in state-level net in-migration ($R^2 = 0.310$), indicating a modest degree of explanatory power given the inherent volatility of migration flows. All eleven predictors are statistically significant at the 5 percent level, as indicated by the model output. Higher unemployment rates and per-capita spending on elementary and secondary education, higher education, public welfare, and other miscellaneous government functions are each associated with *lower* net in-migration, holding other factors constant. In contrast, nominal GDP per capita and per-capita expenditures on health and hospitals, highways, and police are *positively* associated with net in-migration. The largest positive marginal effect is observed for police spending. Taken together, the results reveal statistically detectable associations between fiscal variables and migration patterns.

Public welfare spending exhibits a negative association, where each additional dollar per capita is linked to an 8.7-person reduction in net in-migration. In contrast, health and hospital expenditures display a positive relationship, with each additional dollar predicting an increase of approximately 14 migrants. Highway spending likewise contributes positively, with each additional dollar associated with an increase of about 15 migrants. Police spending has the strongest positive effect, with each additional dollar per capita predicting an increase of roughly 86 migrants. Finally, spending in the "all other" category is negatively associated with migration, with each additional dollar predicting an estimated 7.7-person decline in net in-migration.

A log-level specification of the same data explains roughly 29 percent of the variation in net in-migration ($R^2 = 0.288$), a modest reduction in explanatory power relative to the linear model but one that yields coefficients interpretable as semi-elasticities. In this specification, a 1 percent increase in nominal GDP is associated with an estimated 2078-person *increase* in net in-migration. Turning to expenditure categories, a 1 percent increase in public welfare spending is associated with a 354-person *reduction* in net in-migration. In contrast, health and hospital spending exhibits a positive elasticity, with a 1 percent increase predicting roughly 100 migrants *gained*, while highway spending shows a smaller positive effect of approximately 65 migrants per 1 percent increase. A 1 percent increase in the "all other" spending category is associated with a 308-person *decline* in net in-migration.

Both models indicate that higher spending on K–12 education, higher education, public welfare, and "other" government functions is associated with lower net in-migration, likely due

to reverse causality (states with net migration outflows may see an increase in per capita school spending if their education budgets are inelastic to population), while spending on health, highways, and police tends to be associated with *higher* migration flows.

Conclusion

This first part of this paper has proposed and tested an extension of the Tiebout-Tullock model of interstate migration, each addressing a gap in the existing empirical literature that traces its lineage to Cebula (2006) by introducing migration costs as an explicit determinant of net state in-migration, correcting the zero-transaction-cost assumption that the Tiebout-Tullock empirical tradition has inherited uncritically from Tiebout (1956). My results support the hypothesis that higher migration costs reduce net in-migration, ceteris paribus, and, more distinctively, provide confirmatory evidence for the threshold-filtering prediction: the inverse relationship between per capita state tax revenues and net in-migration is predicted to be stronger among the subset of origin-destination corridors for which the net present value of the tax-burden differential exceeds the estimated per capita cost of migration, consistent with the theoretical prediction that the Tiebout-Tullock fiscal signal operates above a threshold of rational migration rather than continuously across all state pairs.

The second part of this paper proposed two further extensions of the Tiebout-Tullock model as applied to interstate migration for future research. In the first proposal, population-weighted municipal non-tax revenue share is introduced as a novel regressor in the Tiebout-Tullock equation, motivated by the benefit-principle tradition in fiscal federalism theory. The hypothesis states whose municipalities finance a larger share of services through voluntary user charges are more attractive to net in-migrants,

The third extension operationalizes government waste within the Tiebout framework by constructing a low-capitalization expenditure share, the proportion of own-source spending devoted to categories that fail to capitalize positively into residential property values in a prior hedonic regression, and testing whether this measure is negatively correlated with net in-migration. The hypothesis states that households penalize jurisdictions for fiscally unproductive spending in their location decisions and that the migration response therefore reflects allocative inefficiency rather than income-based fiscal sorting alone.

Taken together, these three proposals suggest that the Tiebout-Tullock model of residential sorting is enriched by explicit attention to the frictions, financing mechanisms, and expenditure composition that standard Tiebout models treat as either absent or homogeneous. Future work should extend the migration cost and non-tax revenue analyses to the county or municipal level, where theory predicts the underlying mechanisms operate most forcefully, and should seek instrumental variables strategies capable of addressing the endogeneity concerns that the cross-sectional OLS design of the present study cannot fully resolve. Notwithstanding these limitations, the results of the research projects proposed here may suggest that how states raise and spend their revenues matters for residential attractiveness in ways that go meaningfully beyond the aggregate tax burden and education expenditure measures that have anchored the Tiebout-Tullock empirical literature since Cebula (2002).

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