

A Re-examination on the Tiebout Hypothesis and Migration: A Case Study on the City and State Government in the U.S.

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I. Introduction

One of the most significant article in the area of local public finance and residential choice theory is the Tiebout's article. Charles Tiebout (16) hypothesized that if consumer-voters are fully mobile, then "the consumer-voter may be viewed as picking that community which best satisfies his preference pattern for public goods. . . . And given revenue and expenditure patterns, the consumer-voter moved to that community whose local government best satisfies his set of preferences."¹⁾

This "Tiebout Hypothesis" implies that locally provided public services and the level of local taxes influence residential choice decisions of households. The approach employed is to analyze the determinants of residential choice by looking at the pattern of human migration.

There were many previous examination on the Tiebout hypothesis. But those have mainly concentrated on the capitalization of taxes and spending into property values rather than on migration. And also most previous examinations on the Tiebout hypothesis have concentrated on the study of the inter-jurisdictional differences (Oates, 1969) or the intra-jurisdictional differences (Hamilton, 1976) not the inter-cities differences or inter-states differences.

So, the purpose of this paper is to re-examine the Tiebout hypothesis in terms of migration effects in inter-large cities and inter-states.

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1) Tiebout, C., "A Pure Theory of Local Expenditures," *Journal of Political Economy*, Vol. 65, October 1956, p. 418.

II. Theoretical Review on the Tiebout Model

The Tiebout hypothesis is based on several assumptions. Some of major assumptions are following:

1. Consumer-voters are fully mobile and will move to that community where their preference patterns, which are set, are best satisfied.
2. Consumer-voters are assumed to have full knowledge of differences among revenue and expenditure patterns and to react to these differences.
3. There are a large number of communities in which the consumer-voters may choose to live.
4. Restrictions due to employment opportunities are not considered. It may be assumed that all persons are living on dividend income
5. The public services supplied exhibit no external economies or diseconomies between communities.

Given above assumptions, Tiebout argued that the act of moving or failing to move is crucial. Moving or failing to move replaces the usual market test of willingness to buy a good and reveals the consumer-voter's demand for public goods. Thus each locality has a revenue and expenditure pattern that reflects the desires of its residents. And if the consumers move to the community whose law happens to fit their preference pattern, they will be at their optimum.²⁾

In fact, this Tiebout model really has two Tiebout hypotheses. One is the net benefit capitalization effect of the market clearing process for a given public good partitioning of the population. The other is the homogeneity of income within jurisdictions which emerges as a result of the dynamic sorting or partitioning process.

One of them which is the first and best known study of this type was conducted by Oates. Oates' study reported the findings of cross-sectional study of the effects of local property taxes and local expenditure programs on property values. By estimating the capitalization of location-specific characteristics into housing, Oates identifies fiscal characteristics as a significant factor in an average household's residential choice decision. According to Oates' results, it appears consistent with a model of the Tiebout variety in which rational consumers weigh (to some extent at least) the benefits from local public services against the cost of their tax liability in choosing a community of residence: people do appear willing to pay more to live in a community which provides a high-quality program of

2) Tiebout, C., *Ibid.*, pp. 419-21.

public services (or in a community which provides the same program of public services with lower tax rates).³⁾

Similar capitalization studies have been conducted by Noto (12), Edelstein (5), Edel and Sclar (4), Meadows (11), Hamilton (8), and Reschovsky (15) among others. Especially, Edel and Sclar, and Hamilton had demonstrated that the relationship between capitalization and the Tiebout hypothesis depends crucially on the elasticities of supply and demand for locations. Capitalization indicates consumer sensitivity to fiscal factors, and a Tiebout disequilibrium. But, in the pure Tiebout world, where a perfect elastic supply of locations with any given mix of fiscal factors exists, there would be no capitalization of fiscal factors even though fiscal consideration may be important in residential choice decisions.

There are several disadvantages of using capitalization for studying residential choice behavior. One of them is that studying capitalization does not enable us to distinguish different residential choice patterns of households of different socio-economic groups. So, recently, Reschovsky showed us an evidence that locational preferences differ considerably among income and social classes.

According to Reschovsky's empirical study⁴⁾ which pertain to moving behavior, he found that fiscal factors—clearly the local public sector—significantly affect the residential choice decisions of various income and housing tenure groups in quite different ways. And his test of Tiebout hypothesis is complementary to the capitalization studies conducted by Oates and others.

The other study on the Tiebout hypothesis is concerned about the homogeneity of income within jurisdictions. As an alternative to the capitalization approach, Eberts and Gronberg tested the Tiebout model.

In fact, the Tiebout foot voting mechanism suggests that households will sort and stratify into (approximately) homogeneous local public goods jurisdictions. At a point in time, the efficiency of the sort will be positively related to the number of existing jurisdictions. Using a measure of homogeneity introduced by Theil, Eberts and Gronberg tested empirically the relationship between stratification (homogeneity within jurisdiction) and number of jurisdictions by employing a little-used though powerful decom-

3) Oates, W. E., "The Effects of Property Taxes and Local Public Spending on Property Values: An Empirical Study of Tax Capitalization and the Tiebout Hypothesis," *Journal of Political Economy*, LXXVII, Nov./Dec. 1969, pp. 957-71.

4) Reschovsky, A., "Residential Choice and the Local Public Sector: An Alternative Test of the Tiebout Hypothesis," *Journal of Urban Economics*, October 1979, 6(4), pp. 501-20.

possible measure of inequality. The results of a sample of school districts within 33 SMSAs indicated that an increase in the number of local jurisdictions promotes within community homogeneity thus confirming the version of Tiebout hypothesis which is the homogeneity of income within jurisdictions which emerges as a result of the dynamic sorting or partitioning process.⁵⁾

One of very recent studies on the Tiebout hypothesis is Grubb's paper. The Tiebout model implies, under certain assumptions, that communities will become increasingly homogeneous by income and preferences, and perhaps by race, land use, and other community characteristics. Grubb tested the hypothesis of increasing homogeneity with equations describing changes among Boston area communities between 1960 and 1970. The results confirmed increasing segregation by income and segregation by age, but other community characteristics show no distinct trend. The system of equations was used to forecast community characteristics, and these projections confirmed a tendency toward greater inequality in public spending. The results imply that the Pareto-optimality of the Tiebout model will not be attained and that any efficiencies may come at the expense of greater inequities.⁶⁾

But above these previous examinations of the Tiebout hypothesis are not complete to explicitly explain to find the motivations of migration. Before empirically examining on the migration effect in response to the local public goods, I would like to briefly reproduce the Aaron's mathematical model⁷⁾ which is based on the strong and typically unrealistic assumptions. But it will be very helpful to understand the coming my empirical results in section III.

Under the strong, and typically unrealistic, assumptions that (a) tax payers reveal their true preferences, (b) local decisions take into account all local preferences, but none from outside the community, and (c) the public good is not used to redistribute income, a rational, utility-maximizing community will set the output of that good so that the sum of the private marginal rates of substituting between it and private incomes is equal to its marginal cost.

5) Eberts, R. and Gronberg, T., "Jurisdictional Homogeneity and the Tiebout Hypothesis," *Journal of Urban Economics*, September 1981, 10(2), pp. 227-239.

6) Grubb, W., "The Dynamic Implications of the Tiebout Model: The Changing Composition of Boston Communities, 1960-1970," *Public Finance Quarterly*, January 1982, 10(1), pp. 17-38.

7) Aaron, H., "Local Public Expenditures and the Migration Effect," *Western Economics Journal*, December 1969, 7(4), pp. 385-90.

Let

$$U^i = U^i (v, w, x) \quad (1)$$

be the utility function of household i residing initially in the jurisdiction. A certain quantity, v , of the pure public goods, V , enters irreducibly in the utility function of every household. Commodity W is also provided collectively, but in equal amounts, w , to each household; unlike v , each share, w , is consumed exhaustively by each household. A composite measure of all private goods consumed by each household is denoted by X .

The costs of v and w are borne equally by each household, so that all pay taxes, s , in the amount $s = t + p_w w$, where $t = p_v v/n$, and where n is population and p_j is the price of the j -th good. In addition, let population depend on the local tax rate and the supply of w , so that

$$n = H(w, s) \quad \partial H / \partial w > 0 \quad \partial H / \partial s < 0 \quad (2)$$

Equation (2), following Tiebout, presumes that resident households may differ from potential migrants at least with respect to their valuation of W . In addition, there must exist a number of households ready to migrate to communities offering more W than they have been consuming and to pay the full cost. The mathematical content of this assumption is shown following equation (8) below.

Household i maximizes utility subject to the budget constraint $y = s + p_x x$ where y is income.

Forming the Lagrangean expression

$$Z^i = U^i (v, w, x) + \lambda (y - s - p_x x) \quad (3)$$

the first order conditions for a utility maximum yield

$$\partial U^i / \partial w = \lambda ds / dw. \quad (4)$$

To evaluate ds/dw , note that

$$ds = p_w dw - (p_v v / n^2) dn \quad (5)$$

$$dn = (\partial n / \partial w) dw + (\partial n / \partial s) ds. \quad (6)$$

Substituting (6) into (5) yields

$$ds = [P_w dw - P_v v / n^2] (\partial n / \partial w) dw \quad [1 + (P_v v / n^2) (\partial n / \partial s)]^{-1} \quad (7)$$

which reduces to

$$ds / dw = [p_w - (p_v v / n^2) \partial n / \partial w] [1 + (p_v v / n^2) (\partial n / \partial s)]^{-1} \quad (8)$$

Without loss of generality, we may measure W in units such that $P_w = 1$. In

that case, $ds/dw \geq p_w$ as $(\partial n/\partial w) \geq -(\partial n/\partial s)$. If the assumption stated earlier— that there are households ready to migrate to communities offering more W and to pay the full cost is true, then $\partial n/\partial w > -\partial n/\partial s$ so that $ds/dw < p_w$. Accordingly, households will consume more W than they would if they ignored the impact of the supply of W on migration.

Because of the migration effect, utility maximization for the community requires that output of w should be carried further than the direct marginal utility, $\partial U_i/\partial w$, and marginal cost, P_w , would indicate. Specifically, output of w should be increased as long as the decline in per capita costs of other public goods offsets the amount by which the marginal utility of w falls short of its marginal cost. Conceivably, utility maximization might require that the marginal utility of w be negative.

The importance of the migration effect may vary considerably from one municipality to another. Municipalities with large populations, in which minimum or near-minimum cost of most municipal public goods has been achieved, would be less affected than would smaller municipalities that could expect some major reduction in per capita cost of urban services from an increase in population. This difference would be particularly marked in small communities located close to large ones, so that choice of a new residence would not require people to change jobs and make other unsettling adjustments.⁸⁾

But Aaron's model misrepresents the way in which the providing local public services enters household utility functions, chiefly by omitting intra-municipality effects (by assuming that all households directly consume w) and by treating spillovers in a simpler manner than would be appropriate. Particularly, his model did not much reflect the property of nonexclusive public goods and consumer-voters will often have an incentive to understate the intensity of their preferences, and to "free-ride".

In facts, Aaron's study was limited by considering municipalities in a certain area rather than between areas. So, my following empirical study on Tiebout hypothesis will be concentrated on migration effect between areas (i.e., not intra or inter-municipalities, but inter-cities or inter-large urban areas).

III. Empirical Study

One of implications on the Tiebout hypothesis is, if real income differentials between areas are small, then comparison of the real tax burden

8) Aaron, H. *Ibid.*, pp. 386-89.

and the real expenditures on public goods in each community with other communities determines the ultimate location decision. Other things equal, the individual prefers areas with low real tax burdens, because with a lower real tax burden his disposable real income for purchasing private commodities is greater and hence so is his utility level. Or, other things equal, the individual prefers areas providing higher real levels of public services under given real tax burden.⁹⁾

Empirical research on the migration effects of local government policies has been preformed by a number of authors. As Professor Cebula pointed out, these studies have two common traits. First, they tend to stress the impact of a particular government policy, especially welfare benefits. This presents a problem, since it neglects other facets of local government policy, such as taxes. In other words, these studies have not attempted to examine whether would-be migrants examine various nonwelfare benefits or taxes in their decision calculus. A second trait common to these studies is that they all ignore geographic living-cost differentials. By ignoring such differentials, the consumer-voter is viewed as making locational decisions on the basis of nominal values rather than real values.¹⁰⁾

1. Cebula's Model and Empirical Results:

Cebula empirically tested the Tiebout hypothesis by investigating a migration model that takes into account not only fiscal and labor market conditions in different areas, but also geographic cost of living differentials.

Cebula estimates the following two equations by ordinary least squares:

$$M_i^w = \alpha_0 + \alpha_1 Y_i + \alpha_2 U_i + \alpha_3 W_i + \alpha_4 T_i + \alpha_5 E_i + \alpha_6 H_i + \mu \quad (1)$$

and

$$M_i^n = b_0 + b_1 Y_i + b_2 U_i + b_3 W_i + b_4 T_i + b_5 E_i + b_6 H_i + \mu'', \quad (2)$$

where

M_i^w = gross number of white in-migrants under the age of fifty to area i, 1965-1970, expressed as a percentage of the 1965 white population in area i

M_i^n = gross number of nonwhite in-migrants under the age of fifty to area i, 1965-1970, expressed as a percentage of the 1965 non-

9) Cebula, R., "An Empirical Note on the Tiebout-Tullock Hypothesis," *The Quarterly Journal of Economics*, XCII, November 1978, p. 705.

10) Cebula, R., *Ibid.*, p. 706.

white population in area i

Y_i = real earnings per capita in area i , 1966

U_i = average unemployment rate in area i , 1965

W_i = average monthly welfare payment per recipient family in area i in the form of aid to families with dependent children (AFDC), 1966, expressed in real terms

T_i = per capita property tax in area i , 1966, expressed in real terms

E_i = public educational spending per full-time student in area i , 1966, expressed in real terms

H_i = average annual cost of housing for a four-person family in area i , 1966

α_o, b_o = constants

μ', μ'' = error terms

The OLS estimates of equations (1) and (2) are given by (3) and (4) respectively:

$$\begin{aligned} M_i^w = & -35.294 + 0.004Y_i - 2.359U_i - 0.103W_i \\ & \quad (+2.00) \quad (-1.76) \quad (-1.27) \\ & - 0.176T_i + 0.031E_i - 0.006H_i \\ & \quad (-1.92) \quad (+2.42) \quad (-2.42) \end{aligned}$$

$$DF = 29, \quad R^2 = 0.81, \quad (3)$$

$$\begin{aligned} M_i^p = & 10.162 + 0.002Y_i + 1.650U_i + 0.221W_i \\ & \quad (+1.84) \quad (+0.88) \quad (+2.38) \\ & + 0.091T_i + 0.028E_i - 0.004H_i \\ & \quad (+0.80) \quad (+1.88) \quad (-1.26) \end{aligned}$$

$$DF = 29, \quad R^2 = 0.73, \quad (4)$$

where terms in parentheses are t -values.

Of the twelve coefficients estimated, eight are significant at the 0.05 level or beyond with the expected sign. The R^2 for estimate (3) is 0.81, so that the model explains over four-fifths of the white migration; the R^2 for estimate (4) is 0.73, so that nearly three-fourths of the nonwhite migration is explained.

As for the nonpolicy variables, equation (3) shows that real earnings, the unemployment rate, and housing costs were significant determinants of white migration over the 1965-1970 time period. Equation (4) indicates that while real earnings played an important role in influencing nonwhite migration over the period, housing costs and the unemployment rate

did not.¹¹⁾

2. Modified Cebula's Model and Empirical Results of Large City Governments

In this section, I empirically test the Tiebout hypothesis by investigating a migration model. Where, a basic assumption is that consumer-voters maximize their utility and choose their residential location to maximize utility. So, the previous Tiebout assumptions, 1-5, in section II still hold. But in order to precisely investigate the migration effect, we need to relax some of the assumptions of the Tiebout model and to take into account labor market condition. Basically, the model is quite similar to the Cebula's estimated models. In other words, the models which are based on the Tiebout hypothesis take into account not only fiscal and labor market conditions in different areas, but also geographic cost of living differentials.

But unlike many of the previous examinations of the Tiebout hypothesis, I concentrate on the migration effects of the inter-large cities rather than the inter or intra-jurisdiction of a specifically limited area. In other words, my basic intention of this empirical test is to re-examine whether the Tiebout hypothesis is still applicable for a little more higher local government's level such as the inter-large cities not a inter-small jurisdictions in terms of migration effect. So, I used the twenty-two large cities, data of the SMSAs of the U.S. from 1970 to 1977.

To investigate the Tiebout hypothesis, the following basic model is consisted of various variables for the empirical test.

$$NM_i = \beta_0 + \beta_1 Y_i + \beta_2 U_i + \beta_3 LC_i + \beta_4 T_i + \beta_5 E_i + \mu$$

where,

- NM_i = the total number of net migration in area i
- Y_i = per capita real income in area i
- U_i = the average number of unemployment in area i
- LC_i = annual real total living cost for a four-person family in area i
- T_i = per capita real tax burden in area i
- E_i = per capita real local government expenditures in area i
- β_0 = constant
- μ = error term

The above formula of model is simplified expression for convenience. But in the process of estimation of model, I will rename the each variables, and

11) Cebula, R., *Ibid.*, p. 709.

substitute, add or reduce some variables for various purposes.

Even though there is no doubt that Cebula's study represents a significant contribution to the literature, and especially his study on migration effect by race had a good trial, but I think his model has some problems. First, his dependent variable M_i represents gross number of in-migrants to area i , 1965-1970, expressed as a percentage of the 1965. Actually, this dependent variable represents as a flow concept. But his all independent variables were 1965 or 1966's stock concept. For instance, Y_i is real earnings per capita in area i , 1966, U_i is unemployment rate in area i , 1965, T_i is per capita property tax in area i , 1966, and E_i is public educational spending per full-time student in area i , 1966. These stock independent variables are not enough to represent the socio-economic characteristics of over the 1965 to 1970 time period. Second, his dependent variable - M_i only represents in-migrants to area i . He did never take account out-migrant and natural population growth of area i . Suppose a specific area's natural population growth is relatively higher than other areas or, if a specific area's out-migrants are relatively greater than in-migrants during a certain period, then the effects could be quite different. So I think his models should be reconsidered.

In case of my estimated models, I try to improve above problems. And in my models, unlike Cebula's models, I did not distinguish it by race and did not exclude over the age of fifty in order to examine the effect of migration to the economy as a whole. My results of empirical tests by ordinary least square are the following:

Comparison of Various OLS Results of City Governments

$$(1) \text{ NM} = 1777.7 - 2.99\text{ANUEP} - 0.23\text{ACTLC} + 1.70\text{ACPTAX} + 1.25\text{ACEDE}$$

$$(4.55) \quad (-7.70) \quad (-4.60) \quad (2.44) \quad (1.05)$$

$$R^2 = 0.88$$

$$(2) \text{ NM} = 1828.9 - 3.04\text{ANUEP} - 0.22\text{ACTLC} + 1.91\text{ACPTAX} + 0.06\text{ACTE}$$

$$(3.96) \quad (-7.54) \quad (-3.64) \quad (2.52) \quad (0.17)$$

$$R^2 = 0.87$$

$$(3) \text{ NM} = 1797.6 - 3.00\text{ANUEP} - 0.21\text{ACTLC} + 1.91\text{ACPTAX} + 0.15\text{CTE}$$

$$(4.47) \quad (-7.39) \quad (-4.42) \quad (2.78) \quad (0.33)$$

$$R^2 = 0.87$$

$$(4) \text{ NM} = 1623.8 - 2.72\text{ANUEP} - 0.20\text{ACTLC} + 0.33\text{CTTAX} + 0.39\text{ACWLE}$$

$$(3.13) \quad (-5.70) \quad (-3.15) \quad (0.42) \quad (0.43)$$

$$+ 1.87\text{ACEDE}$$

$$(1.23)$$

$$R^2 = 0.84$$

- (5) $NM = 1594.4 - 2.79ANUEP - 0.17ACTLC + 0.79CTTAX + 0.44ACWLE$
 (3.03) (-5.80) (-2.88) (1.14) (0.47)
 $R^2 = 0.82$
- (6) $NM = 1512.4 + 0.09ACPPI - 0.21ACTLC + 0.40CTAX + 0.32ACTE$
 (2.49) (0.97) (-6.25) (0.46) (0.64)
 $R^2 = 0.83$
- (7) $NM = 1610.5 + 0.06ACPPI - 2.90ANUEP - 0.21ACTLC + 0.55ACTTAX$
 (2.76) (0.47) (-5.92) (-2.75) (0.47)
 + 0.18ACTE
 (0.25)
 $R^2 = 0.83$
- (8) $NM = 1741.8 - 0.09ACPPI - 4.04NUEP - 0.15ACTLC + 1.92CTTAX$
 (3.19) (-0.86) (-5.62) (-2.29) (2.35)
 -0.04ACWLE
 (-0.04)
 $R^2 = 0.82$
- (9) $NM = 1804.9 - 0.11APPI - 3.97NUEP - 0.10ATLC + 1.22TTAX$
 (2.87) (-1.44) (-5.32) (2.12) (2.60)
 -0.46ATWLH
 (-0.80)
 $R^2 = 0.80$

where the figures in parentheses are t-values.

NM = total number of net migration in area i, 1970-1977 Net migration is defined the difference between the number of persons moving into a particular area and the number of persons moving away from the area. And net migration is estimated by subtracting natural increase from the net population change. A positive figure indicates net in-migration to the area and a negative figure indicates net out-migration from the area.¹²⁾

ANUEP = average number of unemployment in area i, 1970 and 1977.

ACTLC = average real annual total living cost for a four person family in area i, 1970 and 1977

ACPTAX = average real per capita property tax in area i, 1970 and 1977

12) Refer to the State and Metropolitan Area Data Book 1979, U.S. Department of Commerce, Bureau of the Census, 1979.

- ACTTAX = average real per capita total tax burden in area i, 1970 and 1977
- ACTE = average real per capital total local government expenditures in area i, 1970 and 1977
- ACEDE = average real per capital education expenditure in area i, 1970 and 1977
- ACWLE = average real per capita welfare expenditure in area i, 1970 and 1977
- ACPPI = average real per capita income in area i, 1970 and 1977
- NUEP = increased number of unemployment in area i, 1970-1977
- CTE = increased real per capita total local government expenditures in area i, 1970-1977
- CTTAX = increased real per capita total tax burden in area i, 1970-1977
- ACTL = average current annual total living cost for a four-person family in area i, 1970 and 1977
- TTAX = increased current per capita total tax burden in area i, 1970-1977
- ATWLH = average current per capita welfare and hospital expenditures in area i, 1970 and 1977

As we can see above empirical test results, we can derive several interesting results.

First, the R^2 for estimate (1) to (9) are all over 0.80, so that the models explain over four-fifths of the migration. Especially, the R^2 for equation (1) is 0.88 and the R^2 for estimate (2) and (3) are 0.87. This tells us my models are much improved and explain well the migration than the Cebula's models.

Second, unemployment (i.e., job opportunity of labor market) and living cost variables in all equations are significant at the 0.05 level and the coefficient signs of those are all negative as we expected. This tells us as increasing the unemployment level and living cost in area i, the population density will decrease in area i.

Third, real tax burden variables (i.e., ACPTAX, CTTAX) in equation (1), (2), (3), and (8) are significant at the 0.05 level and the remaining equations do not have significancy. However, interesting finding is the sign of estimated coefficients are all positive which we are not expected. Superficially, it seems to us the estimated results of tax variables contract with Cebula's results and reject the Tiebout hypothesis. But once we closely examine the collected sample data, we can find the results are not contradicted with Cebula's results and the estimated results strongly support the Tiebout hypothesis. Because, 15 cities out of 22 cities of our samples

had actually decreasing population during the 1970 to 1977. These tell us out-migrants of many large cities were greater than in-migrants in the U.S. during the 1970 to 1977. And hence net migration were negative. The positive sign of the estimated tax variables imply that as increase the real tax burden in area *i*, out-migrants are greater than in-migrants and reduce the population in area *i*. Therefore, the result strongly supports the Tiebout hypothesis that the level of local taxes influence residential choice decision.

Fourth, in case of expenditure variables (i.e., ACTE, ACEDE, ACWLE, CTE), all variables in equation (1) to (9) are not significant and reject the Tiebout hypothesis. This implies that the local government expenditures or services do not much affect migration of the inter-cities unlike the inter-jurisdictions of a specific limited small area.

A possible explanation on the rejection of Tiebout hypothesis in case of the inter-large cities is due to that consumer-voters do not have full information on the difference of expenditure patterns among the inter-large cities unlike the inter-jurisdictions in small areas.

The other possible explanation on the rejection of Tiebout hypothesis is due to that consumer-voters are not fully mobile because of transportation costs. Suppose even a city provides more public services and consumer-voters can get more benefits than the other cities, if moving costs are relatively high and offset their benefits from a city, then consumer-voter will not move into a city which provides more public services. Simply because this violates their utility maximization behavior as we assumed.

And another reason why the estimated expenditure variables reject the Tiebout hypothesis is due to the limitation of data. I used the cross-section data for estimations. But if we estimate the models using the time-series data, then the results would be different and may support the Tiebout hypothesis. But the appropriate time-series data were not available for the purpose of estimation of our models.

Finally, in my models, the real earnings (i.e., ACPPI) differentials among large cities did not play an important role in influencing migration over the period unlike Cebula's estimated result.

I think this is due to the lack of informations. Consumer-voters do not have full knowledge of difference among the inter-large cities unlike the inter-jurisdictions of small area. And the other possible explanation is if moving costs and transportation costs exceed or offset the earnings difference among the inter-large cities, then consumer-voters will not move into the other cities only because of the earnings differentials.

3. Modified Cebula's Model and Empirical Results of State Governments

In this section, I empirically test the Tiebout hypothesis by investigating a migration model for state governments. Where, basically, the precedures are similar with city governments. The differences are using state government data, modified the models, and re-define the name of variables for investigation of state government.

To investigate the Tiebout Hypothesis for state governments, the following basic model is consisted of various variables for the empirical test.

$$TNMS_i = \gamma_0 + \gamma_1 T_i + \gamma_2 E_i + \gamma_3 Y_i + \gamma_4 LC_i + \gamma_5 U_i + \gamma_6 W_i + \mu$$

$$CTPOP_i = \gamma_0 + \gamma_1 T_i + \gamma_2 E_i + \gamma_3 Y_i + \gamma_4 LC_i + \gamma_5 U_i + \gamma_6 W_i + \mu$$

Where,

$TNMS_i$ = the total number of net migration in state i in periods from 1970 to 1977

$CTPOP_i$ = the total population change in state i in periods from 1970 to 1977

T_i = changes of the per capita tax burden in state i in periods from 1970 to 1977

E_i = changes of per capita state government expenditures in state i in periods from 1970 to 1977

Y_i = changes of per capita income in state i in periods from 1970 to 1977

U_i = average unemployment rates or changes of the number of unemployment in state i in periods from 1970 to 1977

LC_i = change of annual living cost of a four-person medium family in state i in periods from 1970 to 1977

W_i = average annual temperatures in state i

γ_0 = constant

μ = error term.

The above formula of the model is simplified expression for convenience. But in the process of estimation of the model, I will rename the each variable and substitute, add or drop some variables for various purposes.

Comparison of Various OLS Results of State Government

$$(1) \quad TNMS = 644.2 - 0.81CPATAX - 0.44CPTEX$$

$$(1.73) \quad (-0.61) \quad (-0.53)$$

$$\begin{array}{rcc}
-0.13\text{CLVCO} + 11.99\text{AUEPRS} + 418.96\text{DTEMP} \\
(-1.16) \qquad\qquad (0.24) \qquad\qquad (2.73) \\
R^2 = 0.71
\end{array}$$

where the figures in parentheses are t-values.

- TNMS** = total number of net migration in state *i*; 1970-1977
CTPOP = number of total population changes in state *i*; 1970-1977
CPATAX = changes of per capita total tax burden in state *i* which is revenue of all taxes from state *i*'s own sources; 1970-1977
CPPTAX = changes of per capita property tax in state *i*; 1970-1977
CPINTX = changes of per capita federal income tax in state *i* which is not included in CPATAX; 1970-1977
CPTEx = changes of per capita total state government expenditures in state *i*; 1970-1977
CPEDEX = changes of per capita education expenditures in state *i*; 1970-1977
CPPWEX = changes of per capita public welfare expenditures in state *i*; 1970-1977
CPHHEX = changes of per capita health and hospitals expenditures in state *i*; 1970-1977
CPAOEX = changes of per capita all others in state *i*, which includes police protection, fire protection, natural resources, sanitation, local parks and recreation, and all miscellaneous lesser function; 1970-1977
CPPSEX = changes of per capita public school expenditures in state *i*, which includes elementary and secondary schools expenditures as well as expenditures for summer schools, adult education, community services, and community colleges and technical institutes under the jurisdiction of local boards of education; 1970-1977.
CPPI = changes of per capita income in state *i*; 1970-1977
CLVCO = changes of per capita average annual total living cost for a four-person medium family in state *i*; 1970-1977
CNUEP = changes of numbers of unemployment in state *i*; 1970-1977
CUEPR = changes of unemployment rate in state *i*; 1970-1977
AUEPRS = average unemployment rate in state *i*; 1970-1977
PICH = percent changes (%) of personal income in constant (1972) dollars in state *i*; 1970-1977

AVTEMP = average annual temperature in state *i*

DETEMP = dummy variables for average annual temperature in state *i*.

As we can see above empirical test results of state governments in section III-3, we can derive several interesting results.

First, the R^2 in equations (1) to (10) for state governments are relatively quite low compare to the results of city governments and Cebula's models. This tells us that Tiebout hypothesis may not be appropriate for higher level of government such as state governments.

Second, unlike city government cases, the fiscal variables alone such as various tax and expenditure variables are not significant at the 0.05 level in equation (1), (2), (3), and (4). This means that we can interpret that migrations are not affected by fiscal policy alone. But combining with other variables such as income (i.e., PICH, CPPI), living cost (i.e., CLVCO), labor market condition (i.e., AUEPRS), and temperature (i.e., AVTEMP, DTEMP), the fiscal variables become significant in equation (5), (6), (7), (8), (9), and (10). I think this is interesting finding that the Tiebout hypothesis can be rejected in case of higher level government. But, tax burden variables (i.e., CPATAX, CPPTAX) in equation (6), (7), (8), (9), and (10) affect the migration compared to expenditure variables (i.e., CPTEX, CPPSEX). This implies that the state government expenditures or services do not much affect migration unlike inter-jurisdictions of a specific limited small area.

Third, unlike the results of city government, in case of state government, labor market condition (i.e., job opportunity—AUEPRS) and the differences of living costs (i.e., CLVCO) in inter-states are not significant at the 0.05 level in all equations (6), (7), (8), (9), and (10). These tell us unexpectedly that migrations are not affected by the labor market conditions and the differences of living costs in case of inter-state governments. Instead of these, the difference of income level (i.e., CPPI, PICH) and the weather conditions (i.e., AVTEMP, DTEMP) in inter-states are more significant for the motives of migrations. This implies that amenities are more important than state government's fiscal policies for the motives of migration in inter-states.

IV. Conclusions

Unlike many previous examinations on the Tiebout hypothesis which have mainly concentrated on the capitalization or the homogeneity of

income within jurisdictions, this paper has concentrated on the study of the determinants of migration. So, this paper tried to re-examine the Tiebout hypothesis in terms of migration effects of the inter-large cities and inter-state governments rather than the inter-jurisdictions of a specific small area.

To investigate migration effects on the Tiebout model, the estimated models for the cities and state governments take into account not only fiscal and earnings difference, but also labor market condition and geographic cost of living differentials.

The Tiebout hypothesis implies that, other things equal, the individual prefers areas with low tax burdens or alternatively, the individual prefers area providing higher real level of public services under given tax burden.

Many previous empirical tests on the Tiebout hypothesis, which have mainly concentrated on the analysis of the inter or intra-jurisdictions of specific small area, strongly support the Tiebout hypothesis.

But according to my empirical study which is concentrated on the migration effect among large cities and inter-state government within the Tiebout framework, the results did not much strongly support the Tiebout hypothesis like others.

In case of city governments, the labor market condition and the difference of living cost in area *i* played the most important role in influencing migration over the period. And, in some case, the real tax burden also played an important role in influencing migration and somewhat support the Tiebout hypothesis. But the differences of earnings and local public services among cities did not play at all.

Especially, the local public expenditures' variables did not have any significant role in influencing migration among large cities over the period. And it somewhat contradicts with the Tiebout hypothesis. According to the results of my empirical test for inter-state governments, the level of tax burden can affect the migration and the state government public services did not affect it at all for the motives of migration like city governments. In spite of the level of tax burden affect the migration, state government's fiscal variables are not enough to support the Tiebout hypothesis for inter-state governments.

In case of state governments, the labor market condition and the difference of living cost also did not much influence the motives of migration unlike city governments. On the other hand, the differences of income level and the weather conditions play the most important role in influencing migration over the periods. In other words, amenities are the most important factor in case of state governments.

In short, the Tiebout hypothesis are not appropriate for higher level of

governments such as state governments.

These results may be due to the lack of informations of consumer-voters, or the limitation of data for this analysis. I used cross-section data because the appropriate and consistant time-series data were not available for the purpose of this analysis.

The other interpretation on these results is that, in case of the U.S., the public services such as education, public welfare, police protection, and fire protection etc., are quite equalized and standardized among large cities and states. The differences on these local public services among large cities and states due to higher local government expenditures may not be attractive for the consumer-voter. In other words, people are sensitive to their extra tax burdens but less sensitive to the benefits from the city or state government services. These may be the reasons why the local public expenditures' variables did not have any significant role in influencing migration among large cities and inter-state governments over the periods unlike inter-jurisdictions of small areas.

Appendix-1*

The List of Variables by Cities

(The figures of each variables represent the year, 1970 or 1977, respectively except variable TNM2 and PNM2, and terms in parentheses are units)

CPI 70/70	: all items CPI (city/SMSA) (1960 = base year)
TNM2	: total number of net migration, 1970-1977 (1,000 persons)
PNM2	: percentage change of net migration, 1970-1977 (%)
NUEP 70/77	: number of unemployment (1,000 persons)
UEPR 70/77	: unemployment rate (%)
PPI 70/77	: per capita current income (in dollars)
TPOP 70/77	: number of total population (1,000 persons)
TLC 70/77	: annual current total living cost for a four-person family (in dollars)
TTAX 70/77	: per capita current total tax (in dollars)
PTAX 70/77	: per capita current property tax (in dollars)
TE 70/77	: per capita current total expenditures (in dollars)
EDE 70/77	: per capita current education expenditures (in dollars)
WLE 70/77	: per capita current welfare expenditures (in dollars)

* These data were gathered from various issues of (1) The Statistical Abstract of the U.S., (2) State and Metropolitan Area Data Book, and (3) Local Government Finances in SMSA's.

HAH 70/77 : per capita current hospital expenditures (in dollars)

The following transformations of the above data were used to generate the variables used in the empirical test for city governments.

- (1) NM = TNM2
- (2) ANUEP = (NUEP70 + NUEP77)/2
- (3) ACTLC = {(TLC70/CPI70) + (TLC77/CPI77)} /2
- (4) ACPTAX = {(PTAX70/CIP70) + (PTAX77/CPI77)} /2
- (5) ACTTAX = {(TTAX70/CPI70) + (TTAX77/CPI77)} /2
- (6) ACTE = {(TE70/CPI70) + (TE77/CPI77)} /2
- (7) ACEDE = {(EDE70/CPI70) + (EDE77/CPI77)} /2
- (8) ACWLE = {(WLE70/CPI70) + (WLE77/CPI77)} /2
- (9) ACPPI = {(PPI70/CPI70) + (PPI77/CPI77)} /2
- (10) NUEP = NUEP77 - NUEP70
- (11) CTE = (TE77/CPI77) - (TE70/CPI70)
- (12) CTTAX = (TTAX77/CPI77) - (TTAX70/CPI70)
- (13) ALTC = (TLC70 + TLC77)/2
- (14) TTAX = TTAX77 - TTAX70
- (15) ATWLH = {(WEL70 + HAH70) + (WEL77 + HAH77)} /2

Appendix-3*, Data for State Governments

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	MAINE	MASSACHUSETTS	NEW HAMPSHIRE	NEW JERSEY	NEW YORK	PENNSYLVANIA	ILLINOIS	MICHIGAN	MINNESOTA	NEBRASKA	NEVADA	NORTH CAROLINA	NORTH DAKOTA	OHIO	OKLAHOMA	OREGON	RHODE ISLAND	SOUTH CAROLINA	TENNESSEE	TEXAS
1	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597
2	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597
3	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597
4	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597
5	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597
6	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597
7	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597
8	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597
9	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597
10	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597
11	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597
12	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597
13	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597
14	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597
15	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597
16	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597
17	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597
18	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597
19	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597
20	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597	597

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