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THE IMPORTANCE OF LOCAL FISCAL CONDITIONS IN ANALYZING LOCAL LABOR MARKETS

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ABSTRACT

A new test of the compensating wage differential model is proposed. The logic behind Roback's model showing how differences in nonproduced amenities may be reflected in intercity wage differentials is extended to the case of differences in local fiscal conditions, represented by tax rates and publicly produced services. Results show that differences in local tax rates and services provisions do generate compensating wage differentials across cities. The effects of a particularly large set of taxes and effective services output measures are examined.

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I. INTRODUCTION

Previous compensating wage differential studies have focused primarily on worker and job characteristics. Implicitly these studies assume that differences in the characteristics of the communities in which these jobs are located are either nonexistent or are not relevant in the sense that they will be capitalized into land prices. However, Roback (1980, 1982) demonstrated that when both firms and workers compete for scarce land in a community, differences in nonproduced goods, such as amenities, may be capitalized into both land prices and wage rates. We will argue in the next section that similar reasoning applies to differences across communities in the services produced by local governments. This paper then empirically tests the hypothesis that differences in local fiscal conditions measured by both service levels and tax rates lead to compensating wage differentials.

We attempt to control for four basic local government services: police, fire, health, and education. The violent crime rate is used as the control for police services. Holding constant the local cost-of-living and the level of taxation, our data indicate that a one percent increase in the incidence of violent crime in a community is associated with a $780 compensating differential in annual earnings. Fire services are controlled for by an insurance rating index which takes values from one being the best to five being the worst. A reduction in the quality of fire services provision in a community as measured by a one category increase in the index is associated with a $374 compensating differential in annual earnings. Health services were proxied by the number of hospital beds per thousand capita. A unit increase in this health measure was associated with a $57 drop in annual earnings. We tested both input and output proxies for education services. The input measure was the student to teacher ratio while the output measure

was a standardized test score ranking. The results from the wage equation estimation showed wages rose with increasing levels of educational input (lower student-to-teacher ratio). This is opposite to the predicted effect. The impact on the educational output measure was insignificantly different from zero. We also estimated the model using the more traditional expenditure measures for services output used in much of the Tiebout literature on land value capitalization in the urban economics field. The impacts of the expenditure variables on earnings were either the wrong sign or were too large in magnitude to be believed. This underscores the importance of employing output or, at the least, nonexpenditure input measures for services provision.

We also investigated whether a variety of state or local sales, income, and property tax differentials lead to compensating wage differentials. Holding constant the cost-of-living and level of services in a community, raising the level of sales or property taxation resulted in a reduction in wages. An increase in the effective property tax rate by one percentage point (from its mean of 2% to 3%) led to a $350 drop in annual earnings.

The paper is organized as follows. The next section of the paper presents the basic argument extending Roback's model to government services. The third section gives the details on the construction of the variables used in the analysis as well as the selection criteria used to generate the sample of workers. The fourth section discusses the specific hypotheses to be tested and presents the empirical results. Concluding remarks are given in the fifth section.

II. RATIONALE FOR INCORPORATING LOCAL FISCAL CONDITIONS IN WAGE EQUATION

One of the cornerstones of modern labor economic theory is the compensating wage difference model. A major research program since Rosen's (1974) explication of the model has been to empirically verify its

implications. Early work concentrated on estimating wage differentials associated with hazardous jobs.[1] Wages were found to increase significantly with the mortality risk of a job. Subsequent studies tended to focus on other types of job characteristics such as the physical effort required, the working conditions, flexibility of hours, access to job training, and layoff risk.[2] While some of the findings were consistent with the theory, overall the results were not encouraging.

Left out variable bias and measurement error were felt to be the two principal reasons for the poor performance of these tests. Brown (1980) surveyed the literature and presented a test using longitudinal as opposed to cross sectional data. This allowed him to difference out the effects of left out variables that remained constant through time.[3] He found that many of the job characteristics still had either wrong signs or insignificant coefficients. More recently, Duncan and Holmlund (1983) also attempted to reduce the problem of measurement error in job characteristics by using both panel data and self reported job characteristics. This allows them to look at the effect of changes in wages on changes in self reported job characteristics. They found that the estimates based on the panel data dominated those based on a single cross section. However, constrained hours and hard physical work still produced inconsistent wage effects.

While there is certainly merit to further refinements of the tests of wage effects arising from job characteristics, we will argue in this paper that there exists a set of characteristics which has largely been ignored in this literature and which provides an additional test of the equalizing differences model. Workers who live and work in the same community "consume" not only the nonpecuniary characteristics of their job but also the characteristics of the community in which that job is located.[4] However,

apart from variables indicating local labor market demand conditions, community characteristics usually have been left out of wage equations.[5]

There are two possible defenses for not controlling for community characteristics. The first is that either there are few differences across communities in their basic characteristics or that these differences are unimportant to a worker's utility. We will demonstrate later in the paper that this is unlikely to be a reasonable justification since fiscal conditions vary widely across communities. Secondly, if the differences that do exist become fully capitalized in the price of the fixed factor, land, then there may be no reason for wages to also adjust.[6] If that is the case, no harm is done by leaving out community traits in wage studies. Roback (1980, 1982) argued that land prices alone will not generally fully reflect differences across communities in the level of nonproduced "amenities" or "disamenities." If her argument can be extended to produced goods such as government services, then there is a compelling reason to include local fiscal conditions in wage studies and to test for their role in generating compensating wage differentials.

Roback's basic argument concerning amenities can be briefly outlined. Consider a competitive labor market and set of product markets where both workers and firms are mobile. In this setting, there exists a market determined level of utility and profitability that the marginal worker and firm must receive. In addition, assume that workers live and work in the same community. If land in the community is scarce, its price will be determined jointly by the demand for land by both workers and firms. Now allow communities to vary in terms of their levels of amenities. By definition, these nonproduced goods are not rationed by explicit prices. Instead, implicit prices are determined by adjustments in land prices and wage rates.

Consider first the case of a "nonproductive" amenity which increases worker utility but has no impact on firm profitability. Some communities have higher levels of this amenity than others. This amenity can be rationed among workers through increasing land prices and/or lowering wage rates in the relatively high amenity localities. Suppose the utility gain conferred by this amenity is fully capitalized into land prices. This leaves the marginal worker indifferent between working in the community with a certain amount of the amenity or in an alternative community. However, the marginal firm would now relocate in a community without the amenity since the higher land prices in the high amenity communities would reduce their profitability below the market determined level. Consequently, equilibrium will require that land prices increase and wage rates decrease in such a way that both marginal workers and firms have no incentive to relocate. The second case to consider is that of a "productive" amenity, a community characteristic that raises both the firm's profitability and the worker's utility, all else constant. As before, the amenity can be rationed among workers by increases in land prices and/or reductions in the wage rate. Rationing the amenity among firms requires increases in land prices and/or increases in the wage rate. Consequently, equilibrium land prices in the community with the amenity will be higher while the wage effect is indeterminate.

Turn now to the case of produced government services. The key difference between government services and amenities is that explicit prices in the form of taxes exist for these services. However, one can still use Roback's methodology to determine the impact of a change in the level of service provision holding constant taxes (or of the converse). For example, consider the impact from an increase in the quality of some service (safety, for example) in a community holding constant the level of local taxation.[7] The

effects on both workers and firms are again important. A worker's utility is obviously increased from an increased service level with no increased tax price. Again, higher land prices and/or lower wages are required to ration workers. The impact on factor prices from the firm side is not so clear in this case. The preponderance of evidence and opinion is that local services do not bring substantial benefits to firms.[8] The effect almost certainly is of second-order importance relative to that on worker-residents. If firms do not value added local services (or do so only marginally), the overall impact of the service level change on factor prices likely will be the same as in the case of the nonproductive amenity--lower wages and higher land prices. However, if firms really value the produced local service, the wage effect becomes ambiguous. This is because higher wages and/or higher rents would serve to ration firms while lower wages and/or higher rents would ration workers. Empirical results presented below are broadly consistent with the hypothesis that firms receive little or no benefits from added local services.

In a similar fashion, increases in a tax that is paid by both workers and firms, such as the property tax, holding constant the worker's cost-of-living may cause wages to fall and have an indeterminate effect of land prices. Since the tax increase to the worker is being offset in his/her budget so as to maintain his cost-of-living, the worker will either benefit from or be indifferent to the tax increase depending upon whether the worker perceives that the additional revenues generated from the tax increase will go toward services that he/she values. In the event that the worker values the additional services, then wages would have to fall and/or land prices rise to ration workers among communities. When the tax bill necessary to pay for any added local services is considered, it is very difficult to argue that firms reap net benefits from the situation.[9] Rationing firms among communities in

this situation requires that wages fall and/or land prices fall. Consequently, downward pressure is placed on wages.

The potential importance of controlling for local fiscal conditions is evidenced by the wide spread in both tax rates and service measures across cities. For example, effective property tax rates were as low as 0.54% in New Orleans and as high as 4.95% in Boston. Violent crimes per 100 capita ranged from 0.38 in San Jose to 3.13 in Newark. Hospital beds per 1,000 capita go from a high of 25.61 in Pittsburgh to a low of 3.25 in San Jose. As a final illustration, student to teacher ratios differed by as much as 5.5 points between Pittsburgh and San Francisco. The diversity in these fiscal variables across cities implies that the potential is there for wages to play a significant role as an equalizing factor.

III. CONSTRUCTION OF THE DATA SET

We test the hypothesis that varying local fiscal conditions generate compensating wage differentials by estimating an expanded wage specification on workers selected from the May 1977 CPS data. The general form of the wage regression augmented with the vector of fiscal characteristics which was estimated is given by

$$\log \text{Wage} = \alpha_0 + \alpha_1 \begin{matrix}\text{Industry}\\ \text{Composition}\\ \text{Variables}\end{matrix} + \alpha_2 \begin{matrix}\text{Personal}\\ \text{Characteristics}\end{matrix} + \alpha_3 \begin{matrix}\text{State/Local}\\ \text{Fiscal Variables}\end{matrix} + \alpha_4 \log \begin{matrix}\text{Cost-of-Living}\\ \text{Index}\end{matrix} + e \quad . \tag{1}$$

where the α's are coefficients or coefficient vectors and e is the error term with the standard properties.

Before estimating (1), the first task was to select a sample of workers which conformed to the basic model discussed in the previous section. We

required that the individual's major activity last week was working or with a job but not working, that they be full time labor market participants or part time for economic reasons, and that they live and work in a central city. One reason for the last restriction is that the tax and service data pertain to the central cities only and not to their surrounding suburbs. In addition, it is important to look at people who not only work in the central city but also live there since this implies that as a resident they "consume" the services provided in the city.[10] Wage rates were imputed for all workers using their reported usual weekly earnings and usual weekly hours.

The sample was further limited to nonunion private sector workers. This was done for a variety of reasons. Particularly as unionism has come to the public sector, it has become more evident that public sector pay and employment decisions can be influenced via the political process.[11] Inman (1981) and others have attempted to model the public sector (union and nonunion) bargaining process. With public sector wages being determined via a budgetary and political process involving the level of state-local taxation, tax rates and levels of services provisions cannot be considered exogenous determinants of public sector wages. Consequently, Rosen's (1974) compensating differential story with respect to the tax-service package does not apply to public sector workers.[12]

Private sector workers who are members of labor unions were also removed from the sample for two basic reasons. First, their wages are determined through a bargaining process which is quite distinct from the competitive labor market described in the previous section. Secondly, that model also assumed that workers were mobile and consequently arbitrage away any advantages that may develop in some cities. This mobility is unlikely to

exist to a great degree for union workers due to the presence of union wage premiums.[13]

A total of 44 cities are listed in the CPS data. Tax data existed for 31 of these cities. Central to the test of our hypotheses is the ability to offset a tax change by holding constant the worker's cost-of-living. However, the Bureau of Labor Statistics (BLS) reports direct metropolitan budget data for only 20 of the cities listed in the CPS data. To take advantage of the full range of variation in fiscal variables, we chose to include all 31 cities for which tax data exists and to impute a cost-of-living index when a direct measure was unavailable. The BLS metropolitan budget figures were regressed on three region dummy variables and city population. These variables explained over 50% of the variation in the budget data.[14] This regression was used to impute values for the cost-of-living index when a direct BLS figure was unavailable.

The fiscal variables which were merged into the sample consisted of a variety of tax rates and service measures. Effective property and sales tax rates were used instead of statutory rates. For property taxes, the effective rate equals the statutory tax rate multiplied by the local assessment to market value ratio. The limited availability of these ratios was the primary restriction on the number of cities for which tax data could be collected. The statutory rate is for 1976 since 1977 figures are not available. The assessment-sales ratios and property tax rates are from Volume II of the Census of Governments for the year 1976. Effective sales tax rates were calculated by taking the actual state or local sales tax rate and multiplying it by the "comprehensiveness" measure reported by Feenberg and Rosen (1986). This measure reflects the degree to which categories of sales items in a state are excluded from sales taxes. State sales tax rates for 1977 were taken from

the 1978 issue of Facts and Figures on Government Finances published by the Tax Foundation. City sales tax rates were collected from various issues of the Commerce Clearing House publication State Tax Reporter. State and local income tax rates were also included in the sample. The local income tax almost universally consisted of a flat tax rate. The state income tax data consisted of a mixture of flat and progressive rate schedules. For progressive rate states, the highest bracket often began at a low to moderate income level. In those cases, we used the highest bracket as the statutory rate for every individual from that state. For a few states such as Louisiana and Ohio the highest bracket did not begin until incomes reached levels of $100,000 and $40,000 respectively. In these cases, the statutory rate was selected to be the marginal rate which applied to the median income level for individuals from that state. State and local income tax data was collected from Facts and Figures on Government Finances.

The last set of variables to consider are the measures of government services. We attempt to control for police, fire, health, and educational services. The standard approach in the Tiebout literature has been to use per capita expenditures data by service category.[15] While it is questionable if expenditures measures adequately proxy for service levels across relatively homogeneous suburbs within a single SMSA, it is very doubtful that they are good proxies for service variation across central cities in different SMSAs. For police services, we use the per capita incidence of violent crimes.[16] Health services are proxied by the number of hospital beds per thousand capita. Both the violent crime and the number of hospital beds are taken from the 1976-77 issue of County and City Data Book and pertain to 1975. The measure used for fire services is a rating scheme developed by insurance companies for setting premiums in a city. The original rating was from zero

to one hundred. However, the data are only published in interval form with the first interval indicating the top 20% and the fifth interval the bottom 20%. These intervals are reported in The Municipal Year Book 1976.

The last service controlled for is education. A standard input measure used to rate city services is the student to teacher ratio. These numbers are published every ten years in the Digest of Education Statistics. Relative rankings of cities changed very little over the 1971-1981 period. The 1981 data is used as the first proxy for education services. Since both educational expenditures and the student to teacher ratios are measures of educational input, an attempt was made to construct an alternative output measure. The natural choice is a standardized test score measure but such measures are not readily available.[17] Scholastic Aptitude Test (SAT) scores by city are one possibility. However, these tests are taken only by students who are applying to college. The fraction of graduating seniors who take the SAT test varies widely by state and city. Consequently we chose instead to collect reading scores on standardized tests for elementary school students for the school districts represented in our sample of cities.[18] For sake of comparison, the results for both the student to teacher ratio as well as the test score variables are reported.[19]

IV. EMPIRICAL RESULTS

The general specification in (1) was run on a sample of 2508 private sector workers. Summary statistics on all variables used are reported in Table 1. Results from three different specifications of (1) are presented in Table 2.

The coefficients on service variables where an increase in the variable corresponds to more (less) of that service being provided in the community should be negative (positive). As the service level is increased holding

constant both the worker's cost-of-living and tax burden, he/she is made better off. In equilibrium, wages will fall in order to help ration workers among communities. Since the value firms place on local services probably is of second-order importance, the negative impact on wages should not be significantly altered by the presence of firms also competing for scarce land. The results in Table 2 are generally consistent with this conclusion.

The coefficient we expected on a tax variable depends on the type of tax which is being varied. It is important at this point to reiterate that we have eliminated the influence of income taxes from the cost-of-living index by removing the income and social security taxes from the budget data used to compute the index.[20] However, state and local sales taxes as well as property taxes are reflected in the index through their effect on consumption and housing costs. As a result, holding constant the cost-of-living variable will offset increases in sales and property taxes through reductions in other prices in the community but will not offset increases in income tax changes. Consequently, the coefficients on the sales and property tax rates should be negative or insignificantly different from zero. Increasing one of these taxes and offsetting the additional tax burden in the worker's budget leaves the worker no worse off than before. If the additional tax revenues generated from the tax increase go to provide services which he/she values and which have not been controlled for (or controlled for imperfectly with the service variables), then the worker is better off and competition will bid down wages. If the worker does not value the additional services or if the tax revenues are diverted by the local government officials away from services, then wages need not change. Since firms are not likely to highly value any added services produced from the higher taxes, wages and/or land rents must fall to restore profitability so that the overall effect on wages is downward.

In contrast, positive coefficients on the two income tax variables are expected. If the increased income tax revenues are used to provide services of equal value to the worker, then the reasoning above suggests that net wages would remain constant. Wage data reported in the CPS are intended to be gross wages. Equations (2) and (3) help derive the income tax coefficient which implies that net wages are unchanged. Let W_g represent the gross wage rate and W_n the net of local income tax wage rate. If the local income tax schedule is characterized by a flat rate, τ, then the following relationship holds.

$$W_n = [1 - (\tau/100)]W_g \tag{2}$$

Taking the log derivative of this expression and setting $d\ln W_n = 0$ yields

$$\frac{d\ln W_g}{d\tau} = \frac{1}{100 - \tau} \tag{3}$$

If the local tax rate is (say) 1% (about the average for cities with nonzero income tax rates), then from the expressions above, $\ln W_g$ must increase by 0.0101 in response to a 1% increase in τ to keep net wages constant. If the tax schedule is progressive as it is for some state income taxes, then a positive coefficient less than 0.01 could still imply that net wages have remained unchanged. This follows from the fact that with progressive taxation, marginal tax rates exceed average tax rates so that a 1% increase in the marginal rate implies less than a 1% increase in the worker's tax bill.

The predicted effects of the job and worker traits have been well discussed in the literature. The coefficients on the worker's personal characteristics reported in Table 2 are quite similar to findings in previous studies. The population growth in the city from 1970 to 1980 was included as a proxy for local labor market conditions. While population growth can signal

either rightward shifts in the labor demand or the labor supply (or both) curves, the positive and significant coefficient is consistent with a demand side story. The last nonfiscal variable to consider is the log of the cost-of-living index. Most studies deflate the nominal wage by the cost of living index and then use the log real wage as the left hand side variable. The implied restriction is that the coefficient of the log cost-of-living equals one. This restriction can not be rejected in our data.[21]

Turn now to the fiscal variables.[22] In each of the two specifications using nonexpenditure measures for services reported in columns 1 and 2, the coefficients on the sales and property taxes are negative and significant in the case of the property tax.[23] Using the first specification, a one percentage point increase in the effective property tax leads to a $350 reduction in annual earnings.[24] The coefficients on the state and local income taxes are positive. In each case, the null that net wages have remained constant is not rejected. The proxy for police services has a positive and significant coefficient. Increasing the incidence of violent crime in a community by 1% is associated with a $780 compensating increase in annual earnings. Similarly, the proxy for fire services also has a positive and significant coefficient. Reducing the level of fire services sufficiently to move a city up one interval in its fire rating is associated with a $295 compensating increase in annual earnings. The coefficient on hospital beds was negative and significant. A unit increase in this variable is associated with a $57 reduction in annual earnings.

While the health figure seems small in comparison, its magnitude is affected by its unit of measurement. The relative importance of these three service measures can be better seen by considering the effect on annual earnings arising from a standard deviation change in each variable, The

corresponding effects for crime, fire, and health are $374, $405, and -$244 respectively.

Since higher student to teacher ratios allegedly correspond to fewer educational services while higher test scores correspond to greater educational services, the student to teacher ratio coefficient was expected to be positive and the coefficient on the test score was expected to be negative. In fact, the coefficient on the student to teacher ratio was negative and significant at the 10% level while the test score coefficient was insignificantly different from zero. One possibility is that there is significant measurement error in each variable which is biasing the coefficients. An alternative explanation is that unlike police and fire services, not all individuals may value the educational services provided in the community. We reestimated the wage equations for the subsample of individuals who had completed at least one year of schooling beyond high school. If more educated people in fact place a higher value on the quality of education in the community, then we would expect to see the coefficient on test scores in this sample of workers to be greater in absolute value. In fact, the coefficient on the test score was over seven times as large in absolute value (-0.0022) as in the overall sample. The t-statistic increased from 0.00 in absolute value to 1.23.[25]

Finally, specification three reports the results from using the expenditure measures for services. In each case, a negative coefficient was expected. In fact, only the coefficient on fire expenditures is negative and significant. The magnitude of this coefficient, however, is much too large to be plausible. Based on the coefficient estimate, an additional $100 per capita in fire expenditure is associated with a $1.90 reduction in the wage rate which corresponds to a $3,800 reduction in annual earnings. Also note

that the coefficient on police expenditures is not only the wrong sign but also significant. These results underscore our concern with using expenditure measures and emphasize that they can be poor or even perverse proxies for actual service levels especially in comparisons across larger cities.

V. CONCLUSIONS

In this paper we investigated the question of whether wages tend to equalize differences across cities due to variation in the level of taxation and the provision of basic services. The data indicated that wages do adjust in a consistent manner for each service category except for education. Tax differentials also give rise to offsetting wage differentials. Overall, the view that a worker's utility is affected not only by the characteristics of the job but also by the characteristics of the city in which that job is located seems reasonable in light of the findings.

Footnotes

[1]See Thaler and Rosen (1975) and Smith (1973).

[2]Effort and working conditions are investigated by Lucas (1977) and Hamermesh (1977). Flexibility of hours and work schedules are investigated by Duncan (1976) and Duncan and Stafford (1977). Layoff risk is investigated by Abowd & Ashenfelter (1981).

[3]Brown assigns to each worker the average job characteristic for his/her occupation classification.

[4]Job and community characteristics can in part be "unbundled" by living and working in different areas. To avoid these situations in our analysis, we attempt to focus on individuals who both live and work in a central city. Further details on the construction of the sample will be given later in the paper.

[5]Two noteable exceptions are Rosen (1979) and Roback (1980, 1982).

[6]There is a long list of empirical studies in the urban literature beginning with Oates (1969) which investigate the degree to which land prices do vary with community fiscal conditions.

[7]It would be possible to perform this type of comparative static exercise in the data if local governments differ in their efficiency at producing services. In addition, we need to assume that the governments set taxes so as to cover unit costs of the services. See Gyourko & Tracy (1986a) for a discussion of the consequences of local governments attempting to capture rents arising from efficiency advantages.

[8]This is a widely-held view in the urban economics and local public finance literatures. The interested reader should see any of the reviews by Newman and Sullivan (1986), Oakland (1978), or Wasylenko (1980) for more on this. Additionally, evidence from the business location literature indicates

that differences in local public services provision have no influence on the location of business activity, all else constant. A series of studies by Schmenner (1973, 1978, 1982) is a good representative of this work.

[9]See the discussion and citations in footnote 8 for why this viewpoint is widely held by most urban and local public finance economists.

[10]The CPS data identifies individual workers by place of residence. Most central city residents who work do so in the central city. Most suburbanites probably do not work in the jurisdiction where they live. Consequently, our sample is restricted to those who live in the central city.

[11]See Freeman's (1986) recent review article and the earlier work by Ehrenberg and Schwartz (1983).

[12]See Gyourko and Tracy (1986b) for an analysis of the relationship between local public sector wages and levels of state and local taxation.

[13]We carried out the same analysis on the union workers as we did for the nonunion workers. As expected, none of the government service measures significantly affected their wage rates. The specific regression results are available upon request.

[14]The specific regression result is as follows:

$$\begin{array}{l} CLI = 0.943 + 0.012*Population + 0.046*NE + 0.009*West - 0.035*South \\ \qquad\quad (0.015)\ (0.036) \qquad\qquad (0.020) \quad (0.021) \qquad (0.019) \\ R^2 = 0.549 \quad MSE = 0.0018 \end{array}$$

The CLI is a cost-of-living index calculated from the BLS metropolitan budget data where all income tax and social security tax components have been deleted. Population is measured in millions. Standard errors are given in parentheses. We also experimented with imputing cost-of-living index values by using a reported value from a nearby city in the region. We do not report results from specifications using this imputation method but they do not

differ significantly from those reported in Table 2. The results are available upon request.

[15]An exception is Rosen and Fullerton (1979). They use school test scores in lieu of education expenditures. Since empirical studies of the Tiebout hypothesis examine land price variation across relatively homogenous locations within an SMSA, it is less surprising that more effort has not gone into developing alternatives to the expenditure variables.

[16]We experimented with both violent and property crime rates and found no significant wage effects associated with changes in property crime holding constant violent crime. Consequently, property crime was dropped from the specification.

[17]All test score data will still have the problem of confounding the quality of the educational services provided with the ability of the students attending these schools.

[18]We were unable to obtain test score data from Newark and Portland.

[19]These data were collected via letter and phone conversations with the individual school districts. It is important to note that the test score data we collected is also not consistent across all cities in our sample. First, not all cities give the same standardized exam. However, a relatively poor performance and ranking on the reading comprehension section of the California Aptitude Test is likely to be (fairly closely) duplicated on the Comprehensive Test of Basic Skills. Second, not all scores are for sixth graders although our data covers only elementary students in the fourth through sixth grade. Six cities had data only on fourth or fifth graders. Third, while most scores are from tests administered during the 1977 academic year, others are from as early as 1976 and as late as 1981. Fourth, not all districts report the percentage of their students at or above the national average on the test.

Conversions had to be made. There was virtually always enough information (e.g., detailed stanine scores) to do this successfully although the underlying data were varied. Fifth and most importantly, some school districts did not administer the exam to a random sample of students. In a few districts, school principals were allowed to pick the students taking the exam. The incentives for choosing the brighter students are obvious. In some cases, we simply were not able to ascertain how the students taking the exam were selected.

[20]See footnote 14. We eliminated the social security and income tax components of the budget when calculating the CLI because much of their variation arises from differences in wages and not from intrinsic cost-of-living differences across communities.

[21]The coefficient reported in table 2 reflects the wage compensation resulting from nontax variation in the cost-of-living. If we delete the sales and property taxes from the specification, then the coefficient on the cost-of-living falls significantly below one. This finding is consistent with the view that local taxes act as prices for local services. That is, variation in taxes need not necessarily be compensated by variation in wages if services provision vary accordingly.

[22]We also tried estimating the model with controls for amenities such as pollution and weather. A particulate matter measure was used as the pollution variable. It consistently had the wrong sign (negative) and was significant. The number of clear days also had a wrong sign (positive) and was significant. Several other weather variables including number of rainy days, annual snowfall, etc. were also tested. The high collinearity among these variables made it impossible to obtain sensible results. Consequently,

we opted to delete the amenity variables from all of the specifications which we report in this paper.

[23]Recall that we expected the nonincome tax coefficients to be negative in part because any increase in the tax burden was being offset by other price reductions in order to maintain the worker's cost-of-living. As a test of this, we estimated the model leaving out the cost-of-living variable and the service measures. In this case, the local sales and property tax coefficients were each insignificantly different from zero. The state sales tax coefficient becomes positive and is significant at the 10% level.

[24]This figure and those to follow are calculated using the mean wage in the sample and an assumption of 2,000 annual hours worked.

[25]In addition, the implied compensating wage differentials for police, fire, and health services increased dramatically. A unit increase in violent crimes is associated with a $1,360 increase in annual earnings. A unit increase in the fire rating is now associated with approximately a $660 increase in annual earnings. Finally, a unit increase in the health measure now results in a reduction in annual earnings of $133.

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TABLE 1

MEANS AND STANDARD DEVIATIONS OF VARIABLES

VARIABLE	MEAN	STANDARD DEVIATION
Log Wage	1.52	0.52
Education (Yrs.)	12.49	3.09
Experience (Yrs.)	17.21	13.99
Married (0-1 dummy; 1 if married)	0.56	0.50
White (0-1 dummy; 1 if white)	0.78	0.41
Male (0-1 dummy; 1 if male)	0.53	0.50
Veteran (0-1 dummy; 1 if veteran)	0.18	0.39
Blue Collar (0-1 dummy; 1 if blue collar worker)	0.25	0.44
Population growth (%)	-6.05	14.91
Log Cost-Of-Living Index	0.00	0.06
Effective Property Tax Rate (%)	2.03	1.72
Effective State Sales Tax Rate (%)	1.01	0.24
Nominal State Sales Tax Rate (%)	4.02	1.07
Effective Local Sales Tax Rate (%)	0.34	0.41
Nominal Local Sales Tax Rate (%)	1.53	1.41
State Income Tax Rate (%)	5.47	3.77
Local Income Tax Rate (%)	0.70	1.15
Violent Crime (#/100 capita)	1.19	0.62
Fire Rating	2.48	0.86
Hospital Beds (#/1000 capita)	9.18	4.11
Student To Teacher Ratio	19.99	2.79
Test Scores	36.13	9.57
Police Expenditures ($100/capita)	0.74	0.22
Fire Expenditures ($100/capita)	0.37	0.10
Health Expenditures ($100/capita)	0.34	0.44
Education Expenditures ($100/capita)	0.84	1.53

TABLE 2

EFFECT OF LOCAL FISCAL VARIABLES ON WAGE RATES

VARIABLE	(1)	(2)	(3)
Intercept	0.6350	0.6475	0.7063
	(0.1466)	(0.1571)	(0.1223)
Education	0.0619	0.0588	0.0621
	(0.0032)	(0.0033)	(0.0032)
Experience	0.0197	0.0208	0.0205
	(0.0020)	(0.0021)	(0.0020)
$(\text{Experience})^2$	-0.0003	-0.0003	-0.0003
	(0.00004)	(0.00004)	(0.00004)
Married	0.0674	0.0692	0.0679
	(0.0171)	(0.0178)	(0.0171)
White	0.1184	0.1114	0.1109
	(0.0199)	(0.0205)	(0.0198)
Male	0.2002	0.2006	0.2007
	(0.0195)	(0.0203)	(0.0195)
Veteran	0.1230	0.1260	0.1156
	(0.0239)	(0.0250)	(0.0238)
Blue Collar	-0.0855	-0.1082	-0.0811
	(0.0229)	(0.0240)	(0.0229)
Population Growth	0.0025	0.0028	0.0021
	(0.0009)	(0.0010)	(0.0007)
Log Cost-of-Living Index	0.8057	0.8891	0.9011
	(0.2681)	(0.2764)	(0.3157)
Property Tax Rate	-0.0396	-0.0391	-0.0143
	(0.0189)	(0.0193)	(0.0206)
State Sales Tax Rate	-0.0308	-0.1905	-0.0963
	(0.0497)	(0.0888)	(0.0504)
Local Sales Tax Rate	-0.0216	-0.0100	0.0119
	(0.0332)	(0.0357)	(0.0338)
State Income Tax Rate	0.0090	0.0098	0.0010
	(0.0039)	(0.0045)	(0.0031)
Local Income Tax Rate	0.0071	0.0135	-0.0091
	(0.0099)	(0.0094)	(0.0089)
Violent Crime	0.0826	0.0679	
	(0.0263)	(0.0278)	
Fire Rating	0.0313	0.0342	
	(0.0114)	(0.0126)	
Hospital Beds	-0.0067	-0.0051	
	(0.0030)	(0.0029)	
Student-to-Teacher Ratio	-0.0086		
	(0.0048)		
Test Scores		-0.0003	
		(0.0011)	
Police Expenditures			0.1248
			(0.0633)
Fire Expenditures			-0.5380
			(0.1570)
Health Expenditures			0.0400
			(0.0338)
Education Expenditures			-0.0006
			(0.0124)
R^2	0.4503	0.4530	0.4497
N	2,508	2,280	2,508

Note: Thirty-two industry dummy variables are controlled for in each specification. Standard errors are in the parentheses.