Identifying Amenity and Productivity Cities Using Wage and Rent Differentials

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Introduction

Many studies have explored the existence of nominal wage differentials between regions. The irrefutable conclusion is that wage differentials exist and that they persist over time.[1] Such differentials are difficult to explain within a neoclassical framework in which regions and factors are identical and all factors are free to move in response to interregional factor price differentials. In this case, one must resort to explanations based on institutional barriers and other impediments to free mobility.

The key to understanding how wage differentials (and other factor price differentials) can persist in the presence of free mobility is to recognize that some factors are inherently immobile. For instance, each region has geographic and climatic characteristics that are unique to the area. Even for those areas that share common features, the quality and quantity of the site-specific characteristics may differ. Therefore, firms or households will be willing to pay or accept different levels of wages depending upon the value they place on these attributes.

For instance, firms may find that proximity to improved harbors reduces shipping costs and thus reduces production costs. In this case, firms can offer higher wages and still remain competitive with firms in lower-wage regions because of the cost advantage of the harbor. Since land next to the harbor is limited, the influx of firms attracted by the harbor will increase the demand for both labor and land. Wages and rents will be bid up until the cost advantage of the harbor is completely offset by the increase in factor prices. Thus, wages and land rents vary across regions according to the value firms place on the site-specific attributes in each region and their ability to substitute between factors of production.

A similar story can be told about households. Households may value the same harbor that firms find attractive, except for different reasons. The harbor that reduced shipping costs for firms may be attractive to households as a place to enjoy water sports. Consequently, as more households move into the area to take advantage of the harbor, the supply of labor increases and the demand for land increases. Thus, wages fall and land rents rise until individuals are no longer willing to accept proximity to the harbor as compensation for lower wages and higher land rents.

The resultant wage differential between an area with a harbor and one without depends upon the relative magnitudes of the demand and supply responses to site characteristics. If wages are observed to be higher in the harbor area than in the area without a harbor, then the demand response (the firm's response) dominates the wage determination process. If wages are relatively lower in the harbor area, then the supply response (the household's response) dominates the process. In both cases, land rents will be higher because both households and firms value the harbor. Iand rents would be

1 Bellante (1979). Johnson (1983), and Eberls and Stone (1986) are examples of numerous studies that have examined interregional wage differentials.

lower in the harbor area than in an otherwise comparable area if the harbor was detrimental to both parties. Consequently, by observing relative wages and rents, it is possible to identify whether a region's bundle of site characteristics has a greater net effect on firm location decisions or household location decisions.

The purpose of this paper is to identify metropolitan areas according to the extent to which they are dominated by supply and demand responses to their net bundle of site-specific characteristics. To do this, we estimate hedonic wage and rent equations for a sample of metropolitan areas. From these estimates, we derive quality-adjusted wage and rent differentials for each area. The metropolitan areas are then classified into four groups based on the relative values of an area's wage and rent differential vis-à-vis the national average. The metropolitan areas are identified as high amenity (low wage, high rent), low amenity (high wage, low rent), high productivity (high wage, high rent), and low productivity (low wage, low rent). Classification of this sort provides information about the relative attractiveness to firms and households of the total bundle of attributes indigenous to each metropolitan area.

I. A Model of Household and Firm Equilibrium

In this section, we first present a model, based on the work of Roback (1982), of the effects of interarea differences in amenities and productivity on wages and rents. We then show how this model can be used to determine the relative importance of amenity and productivity differences as sources of factor price differentials across cities.

Several simplifying assumptions are made in modeling the relationship between interarea differences in amenities and productivity and interarea differences in wages and rents. Workers are assumed to be identical in tastes and skills and completely mobile across cities. Similarly, capital is assumed to be completely mobile and production technologies are assumed to be identical across firms.[2]

In this model, cities are characterized as bundles of attributes, which can affect the utility of households and the costs of production for firms. Individuals in these cities consume and produce a composite consumption good. The price of the good is determined by international markets and for convenience is normalized to one. Each worker supplies a single unit of labor independently of the wage rate. We assume that individuals work in the city in which they live, and we treat differences in leisure resulting from differences in intracity commuting as a site characteristic.[3] Equilibrium in this model is characterized by equal utility for identical workers and equal unit costs for firms across all regions.

Workers choose the location that maximizes their utility, subject to an income con straint. Utility depends upon consumption of the composite commodity (X), residential land (L^c), and amenities (s). Equivalently, the problem can be stated in terms of an indirect utility function, V, which is a function of wages (w), rents (r), and amenities (s). Equilibrium for workers requires that utility is the same at all locations, or

(1) $V(w,r;s) = V^0$.

The equilibrium relationship between wages, rents, and amenities for households can be determined by totally differentiating the indirect utility function. In log form, this relationship can be stated as:

(2) $$\frac{\partial lnV}{\partial lnw}\frac{dlnw}{ds} + \frac{\partial lnV}{\partial lnr}\frac{dlnr}{ds} + \frac{\partial lnV}{\partial s} = 0$$

Using Roy's identity, the marginal valuation of amenities in a city evaluated relative to the marginal utility of income is

(3) $$\frac{P_s}{w} = k_1 dlnr/ds - dlnw/ds,$$

where P_s is the monetized value of the amenities, and k_1 is the portion of consumer income spent on land. Equation 3 states that individuals pay for amenities through reductions in real income in the form of higher land rents (which reduce income by k_1 times the increase in rents) and lower wage income.

Firms are assumed to employ local residents and to use land to produce the composite commodity, X, according to a constant-returns-to-scale production technology. Under these assumptions, equilibrium for firms requires that unit costs are equal in all locations and equal to the price of X, assumed to be 1,

(4) $C(w,r;s) = 1$.

2 If people have different preferences the value of certain areas will be understated in our approach, which uses a comparison of cost of living differences as an indication of the value individuals place on cities (see Roback [1982]). The second set of assumptions refers to the mobility of households and firms. We assume that migration is costless and that given the relative wages, rents, and site characteristics across cities, both firms and households have chosen locations such that they could not be made better off by relocating. If moving is not costless, we may have biased estimates of the attractiveness of areas. Individuals or firms may perceive that they would be better off by moving, but if it is costly to do so they will move only if the extra benefits of moving outweigh the costs of moving. We may then be over- or underestimating the attractiveness of an area since we ignore the costs of moving.

3 Roback's model ignores intracity commuting. Hoehn et al. (1986) have pointed out that this leads to incorrect estimates of the value of other site characteristics. Since we are not interested in deriving values for specific characteristics, but simply the net impact of these characteristics, our model is not subject to this criticism. We therefore simply assume that intracity commuting is another site characteristic that reduces leisure time and therefore is a disamenity for workers.

The relationship between wages, rents, and site characteristics (s), which are consistent with equilibrium for firms, can be expressed in log form as:

$$(5) \quad \frac{\partial lnC}{\partial lnw}\frac{dlnw}{ds} + \frac{\partial lnC}{\partial lnr}\frac{dlnr}{ds} + \frac{\partial lnC}{\partial s} = 0.$$

The marginal value to firms of different locations is

$$(6) \quad C_s = -\theta_r(dlnr/ds) - \theta_w(dlnw/ds),$$

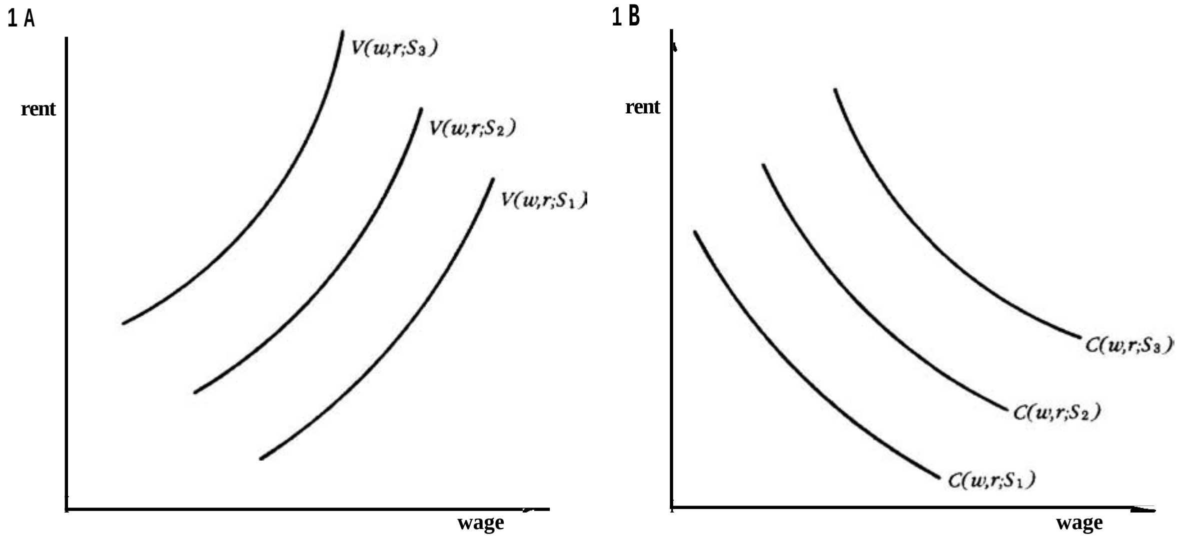
where $-C_s$ is the price that firms are willing to pay to locate in one city rather than another, and θ_r and θ_w are the cost shares of land and labor, respectively.

If the site characteristics of a city provide a net productivity advantage to firms, then firms will pay for this advantage in terms of higher wages and rents and $-C_s$ will be positive. Wages and rents in each city are determined by the interaction of the location decisions of the households and firms.

Combinations of lnw and lnr for which the unit costs of firms are equal are depicted in figure 1b. The value of site characteristics to firms is fixed along each quasi-isocost curve, and the curves shift up (down) as the site characteristics of a city increase (decrease) the productivity of firms. The slope of the quasi-isocost curve is equal to the elasticity of substitution between land and labor, which from equation 6 is $-\theta_w/\theta_r$. According to figure 1b, site characteristics in city S_2 enhance productivity more than site characteristics in city S_1.

Each city is characterized by a bundle of amenities and site characteristics that are associated with a specific pair of isocost and iso-utility curves in figures 1a and 1b. The intersection of any two curves for each city then determines relative wages and rents. In figure 2, equilibrium wages and rents in city S_1 will be w_1 and r_1. Using city S_1 as a reference point

Equilibrium Conditions for Households and Firms



SOURCE: Authors.

FIGURE 1

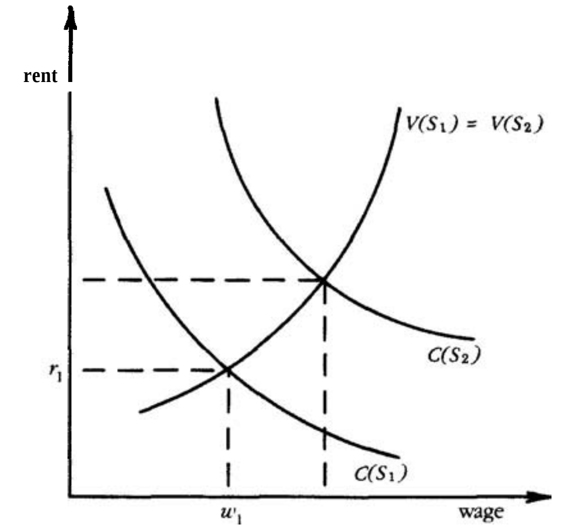
Classification of Cities as Amenity or Productivity Cities

The model described above is illustrated in figure 1. The upward sloping curves in figure 1a [labeled $V(.)$], show combinations of lnw and lnr for which utility is equal. The slope of these curves is the trade-off that households are willing to make between wages and rents for any given level of amenities. From equation 3, this trade-off is equal to the inverse of the budget share of land, k_1^{-1}. Along each curve, the value of amenities is fixed and the curves shift up (down) as the amenities of one city are valued more (less) than the amenities of other cities. The value of amenities in the city labeled S_2 is greater than the value of amenities in the city labeled S_1, since individuals are willing to pay higher rents at every wage rate.

(which could be thought of as the average city), we can see how intercity differences in amenities and productivity will be reflected in differences in wages and rents.

Consider a city S_2 that differs from S_1 only in that the site characteristics of city S_2 provide a greater productivity advantage to firms than the site characteristics of city S_1. In figure 2, this is illustrated by $C(S_2)$ lying above $C(S_1)$. Assuming there is no difference in amenities between the two cities, we can see that equilibrium requires that wages and rents in city S_2 be high relative to city S_1. These higher wages and rents reflect the amount firms are willing to pay to locate in city S_2 rather than S_1 and, therefore, the productivity value of S_2 relative to the average city.

Productivity Differences and Equilibrium Wages and Rents

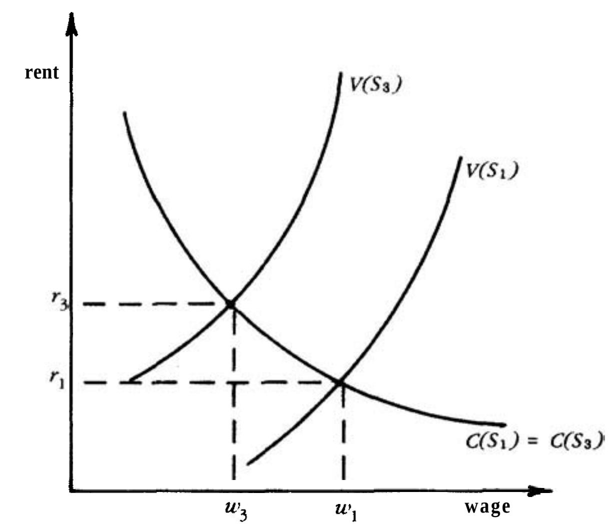


SOURCE: Authors

FIGURE 2

Consider another city, S_3, that differs from S_1 only in that households find it to be more amenable. This relationship is illustrated in figure 3, where city S_3 is represented by $V(S_3)$, which is to the left of $V(S_1)$. If no productivity differences exist, [that is, $C(S_1) = C(S_3)$], the difference in the households' valuation of amenities across cities leads to lower wages and higher rents in the more amenable city, S_3.

Amenity Differences and Equilibrium Wages and Rents



SOURCE: Authors.

FIGURE 3

Within this simple framework in which cities differ in either amenities or productivity, but not both, we can determine whether factor price differences reflect intercity differences in amenities or productivity by examining the pattern of wages and rents across cities. If wage and rent differences primarily reflect amenity differences across cities, we would see a negative relationship between wages and rents. If they reflect productivity differences, the relationship would be positive.

Within the same framework, we can also classify individual cities on the basis of whether their wages and rents differ from the average because of above-average amenities, below-average amenities, above-average productivity, or below-average productivity. These classifications are summarized in table 1 and figure 4.

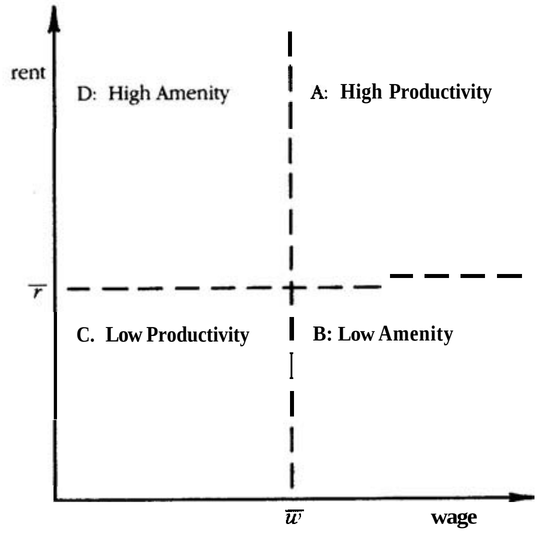
Of course, cities may differ in characteristics that affect both household utility and production costs. The problem of classifying cities by the relative magnitudes of these two effects becomes one of identifying the portion of the wage and rent differentials due to a shift in each curve. This can be done by identifying the combinations of *lnw* and *lnr* that would result from equal shifts of both curves and determining how wages and rents in each city fall relative to these shifts. The combinations of *lnr* and *lnw* that would result from equal shifts of both curves will form two lines with slopes that depend upon k_i^{-1} and $-\theta_w/\theta_r$. If k_i^{-1} (the slope of the V_s curve) is equal to θ_w/θ_r (the negative of the slope of the C_s curve), the combinations of *lnw* and *lnr* resulting from equal shifts of both curves would coincide with the x and y axis. 19

Assuming for illustration that this is the case, for any city with above-average wages and rents, the shift of the C_s (productivity) curve must be greater than the shift of the V_s (amenity) curve. Therefore, any city with wage and rent combinations in quadrant **A** in figure 4 is classified as a "high productivity" city, because the *primary* reason that this city's wages and rents differ from those of the average city is the above-average productivity it affords firms. This above-average productivity is reflected in the ability of firms in these cities to pay above-average wages and rents.

Similarly, cities with below-average wages and rents (quadrant C in figure 4) are classified as "low productivity" cities, since firms in these cities are compensated for the below-average productivity related to site characteristics with below-average factor costs.

Above-average amenities in a city are associated with increases in rents and decreases in wages reflecting households' willingness to pay for the amenities. Quadrant D then identifies cities where the dominant factor determining relative wages and rents is high amenities. For cities in quadrant B, the dominant factor is their below-average amenity value.

Classification of Cities



SOURCE: Authors.

FIGURE 4

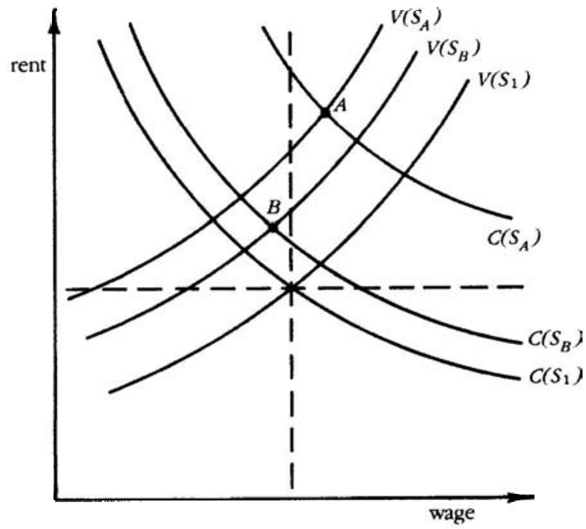
Classification of Cities

City Classification	Wage	Rent	Shift
	Direction of Price Differential		
High productivity	High	High	$C(S_i)$ curve up
Low productivity	Low	Low	$C(S_i)$ curve down
High amenity	Low	High	$V(S_i)$ curve up
Low amenity	High	Low	$V(S_i)$ curve down

SOURCE: Authors

TABLE 1

Classification of Cities and the Relative Productivity and Amenity Effects



SOURCE: Authors.

FIGURE 5

These labels may be misleading in that what we are referring to as "high productivity" cities are not necessarily more or less attractive to households than the "high amenity" cities. A city like the one represented by point A in figure 5 is relatively attractive to both households and firms. This relationship can be seen by the positions of $C(S_A)$ and $V(S_A)$ relative to the average city. The effect that dominates, however, is the productivity effect, since the shift of the C_s curve is greater than the shift of the V_s curve.

Another city like the one represented by point B may be less attractive to both firms and households than city A (again reflected in the relative positions of the amenity and productivity curves). However, the dominant trait of city B is its amenities, which are above average.

II. Estimation

The analysis is based on wage and rent data for a sample of recent movers drawn from the Public Use Microdata Sample of the 1980 Census of Populations. This subsample includes individuals who lived and worked in the same Standard Metropolitan Statistical Area (SMSA) in 1980 and who changed addresses between 1975 and 1980. This subsample of movers was chosen because housing prices of recently acquired or rented dwellings more accurately reflect current land market conditions.

The rent equation includes both owner-occupied and rental units for which positive values of unit or gross rent are reported. The dependent variable in the rent equation is gross monthly housing expenditures. For homeowners, the monthly housing expenditure is based on the value of the dwelling using 7.85 percent as the discount rate.[4] The monthly housing expenditure is the sum of this imputed rent and monthly utility charges. For renters, the monthly expenditure is gross rent (contract rent plus utilities).

Individuals included in the wage sample had to meet the following criteria. Individuals had to be between the ages of 25 and 55; work more than 25 hours per week; not be self-employed; and have positive wage and salary income. The dependent variable in the wage equation is average weekly earnings, which is calculated by dividing annual wage and salary income by the number of weeks worked.

4 The discount rate is from a study of the user cost of capital by Peiser and Smith (1985).

Quality-Adjusted Wages

A hedonic approach is used to estimate wage differentials across SMSAs. This approach uses regression analysis to determine the value the market places on different worker characteristics. An individual's wage is then predicted based on the value of his or her characteristics. The first step in constructing the wage indexes is to specify estimable equations that reflect appropriate individual characteristics of workers that could affect wages. Our approach follows the human capital specification of individual wages set forth by Hanoch (1967) and Mincer (1974). Thus, we specify individual wages (expressed in logarithms) as a function of education level (entered as a quadratic), potential experience (age minus years of education minus six, also entered as a quadratic), a binary variable indicating part-time employment status (less than 35 hours per week), and 42 binary occupation variables (with one omitted as a constant). Binary variables are also entered to account for gender, race, marital status, union affiliation, and whether or not an individual is a veteran.[5] In addition, the gender variable is interacted with other characteristics in order to control for male/female differences in the rate of return to these attributes.

The estimated coefficients of the wage equation are presented in table 2, except for the occupation variables, which are omitted for brevity. The estimated coefficients are as expected. Education and experience are valued positively in the labor market, while part-time, female, and nonwhite workers receive lower wages than their otherwise identical counterparts. We also find that individuals who are married, heads of households, and in highly unionized industries earn more than their counterparts. Females receive less return on experience than males.

The predicted wage level for each worker in the sample is obtained by multiplying the estimated coefficients by each worker's characteristics. The predicted wage can be interpreted as the compensation a worker could expect to receive, given his or her characteristics, regardless of geographic location. Subtracting the predicted wage from the actual wage nets out the portion of the actual wage that is related to the individual worker's characteristics. The skill-adjusted metropolitan wage differentials are then obtained by averaging the wage residuals (actual minus predicted wage) for all workers in a particular metropolitan area. Average wage differentials are calculated for each of 38 cities. The 38 metropolitan areas are chosen by including only those SMSAs for which 100 or more individuals in the sample were recorded as movers between 1975 and 1980. The quality-adjusted wage differentials are displayed in table 4.

Estimates of Wage Equation

Variables	Mean	Coefficient
Intercept	—	4.33 (50.19)
Sex (Female = 1)	.42	-.083 (-5.00)
Race (Black = 1)	.16	-.161 (-11.57)
Education	15.55	.043 (5.16)
Education squared	250.37	.0007 (2.81)
Experience	10.29	.043 (25.12)
Experience squared	192.33	-.0008 (-15.63)
Part time	.04	-.308 (-14.44)
Usual hours worked per week	42.05	.006 (10.84)
Head of household	.64	.111 (10.20)
Veteran	.20	-.017 (-1.53)
Sex x Race	.08	.111 (5.47)
Sex x (Marital status)	.22	-.058 (-3.14)
Sex x Experience	4.10	-.019 (-7.81)
Sex x (Experience squared)	76.82	.0003 (3.54)
Marital status	.62	.108 (9.62)
Union member	.25	.434 (14.12)
(42 Occupation Dummies)		
R-square		.34
No. observations	22,313	
Dependent variable: log (weekly earnings)	5.50	

Note: Estimates derived from Public Use Microdata Sample. T-statistics in parentheses.
SOURCE: Authors.

TABLE 2

Rent Equation

The method used to calculate quality-adjusted rent differentials is similar to the one used to calculate quality-adjusted wage differentials. The log of monthly housing expenditures is regressed

5 The measure of unionization in the wage equation is the industry unionization rate taken from Kokkelenberg and Sockell (1985)

Estimates of Rent Equation

Variables	Mean	Coefficient
Intercept	—	9.93 (248.36)
Dwelling rented (=1)	.53	.084 (1.35)
Central city (=1)	.14	-.05 (-3.29)
x rental		.021 (1.70)
Number of floors	1.10	.122 (5.43)
x rental		-.056 (-2.62)
Attached dwelling (=1)	.06	.06 (2.41)
x rental		.027 (1.17)
Year dwelling built	3.65	-.06 (-17.98)
x rental		-.018 (-4.94)
Number of rooms	7.07	.11 (22.80)
x rental		-.032 (-5.64)
Number of bedrooms	4.25	.10 (9.96)
x rental		.011 (1.03)
Well water (=1)	.14	.06 (3.70)
x rental		-.027 (-.83)
Central air conditioning (=1)	.52	.12 (9.13)
x rental		.038 (2.82)
Central heating (=1)	.91	.12 (6.35)
x rental		-.058 (-4.14)
Dwelling other than condominium (=1)	.96	-.046 (1.62)
Number of units at address	2.92	-.003 (-.65)
x rental		.007 (1.41)
Number of bathrooms	2.72	.179 (32.03)
x rental		-.056 (-6.73)
City sewer connection (=1)	.87	.053 (4.27)
x rental		.004 (.18)
Lot size less than one acre (=1)	.92	-.130 (8.72)
x rental		.185 (8.07)
Elevator (=1)	.04	.065 (2.45)
R-square		.63
No. observations	16,017	
Dependent variable: log (house value)	11.07	

Note: Estimates derived from Public Use Microdata Sample. T-statistics in parentheses. The entry "x rental" indicates that the rental dummy variable has been interacted with the variable listed immediately above it.
SOURCE: Authors.

TABLE 3

against housing attributes. These characteristics include the number of rooms, number of bedrooms, number of bathrooms, and separate binary variables indicating location of the dwelling in the central city, and whether or not the dwelling is a single structure, has central air conditioning and/or heating, is connected to a city sewer system, and has well water. The year the dwelling was built is entered to proxy the vintage. Dwelling characteristics are interacted with rental status in order to account for differences in the valuation of these attributes between rented and owner-occupied dwellings.

Coefficient estimates are reported in table 3. The results are as expected. larger, newer dwellings with central air and heating and that are located outside the central city have higher market value than otherwise identical homes. In general, attributes of rentals are valued less than otherwise identical owner-occupied dwellings. The predicted rent is calculated by multiplying the estimated coefficients by the housing characteristics of each household. The quality-adjusted rent differentials presented in table 4 are the differences between the actual and predicted house values.

By including a number of housing characteristics in the rent equation, the difference between actual and predicted house values can be interpreted to reflect primarily land values in specific geographical locations. Thus, quality-adjusted rent differentials relative to the national average reflect differences in city land values, which are due primarily to the capitalized effects of differences in site characteristics.

Land Shares

In addition to the quality-adjusted wage and rent differentials, our classification of cities requires estimates of the share of household income spent on land (k_l) and the ratio of the income shares of land and labor in production (θ_r/θ_u). These values are not readily available for each specific metropolitan area. Thus, we use national estimates and assume that the portion of household income spent on land and the ratio of labor income to land income in production are constant across metropolitan areas and equal to the national average.

The budget share of land is calculated by multiplying the fraction of income spent on housing (27.0 percent in our sample) by the ratio of land value to the total value of the house (estimated to be 19.6 percent).[6] From these estimates, land's share of household income (k_1) is

6 The ratio of land value to total house value was estimated by Roback using FHA housing data. Unfortunately, the census data used in this study cannot be used to make a new estimate.

5.3 percent. The ratio (θ_r/θ_u) is calculated by subtracting our estimate of k, from the ratio of the total income to land (*6.4* percent of national income) relative to total labor income (73 percent of national income).' The ratio of these income shares is 8.8 and the estimate of θ_r/θ_u is 3.5.

III. Classification of Cities

As discussed in section I, we can determine whether wage and rent differentials reflect variations in productivity or amenities across SMSAs by examining the pattern of wage and rent differentials across SMSAs. If intercity wage and rent differentials primarily reflect amenity differences, we should observe a negative relationship between wages and rents. If they primarily reflect productivity differences, the relationship should be positive.

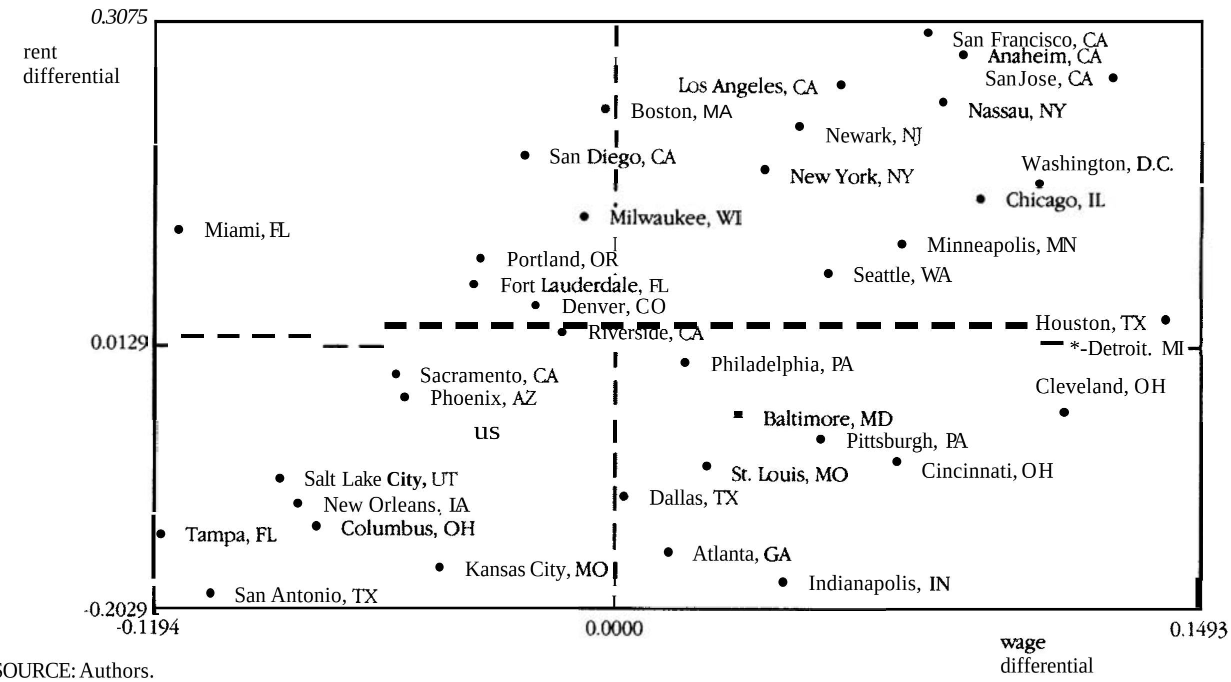
The quality-adj ted wages and rents for the SMSAs in our sample are presented in figure *6*. It appears from figure 6 that there is a slight positive relationship between wages and rents in our sample. Using the same amenity and productivity quadrants found in figure *4*, more SMSAs lie in the "productivity" quadrants than in the "amenity" quadrants. This is confirmed by a positive correlation coefficient of *0.46*. The relatively small value of the coefficient suggests that the relationship is not the same across all SMSAs.

We now proceed to determine whether deviations from the average wages and rents for individual SMSAs primarily reflect a) above-average amenities, b) below-average amenities, c) above-average productivity, or d) below-average productivity.

In order to determine the combinations of wages and rents that fall into each of these categories, we must first determine the wage and rent combinations that form the boundaries for these categories. These boundaries are determined by the combinations of wages and rents that would result from equal shifts of the V_s and C_s curves relative to the average SMSA. Using the estimates of land shares discussed above, we find that for all practical purposes these boundaries coincide with the x and y axis in figure 6.[8]

A listing of cities in each category is presented in table 5. Most of the SMSAs fall

Standard Metropolitan Statistical Areas Included in Sample



SOURCE: Authors.

FIGURE 6

7 The estimate of labor compensation is taken from the national income account data reported in Table B-23 of the Economic Report of the President (1987) Unfortunately, the national income accounts do not include land income as a separate category of income Our estimate of land's share of income is taken from Mills and Hamilton (1984)

8 The exact boundaries are two lines that pass through the origin, one with a slope of 003, the other with slope 333 We classified cities based on these boundaries, but the classifications do not change if one uses the x and y axis as reference points

Quality-Adjusted Rent and Wage Differentials[a]

Metropolitan Area	Quality-Adjusted Rent	Quality-Adjusted Wage
Anaheim, CA	.281	.078
Atlanta, GA	-.145	.014
Baltimore, MD	-.075	.031
Boston, MA	.220	-.001
Chicago, IL	.104	.081
Cincinnati, OH	-.082	.064
Cleveland, OH	-.053	.108
Columbus, OH	-.126	-.074
Dallas, TX	-.103	.001
Denver, CO	.036	-.013
Detroit, MI	.013	.149
Ft. Iauderdale, FL	.039	-.029
Houston, TX	.023	.142
Indianapolis, IN	-.172	.041
Kansas City, MO	-.155	-.037
Los Angeles, CA	.261	.049
Miami, FL	.076	-.112
Milwaukee, WI	.100	-.002
Minneapolis, MN	.073	.065
Nassau-Suffolk, NY	.240	.077
New Orleans, LA	-.110	-.079
New York, NY	.145	.036
Newark, NJ	.195	.045
Philadelphia, PA	-.013	.017
Phoenix, AZ	-.029	-.047
Pittsburgh, PA	-.079	.047
Portland, OR	.059	-.027
Riverside-San Bernardino, CA	.016	-.008
Sacramento, CA	-.014	-.047
St. Louis, MO	.085	.019
Salt Lake City, UT	-.099	-.081
San Antonio, TX	-.203	-.105
San Diego, CA	.148	-.014
San Francisco, CA	.308	.073
San Jose, CA	.269	.125
Seattle, WA	.048	.047
Tampa, FL	-.142	-.119
Washington, D.C.	.116	.103

a Quality adjusted differentials are obtained by subtracting the predicted estimate from the actual value The reference point for these estimates is the sample average.
SOURCE: Authors

TABLE 4

within expected classifications. For instance, Miami, Denver, Portland, Ft. Iauderdale, and San Diego are classified as high-amenity cities, since these cities are characterized by below-average wages but above-average rents, both of which reduce the income of households.

In cities like Baltimore, Cleveland, Pittsburgh, and Atlanta, wages and rents primarily reflect the below-average amenity value to households of these cities. Households in these cities receive compensation for this low amenity value in the form of above-average wages and below-average rents.

SMSAs that can be characterized as "high productivity" include Chicago, Houston, Los Angeles, and San Jose, among others. For these cities, both wages and rents are above average, suggesting that the firms in these cities are compensated for high factor costs by other locational characteristics of these cities. SMSAs like Tampa, New Orleans, and San Antonio can be characterized as "low productivity." Firms in these areas are compensated for the below-average productivity value of site characteristics in the form of lower wages and rents.

Classifying SMSAs according to the dominant effect of their site characteristics does not mean that a high-prtxluctivity city has no amenity value. It simply means the city is dominated by its productivity characteristics. Using equations 3 and 6, we can develop relative rankings of cities within the productivity groups by amenities and within the amenity groups by productivity. The ordering of cities in table 5 reflects this sort of cross classification. For example, of the high-productivity cities, New York, Los Angeles, and Seattle are considered more amenable than Chicago, Houston, and Detroit. Of the high-amenity cities, Boston is more attractive to firms than Miami.

The classifications of some cities are questionable, especially for cities near the boundaries. For some cities like Boston and Milwaukee, rents are considerably higher than average, but wages are so close as to be indistinguishable from the average. As a result, we cannot be confident in our classification of these cities as high productivity or high amenity, although we can be fairly confident that they are not low-amenity or low-productivity cities. Philadelphia and Riverside are examples of cities that are so close to the average in both wages and rents that their classifications may also be meaningless.

IV. Conclusion

In this paper, we have utilized the relationship between regional wage and rent differentials to identify cities by the net effect of their bundle of site characteristics on firms and households. We have found that, on average, firms respond more to site characteristics than households, as is revealed in the relatively large contribution of demand effects to determining regional wage differentials. Nevertheless, the amenity (or household) component of the total regional differential is also significant. Thus, regional wage differentials result from the interplay of the forces of supply and demand and exist even though individuals move freely in response to factor price

Classification of Cities

High Productivity	Low Productivity
New York, NY	Tampa, FL
Newark, NJ	San Antonio, TX
Los Angeles, CA	Salt Lake City, UT
Seattle, WA	New Orleans, LA
San Francisco, CA	Columbus, OH
Minneapolis, MN	Sacramento, CA
Anaheim, CA	Phoenix, AZ
Nassau-Suffolk, NY	Kansas City, MO
Chicago, IL	
Washington, D.C.	
San Jose, CA	
Houston, TX	
Detroit, MI	

High Amenity	Low Amenity
Boston, MA	Cleveland, OH
San Diego, CA	Cincinnati, OH
Milwaukee, WI	Pittsburgh, PA
Denver, CO	Philadelphia, PA
Riverside, CA	Baltimore, MD
Portland, OR	St. Louis, MO
Ft. Lauderdale, FL	Indianapolis, IN
Miami, FL	Dallas, TX
	Atlanta, GA

NOTE: Productivity cities are listed from the most amenable to the least. Amenity cities are listed from the most productive to the least.
SOURCE: Authors.

TABLE 5

differentials. Thus, so long as regions differ in the amount and quality of their site-specific characteristics, wage differentials will continue to exist.

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