

Working Paper 8709

AMENITIES AND THE RETURNS  
TO HUMAN CAPITAL

by Patricia E. Beeson

Patricia E. Beeson is a visiting economist at the Federal Reserve Bank of Cleveland and an assistant professor of economics at the University of Pittsburgh.

Working Papers of the Federal Reserve Bank of Cleveland are preliminary materials circulated to stimulate discussion and critical comment. The views stated herein are those of the author and not necessarily those of the Federal Reserve Bank of Cleveland or of the Board of Governors of the Federal Reserve System.

November 1987

## I. Introduction

The determinants of interregional wage differentials is a topic that has drawn considerable attention among economists. Two theories have come to dominate as explanations of these differentials. The first assumes a national labor market and, therefore, views interregional differences in nominal wages as compensation for differences in rents and other prices or nonpecuniary attributes. According to the second theory, labor market conditions may vary regionally, and interarea wage differentials result from structural differences across these local labor markets.

Attempts to discriminate between these two hypotheses have involved estimating reduced form wage equations. The belief that factor mobility will result in the equalization of characteristic prices across regions has led researchers to interpret shifts of the wage equation in response to amenity and price differences as compensation for regional differences in amenities. Differences in the return to human capital (that is, changes in the slope of the wage equation) such as those found by Hanushek (1973), Sahling and Smith (1983), Krumm (1984), Jackson (1985), and Farber and Newman (1985), on the other hand, have been interpreted as reflecting structural differences in regional labor markets--an interpretation some find difficult to accept given the persistence of these differences despite the geographic mobility of the U.S. labor force.

This paper shows, theoretically, that regional differences in the returns to human capital do not necessarily imply structural differences in regional labor markets. Regional differences in the returns to human capital, like regional differences in the level of wages, could be reflecting compensation for regional differences in amenities. These compensating differences in the return to human capital depend on the income elasticity of the marginal evaluation of amenities relative to the income elasticity of

demand for land and other goods, and can exist even when workers are mobile and have identical preference functions.

The extent to which regional differences in the returns to human capital reflect compensation for regional differences in human capital is then examined empirically. Regional differences in the return to education are found to be explained almost entirely by regional differences in amenities. Furthermore, a substantial portion of regional differences in the returns to occupation are also found to be related to amenities. Together this evidence supports the view of a national labor market with regional wage differentials representing compensation for regional differences in amenities.

In the following section, Roback's (1983) general equilibrium model of household and firm location is extended to incorporate differences in human capital. In the context of this model, the relationship between site characteristics and rents, average wages, and the returns to human capital is examined. The empirical results are presented and discussed in Section III.

## II. Theoretical Model

In this section, we develop a model that shows the mechanism through which interarea differences in site characteristics are capitalized into wages. In this model, site characteristics are allowed to affect both the utility of households and the productivity of firms. The interactions of these two groups then determines the average wage and rents in an area. Rents are shown to reflect the average value per unit of land of site characteristics to both firms and households. The total payment made by an individual or firm in the form of land then is their consumption of land times the average value of the amenity.

Differences in the marginal evaluation of the site characteristics per unit of land for the average worker relative to firms are shown to be capitalized into the average wage change and therefore are reflected in a shift of the wage equation as related to amenities. It is then shown that, since differences in human capital imply differences in real income, the size of the wage premium will vary for workers with different amounts of human capital if the income elasticity of the marginal valuation of amenities differs from the income elasticity of demand for land and for all other goods. This, in turn, will lead to regional differences in the return to human capital reflected in the slope of the wage equation.

#### THE MODEL

Cities are assumed to differ in endowed site characteristics,  $s$ .<sup>1</sup> Workers are assumed to have identical preference functions and to differ only in their endowments of human capital, which determines their real income. While skills vary across individuals, tastes do not. For simplicity, differences in leisure that result from differences in intercity commuting are ignored and it is assumed that individuals live in the city in which they **work**.<sup>2</sup> Workers produce and consume a composite commodity,  $x$ , sold in national markets and used as the numeraire. Workers and physical capital are assumed to be completely mobile across locations, at least at the margin.

In each city with amenity level,  $s$ , workers maximize their utility, which is a function of their consumption of a composite commodity,  $x$ , land,  $h$ , and amenities,  $s$ , subject to an income constraint.<sup>3</sup> In equilibrium, the utility of all workers with the same endowment of human capital must be the same at all locations. If this were not the case, workers would relocate and arbitrage away differences in utility. This yields  $n$  equilibrium conditions,

one for each class of worker. In the form of indirect utility functions, equilibrium requires,

$$(1) \quad V_i = V(w_i, r; s) \quad i=1 \dots n,$$

where,  $i$  indexes the workers by human capital;  $V_i$  is the level of utility attainable for workers in class  $i$ ;  $w_i$  is the nominal wage of workers in class  $i$ ;  $r$  is the rental rate of land, which is the same for all workers in a city regardless of human capital; and  $s$  is the amenity level in the city.

Differentiating the indirect utility function for the representative worker in each class with respect to amenities and setting the result equal to zero yields,

$$(2) \quad \frac{dV_i}{ds} = 0 = -V_{w_i} \frac{dw_i}{ds} - V_r \frac{dr}{ds} - V_s \quad i=1 \dots n.$$

Rearranging and using Roy's identity yields the following equilibrium relationships for workers in each class,

$$(3) \quad \frac{dw_i}{ds} = h_i \frac{dr}{ds} - p_i^e \quad i=1 \dots n$$

or

$$(4) \quad \frac{d \log w_i}{ds} = k_i \frac{d \log r}{ds} - \frac{p_i^e}{w_i} \quad i=1 \dots n$$

where  $h_i$  is consumption of land;  $p_i^e$  is the monetized value of marginal utility of the amenity; and  $k_i = r h_i / w_i$  is the budget share of land.

According to equation 3, wage differentials across cities for each class of worker represent the difference between their marginal evaluation of the amenities,  $p_i^e$ , and their payment for these amenities in the form of land rents,  $h_i(dr/ds)$ .

Firms in each city are assumed to employ workers with different amounts of human capital ( $N_i$ ), land ( $L^p$ ) and physical capital to produce the composite commodity,  $X$ , according to a constant returns to scale production function. The productivity of firms may also be affected by the site characteristics of a city. Firms minimize unit cost that, in equilibrium,

must be equal across locations and equal to the price of  $x$ , assumed to be 1. Differentiating the unit cost function with respect to site characteristics gives the following equilibrium condition for firms:

$$(5) \quad \frac{dC}{ds} = 0 = \sum_i C w_i \frac{dw_i}{ds} + C_r \frac{dr}{ds} + C_s$$

Substituting  $C w_i = N_i/X$  and  $C_r = L^P/X$ ,

$$(6) \quad \sum_i N_i \frac{dw_i}{ds} + L^P \frac{dr}{ds} + C_s X = 0.$$

### EQUILIBRIUM RENTS AND WAGES

Given a level of utility attainable for each category of worker ( $V_i$ ), the  $n$  equilibrium conditions for workers, equation (3), together with the equilibrium condition for firms, equation (6), determine wages and rents in each city. Solving these equations simultaneously for changes in rents across cities yields

$$(7) \quad \frac{dr}{ds} = \frac{-C_s X + \sum_i N_i p_i^e}{L^P + \sum_i N_i h_i} = \frac{-C_s X + N \bar{p}}{L^P + N \bar{h}} = \frac{-C_s X + N \bar{p}}{L}$$

or

$$(8) \quad \frac{dr}{ds} = \frac{-C_s X}{L^P} \frac{L^P}{L} + \frac{N \bar{p}}{L^c} \frac{L^c}{L},$$

where  $p$  is the average marginal evaluation of the site characteristics to workers;  $h$  is the average land per household; and  $L^c$  is the total amount of land used in housing.

Interurban differences in the rent per unit of land are then the weighted average of the value of the amenities relative to land used, for firms ( $-C_s X/L^P$ ), and the value for households ( $N \bar{p}/L^c$ ), where the weights are the portion of land in each activity.

Note that the full value of regional differences in site characteristics are capitalized into aggregate land values,

$$(9) \quad L \frac{dr}{ds} = -C_s X + N p.$$

Since the rental rate of land represents an average value of the site characteristics, rental payments by individual workers and firms will be equal to the value of the site characteristics to the individual workers and firms only **if** the value per unit of land used is equal in all activities. **If** this is not the case, any difference will be capitalized into wages in the labor market.

The effect of site characteristics on wages can be seen by substituting equation (7) into the equilibrium condition for workers, equation (4). For each class of workers,

$$(10) \quad \frac{dw_i}{ds} = h_i \left( \frac{-CsX}{L} + \frac{N\bar{p}}{L} \right) - p^e = h_i \left[ \frac{-CsX}{L} + \frac{N\bar{p}}{L} - \frac{p_i^e}{Lh_i} \right] \quad i=1\dots n$$

and

$$(11) \quad \frac{d \log w_i}{ds} = k_i \left( \frac{-CsX}{rL} + \frac{N\bar{p}}{rL} \right) - \frac{p_i^e}{w_i} \quad i=1\dots n.$$

In equilibrium, wages for each class of workers adjust to reflect the difference between their marginal evaluation of the amenities per unit of land they own, and the average value for the community as a whole.

#### THE AVERAGE CHANGE IN WAGES

The average change in wages across cities reflects the average difference between households and firms in their valuation of site characteristics relative to land.

$$(12) \quad \frac{dw}{ds} = \bar{h} \left( \frac{-CsX}{L} + \frac{N\bar{p}}{L} \right) - \frac{N\bar{p}}{Nh} = \frac{hL^p}{L} \left[ \frac{-CsX}{L^p} + \frac{N\bar{p}}{L^c} \right]$$

or

$$(13) \quad \frac{d \log w}{ds} = k \left( \frac{-CsX}{rL} + \frac{N\bar{p}}{rL} \right) - \left[ \frac{\bar{p}}{w} \right].$$

From equation (12) one can see that the average wage differential depends on the allocation of land in the city, ( $L^p$ ), the amenity value of

the site characteristic per unit of land in housing,  $(N\bar{p}/L^c)$ , relative to its production value per unit of land in production,  $(-CsX/L^p)$ , and the distribution of workers across skill classes, which determines  $\bar{h}$  and  $\bar{p}$ .

The relationship between the average wage change and relative amenity and productivity values has a simple interpretation. If a site characteristic is valuable to both firms and households (that is,  $Cs < 0$  and  $p > 0$ ), rents will increase by the weighted average of the two. If the value of households per unit of land exceeds that of firms, rent payments by firms will exceed the productivity value of the site characteristic to firms, and rent payments by households will be less than the amenity value of the site characteristic to households. Competition in the labor market will then lead to lower average wages, which compensate the firms for the rent payment in excess of productivity value and make the total payment (rents and foregone wages) by households equal to the value of the amenity.

In general, wages will decrease whenever the amenity value per unit of land to workers of an urban attribute exceeds its productivity value per unit of land to firms. If the productivity value is relatively larger, wages will increase. Whether rents increase or decrease, on the other hand, depends on the net value of the site characteristic to both firms and households, rather than the relative values. If the net value is positive, rents will increase; if negative, they will decline.

#### CHANGES IN THE SLOPE OF THE WAGE GRADIENT

Any systematic difference between the value per unit of land of amenities across workers with differing endowments of human capital will be capitalized into the relative wages. Since increases in human capital



increase real income, the value per unit of land of amenities may vary systematically across skill groups **if** the income elasticity of the marginal evaluation of the amenity is not equal to that for land and other goods.

Differentiation equation (4) with respect to real income,  $y$ , which includes the value of amenities as well as money income, for location fixed yields,

$$(14) \quad \frac{d(\partial \log w / \partial s)}{d \log y} = k \frac{d \log r}{ds} (\eta_{h,y} - \eta_{w,y}) - \frac{p^e}{w} (\eta_{pe,y} y_0) \gtrless 0,$$

where  $\eta_{pe,y}$  is the income elasticity of the marginal evaluation of the amenity,  $\eta_{h,y}$  is the income elasticity of demand for housing and,  $\eta_{w,y}$  is the income elasticity of demand for money income, which reflects the demand for market goods.

**If** equation (14) is negative, the slope of the amenity-wage gradient decreases with increases in human capital. In reference to a standard wage equation, a negative value for equation (14) implies that the returns to human capital will be lower in high-amenity areas. Similarly, **if** equation (14) is positive, the return to human capital will be increasing in amenities.

The sign of equation (14) depends in part on the income elasticity of the marginal valuation of amenities relative to the income elasticity of demand for land. This relationship can be clearly seen **if** we assume the income elasticity of demand for housing is equal to that for all other goods. In this case equation (14) can be written as,

$$(15) \quad \frac{d(\partial \log w / \partial s)}{d \log y} = - \frac{p^e}{w} (\eta_{pe,y} - \eta_{h,y}) \gtrless 0 \text{ as } (\eta_{pe,y} - \eta_{h,y}) \gtrless 0.$$

This makes sense since those who most value amenities relative to housing will pay proportionately more for the amenity in the form of wages. Since they consume relatively less land, they pay relatively less for the amenity in the form of land rents. The difference is made up in the form of a relative decline in wages.

If the income elasticity of demand for housing is not equal to that for all other goods, the sign of equation (14) depends of factors other than these two elasticities. In particular, equation (14) will be negative if  $\eta_{pe,y} > \eta_{w,y} > \eta_{h,y}$ ; positive if  $\eta_{pe,y} < \eta_{w,y} < \eta_{h,y}$ ; equal to zero if all elasticities are equal; and the sign will be indeterminate, if both  $\eta_{pe,y}$  and  $\eta_{h,y}$  are greater or less than  $\eta_{w,y}$ . In the latter case, the sign will depend on the share of real income spent on land and the share spent on amenities, as well as the relative elasticities.

To summarize, the average value of site characteristics is capitalized into rents per unit of land. Each individual then 'pays' in rent an amount equal to their consumption of land, times the average marginal valuation of the site characteristic. Difference between the amount an individual pays in the form of rents and their valuation of the amenity will then result whenever their consumption of land relative to their marginal valuation of the amenity differs from the average.

Since increases in human capital increase the real income of individuals, the consumption of land relative to the marginal valuation of the amenity will vary systematically with human capital if the income elasticity of demand for land is not equal to the income elasticity of the marginal valuation of the amenity. If workers in all skill classes are mobile, at least at the margin, competition among workers within each skill class for locations where the value of the amenity is greater than the payment in land rents will result in the capitalization of the difference into wages.

If, for example, the income elasticity of the marginal valuation of the amenity is greater than that for land, the marginal valuation of the amenity will increase more rapidly than land consumption (and, therefore, land rent payments) as income/human capital increases. Competition among high-skill

workers for locations in these high-amenity locations will drive down their wages relative to low-skilled workers, decreasing the returns to human capital in the form of wages, and decreasing the slope of the wage gradient.

Similarly, **if** the income elasticity of the marginal valuation of the amenity is less than that of land, the returns to human capital reflected in the slope of the wage gradient will increase with amenities.

### III. EMPIRICAL RESULTS

In this section, the extent to which regional differences in the return to capital reflect compensation for interregional differences in amenities is examined empirically. Before reviewing the empirical model and results, a few points should be noted.

First, the theory developed in the previous section assumes that tastes do not vary within skill groups. To the extent that they do, the results presented represent an average across workers in each skill group.<sup>4</sup>

Furthermore, tastes for certain amenities may vary with human capital independent of the effects of increases in real income described above. Highly educated individuals may value education or cultural facilities more highly than those with less education and, therefore, may be willing to pay more than individuals with less education for locations where schools are better or where there are more cultural facilities, even **if** their real income were the same.

In the estimation, no attempt is made to separate these two effects.<sup>5</sup> Note, however, that this will not affect any conclusions regarding the extent to which regional differences in the returns to capital reflect compensation for differences in amenities. **It** would simply change the interpretation of why compensation varies across skill groups.

The final note concerns the list of amenities and the types of human

capital considered. No attempt is made to include a complete list of amenities, though some care was taken to choose characteristics that reflect different aspects of cities. Cultural and recreational facilities and the quality of schools are included along with more standard attributes, such as climate and density. As with the amenity variables, the human capital variables considered--education and occupation--are not intended to fully describe all worker attributes that reflect human capital.

#### DATA

The principal source for wage data is the Census Bureau's Current Population Survey Earnings file for 1980. The sample used is limited to individuals reporting earnings of more than \$1 per hour and residing in one of the 44 Standard Metropolitan Statistical Areas (SMSAs) identified in the survey. The sample was further limited to full time, civilian, nonagricultural workers employed for wage or salary and not self-employed.

The mean values of the personal characteristics of workers included in the wage equation, along with the coefficients from a regression of these characteristics on the log of hourly earnings, are presented in Appendix A. The list includes most individual attributes thought to influence wages.<sup>6</sup> These coefficient estimates remain fairly constant when region and amenity variables are included in the wage equation. The sources and definitions of the amenity characteristics are presented in Appendix B.

#### AMENITIES AND THE RETURNS TO EDUCATION

Table 1 addresses the question of the influence of urban attributes on the returns to education. The first column of table 1, presents evidence of differential returns to education across regions, as well as regional differences in the average wage. Standard t-tests indicate significant

differences in the returns to education across regions, reflected in the region-education interaction terms, in addition to regional differences in the average wage, reflected in the regional intercepts. Furthermore, an F-test of the joint significance of the three slope coefficients gives an F-value of 34.8 where the critical F at 1 percent significance is 3.78.

We expect that the inclusion of amenities will reduce the importance of region in explaining the returns to education as well as reducing its importance in explaining the intercept of the wage equation. The second column of table 1, presents the regression results when amenities are included in the intercept and interacted with education.

A comparison of columns 1 and 2 of table 1 support the hypothesis that regional differences in the return to education represent, at least in part, compensation for regional differences in amenities. The coefficients capturing differential returns to education across regions fall dramatically, and t-tests indicated that, after controlling for amenities, the returns to education in the Northeast and West are not significantly different from the returns in the North Central region. While the returns to education in the South remain significantly higher than in the North Central even after amenities are taken into account, the role of region is reduced substantially, as is reflected in a decline in the coefficient from .01583 to .0061. Given the limited number of amenity variables included, the higher returns to education in the South may well be related to some unmeasured site characteristics.

The joint significance of the regional terms when amenities are included was calculated by comparing columns 3 and 2 in table 1. Column 3 contains the estimates of a wage equation, which includes the amenities, but which omits the regional variables. The inclusion of regional variables does not substantially affect the coefficients or significance of most of the amenity

variables. In addition, an F-test of the joint significance of the amenity-education interaction terms when amenities are included gives an F-value of 34.8 when amenities were omitted. The combined evidence presented in table 1 suggests that regional differences in the returns to education largely represent compensation for regional differences in amenities.

A decline in the importance of region in explaining the differences in the average wage once amenities are taken into account is also evident in table 1. When amenities are included, the coefficients on the Northwest and South dummies, while still significant, fall dramatically. The average wage is significantly higher in the West than in the North Central after controlling for regional differences in amenities. Prior to the inclusion of amenities, the opposite was true.

A test of the joint significance of all the regional terms when amenities are not included, gives an F-value of 68.9. Once regional differences in amenities have been accounted for, the F-value is reduced to 14.7. A similar comparison of the significance of the amenity variables when region is not included, and when the regional terms are included, gives F-values of 63.6 and 43.0, respectively. Overall, the evidence seems persuasive that regional differences in both the level of earnings and the returns to education, to a large extent, represent compensation for regional differences in amenities.

#### AMENITIES AND REGIONAL DIFFERENCES IN THE RETURN TO OCCUPATION

Table 2 addresses the question of the relationship between amenities and the returns to occupation. The findings are similar to those for the returns to education. Column 1 presents the coefficient estimates on the regional variables when no amenities are included in the regression. Evidence of regional differences in the returns to occupation are found in a test of the

joint significance of the 27 slope coefficients, which gives an F-value of 9.3 where the critical value is 1.7. (F-values are summarized in table 3).

Column 2 in table 2 presents the coefficient estimates for the regional intercepts and the region-occupation interaction terms when amenities are both included in the intercept and interacted with occupation.<sup>7</sup> Of the 20 region-occupation coefficients that were significant in the absence of amenities, 13 are no longer significant when regional differences in amenities are taken into account. Of these 13, the absolute value of the coefficient fell for 10. Of the seven region-occupation coefficients that remained significant, the absolute value of the coefficient declined for five, and increased for two. In two cases, Sales and Private Household Services in the West, coefficients that were insignificant in the absence of the amenity variables became significant when they were included.

A test of the joint significance of the region-occupation interaction terms when regional differences in amenities are accounted for gives an F-value of 2.7, which is a substantial decline from the F-value of 9.3 when amenities are not included. As was the case with the regional differences in the returns to education, the evidence suggests that to a large extent these regional differences in the return to occupation represent compensation for regional differences in amenities.

## THE DEMAND FOR AMENITIES

The final question addressed concerns inferences that can be made concerning the demand for amenities. In the absence of rent data, we are unable to determine whether the urban attributes included in the regressions are viewed by households as amenities or disamenities. Using the information on amenities from the estimation of amenities and education (table 2), we can

say, however, that, on average, characteristics, such as Density, for which the average worker receives compensation in the form of higher wages, are valued more highly by firms than by households. Similarly, characteristics such as Culture that are associated with lower wages, on average are valued more highly by households than by firms.

A negative correlation between the intercept and slope coefficients on the amenity variables is apparent in table 1. Without exception, the returns to education increase with net amenities. That is to say, the more highly educated workers pay relatively less in the form of forgone wages for attributes that, on average, lower wages, and they receive relatively less for attributes that, on average, require wage compensation.

This does not imply that highly educated individuals value amenities less than others, either absolutely or relatively. They may well value amenities more. Payments for amenities take the form of rents as well as wages and, as noted in section II of this paper, increases in human capital (such as education) that increase real income, may increase land ownership, thereby increasing rent payments. If these rent payments increase more rapidly than the value of amenities, the difference will be reflected in relatively lower wages. This evidence is then consistent with a positive sign on equation (14) and an income elasticity of demand for land that exceeds the income elasticity of the marginal evaluation of amenities.

#### IV. SUMMARY AND CONCLUSIONS

This paper has shown that interpreting regional differences in the returns to human capital as evidence of structural differences in regional labor markets is incorrect. The theory demonstrated that regional differences in the returns to human capital may reflect compensation for regional differences in amenities and that these differences in the returns to human



capital would exist in equilibrium due to differences between the income elasticity of the marginal evaluation of amenities and the income elasticity of demand for housing and other goods.

The empirical work on wages found that well-documented regional differences in the returns to both education and occupation can be largely explained by amenities. One interesting question for future research is whether the empirical relationship between amenities and the returns to human capital is due to systematic differences in preferences across education or occupation groups, or whether the relationship results from the relative income elasticities of demand as was suggested in the theoretical model. Another area for further research is the impact of differences in amenities on the migration patterns of different human capital groups. Finally, this work could be extended by allowing for substitution of inputs by firms and by considering different types of firms as well as workers.

## References

- Bartik, Timothy J. "The Estimation of Demand Parameters in Hedonic Price Models," J.P.E. 95 (February, 1987, pp. 81-88.
- Epple, Dennis. "Hedonic Prices and Implicit Markets: Estimating Demand and Supply Functions for Differentiated Products." J.P.E. 95 (February, 1987, pp. 59-80.
- Hanushek, Eric. "Regional Differences in the Structure of Earnings." Rev. Econ. and Statis. 55 (May, 1973, pp. 204-213.
- Hoehn, John P.; Berger, Mark C.; and Bloomquist, Glenn C. "A Hedonic Model of Interregional Wages, Rents and Amenity Values." Working Paper. Lexington, Kentucky; University of Kentucky, (April, 1986).
- Jackson, Lorie D. "The Changing Nature of Regional Wage Differentials from 1979 to 1983." Economic Review, Federal Reserve Bank of Cleveland, First Quarter (1986, pp. 12-23.
- Krumm, Ronald J. "Regional Wage Differentials, Labor Supply Responses and Race." J. Reg. Sci. 24 (August, 1984, pp. 431-442.
- Roback, Jennifer. "Wages, Rents, and the Quality of Life." J.P.E. 90 (December, 1982, pp. 1257-1278.
- Sahling, Leonard, and Sharon Smith. "Regional Wage Differentials: Has the South Risen Again?" Rev. Econ. and Statis. 65 (February, 1983, pp. 131-135.

Endnotes

1. The ability of an area to create amenities is not considered.
2. The question of intra-urban location can be addressed in the framework developed here. Hoehn, et.al. (1986) incorporate intra-urban location in a similar model that only allows for one type of worker.
3. Common ownership of land and capital are assumed and the income from these factors is assumed to be distributed equally among the workers.
4. See Roback (1983) for a discussion of this point.
5. Recent work by Epple (1986) and Bartik (1986) address the question of estimating hedonic equations when tastes vary.
6. One notable exception is union status, which has been found to be an important determinant of wages, but was not reported in 1980 CPS data.
7. The 80 amenity-occupation interaction terms, which are omitted for brevity, are available from the author upon request.

Table 1: Amenities and the Returns of Education

	Model 1	Model 2	Model 3
Intercept	1.1447** (.0191)	.9918** (.1753)	.4439** (.0893)
New England (NE)	-.1665** (.0203)	-.0825* (.0416)	
South (S)	-.2541** (.0205)	-.0675* (.0402)	
West (W)	-.1052** (.0205)	.1000** (.0377)	
Education * NE	.0093** (.0015)	.0028 (.0032)	
Education * S	.0158** (.0016)	.0061* (.0030)	
Education * W	.0090** (.0015)	-.0040 (.0028)	
Recreation (Rec)		.3396 (.2647)	.1472 (.2443)
Density (Den)		.4867** (.1867)	.0856 (.1372)
Schools (Sch)		-.9610 (.6572)	1.382** (.4062)
Health (Heal)		-.0045 (.0890)	-.0532 (.0873)
Culture (Cult)		-.1245** (.0322)	.6788* (.2797)
Crime (Crime)		.5154 (.9592)	2.369** (.7123)
Population (Pop)		.0923 (.0585)	.1213* (.0512)
Heating Degree Days (HDD)		.4257** (.0825)	.4987** (.0465)
Education * Rec		-.0486* (.0200)	-.0271 (.0185)
Education * Den		-.0516** (.0139)	-.0397** (.0102)
Education * Sch		.1139* (.0505)	-.0194 (.0311)
Education * Heal		.0186** (.0068)	.0203** (.0066)
Education * Cult		.1259** (.0242)	.1026** (.0209)
Education * Crime		-.0440 (.0735)	-.1023* (.0538)
Education * Pop		-.0061 (.0044)	-.0090* (.0039)
Education * HDD		-.0212** (.0063)	-.0291** (.0035)
$\bar{R}^2$	.4235	.4302	.4296

Note: Regression includes personal characteristics; standard errors are in parenthesis. See Appendix for variable definitions.

\*\*1 percent level of significance

\*10 percent level of significance.

Source: Author.

Table 2: Amenities and the Return to Occupation

	Model 1	Model 2
New England		
Intercept	.0076 (.0099)	-.0295 (.0201)
Managers	-.0306** (.0163)	-.0689* (.0332)
Sales	-.0354** (.0214)	-.0782* (.0422)
Clerical	-.0401** (.0135)	.0033 (.0273)
Craftsmen	-.1182** (.0153)	-.0687* (.0294)
Operatives	-.1264** (.0162)	.0257 (.0317)
Transport	-.1275** (.0253)	-.0650 (.0490)
Nonfarm Labor	-.1053** (.0249)	.0268 (.0472)
Private Household	.1812* (.0733)	.2123 (.1940)
Other Service	-.0198 (.0164)	-.0092 (.0344)
South		
Intercept	.0242* (.0101)	.0472 (.0188)
Managers	-.0398* (.0164)	-.0434 (.0312)
Sales	-.0919** (.0214)	-.0829* (.0403)
Clerical	-.0473** (.0137)	-.0292 (.0255)
Craftsmen	-.1502** (.0156)	-.1037** (.0290)
Operatives	-.1458** (.0176)	.0155 (.0328)
Transport	-.1558** (.0254)	-.1121* (.0471)
Nonfarm Labor	-.1654** (.0246)	-.0441 (.0449)
Private Household	.1301** (.0724)	-.0579 (.1679)
Other Services	-.0652** (.0175)	-.0476** (.0324)

Table 2: Amenities and the Return to Occupation (Cont.)

---

	Model 1	Model 2
<hr/>		
West		
Intercept	.0390** (.0098)	.0326* (.0175)
Managers	-.0186 (.0160)	-.0004 (.0286)
Sales	.0020 (.0209)	.0726* (.0360)
Clerical	-.0085 (.0136)	.0050 (.0240)
Craftsmen	-.0562** (.0153)	.0036 (.0272)
Operatives	-.1042** (.0162)	.0436 (.0296)
Transport	-.0144 (.0256)	.0444 (.0432)
Nonfarm Labor	-.0455* (.0253)	.0539 (.0416)
Private Households	.0998 (.0752)	-.2593* (.1424)
Other Service	-.0073 (.0175)	.0329 (.0308)
$\bar{R}^2$	.4248	.4333

---

Note: Both regressions include personal characteristics; amenities are included in model 2; standard errors are in parentheses. See Appendix for variable definitions.

\*\* significant at 1 percent  
 \* significant at 10 percent

Source: Author

Table 3: F-values for Regional Returns to Human Capital

	Without Amenities	With Amenities
Education		
Regional intercepts	102.6	23.2
Regional slopes	34.9	6.2
Both	68.9	14.7
Occupation		
Regional intercepts	102.6	25.5
Regional slopes	9.3	2.7
Both	18.7	5.0

Source: Author

Appendix A:  
Regression of Log of Weekly Earnings on Personal Characteristics

---

	Mean	Coefficient
Intercept		.9922 (.0136)
Education	12.92	.0434 (.0007)
Experience	18.46	.0214 (.0004)
Experience squared/100	5.250	-.0354 (.0009)
White	.832	.0660 (.0043)
Male	.590	.2096 (.0042)
Married	.594	.0849 (.0035)
Household Head	.621	.1480 (.0040)
Private	.817	-.0296 (.0043)
Occupation		
Managers	.116	.0131 (.0059)
Sales	.054	-.1666 (.0078)
Clerical	.226	-.1686 (.0053)
Craftsmen	.132	-.0567 (.0063)
Operatives	.104	-.2165 (.0069)
Transport	.034	-.1773 (.0097)
Nonfarm Labor	.036	-.2351 (.0096)
Private Households	.005	-.7263 (.0243)
Other Service	.099	-.3684 (.0067)

---

Note: Data are from the 1980 Current Population Survey;  $\bar{R}^2 = .4194$ ,  $N = 57,172$ . The omitted occupation is Professional. Standard errors are in parentheses. All coefficients are significant at 1 percent level except Managers, which is significant at 5 percent.

Source: Author.



## Appendix B:

### Notes on Site Characteristic Variables

1. Recreation: Index of quality of recreational facilities. Recreation score from Places Rated Almanac, 1981. Scaled by 10,000. Mean = .1713.
2. Density: Population density of SMSA. Source: City and County Data Book. Scaled by 10,000. Mean = .1517.
3. Schools: Student-teacher ratio for local public schools. Source: Places Rated Almanac, 1981. Scaled by 100. Mean = .1759.
4. Health: Measure of quality of health care facilities. Based on data from Places Rated Almanac, 1981, one point for each of the following: three or more medical schools or teaching hospitals, (one additional point for 5 or more), cardiac rehabilitation center, acute stroke center, and comprehensive cancer care center. Scaled by 10. Mean = .521.
5. Culture: Measure of quality of cultural activities. Based on Arts score in Places Rated Almanac, 1981. Scaled by 100,000. Mean = .1370.
6. Crime: Index of serious crimes per person. Source: County and City Data Book. Mean = .0637.
7. Population: Metropolitan area population. Source: Census of Population, 1980. Scaled by 10 million. Mean = .3563.
8. Heating Degree Days: Average number of heating degree days, 1950-1980. Source: County and City Data Book, 1981. Scaled by 10,000. Mean = .4347.