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Measuring The Impact of Urban Amenities on Average Wages in Metropolitan Areas

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Abstract: This paper seeks to quantify the impacts of climate, crime, population density, and travel time on median hourly wage in urban areas using the hedonic approach. In accordance with theory of utility equalization across urban areas, worker skill level, job composition, and intercity cost of living differences are held constant. This study's sample size consists of thirty-one metropolitan statistical areas in the continental U.S. with a population greater than five hundred thousand. Results support a significant impact of urban amenities on wages.

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I. Introduction

Many studies have examined the obvious disparity between the average wages of workers in different metropolitan areas. Traditionally, these studies have attempted to account for average wage differentials with two popular explanations. First, researchers point to substantial differences in job composition. For example, workers in San Jose, California have much higher wages than the national average. However, this phenomenon can largely be explained by the fact that San Jose employs 10.2 percent of the nation's information technology workers (O'Sullivan, 2007). With such a disproportionate share of skilled employees, we can account for much of the deviation in wages from the national average.

A second explanation for wage discrepancies is differences in cost of living. It has been established that there is marked variation in purchasing power between metropolitan areas. This can explain wage differences in that, if the cost of living is particularly high in one city, workers will demand higher wages to be willing to live in that metropolitan area (Gittleman, 2).

Still, these traditional explanations are far from a complete explanation. The National Compensation Survey (NCS) published by the Bureau of Labor Statistics has rated every job from 1 to 15. A higher number corresponds to higher skill levels, more responsibilities, and union status. To examine the two traditional explanations, studies have used these numerical designations to control for differences in job composition as well as real wage (instead of nominal wage) to control for intercity cost of living

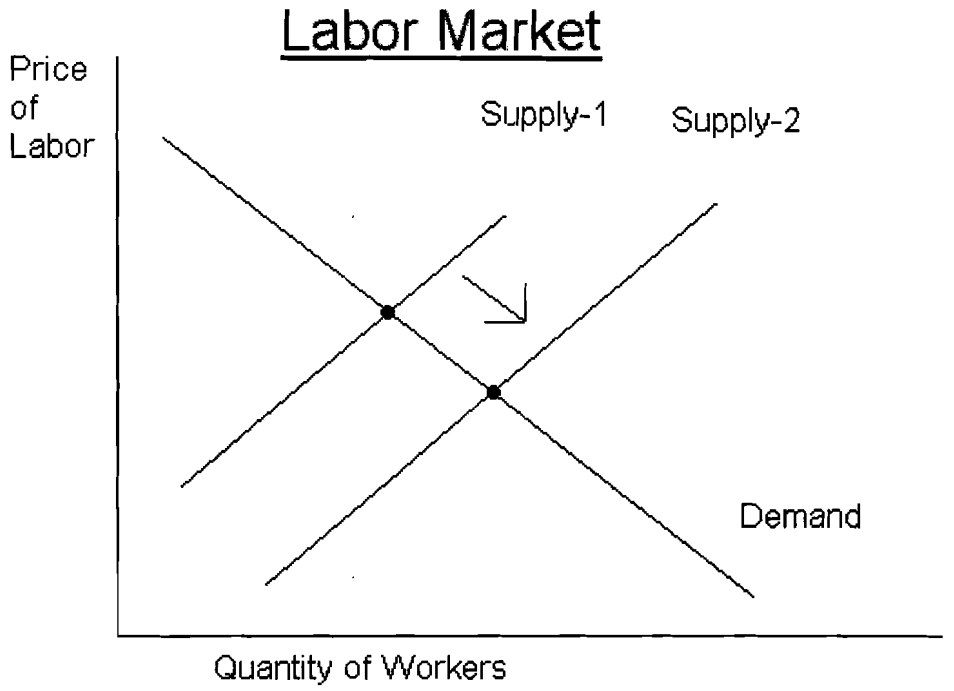
differences. The results of such studies reveal that significant disparities between average wages across metropolitan areas still exist.

More recent studies in urban economics have produced a third explanation to account for the remaining discrepancies in average wages across metropolitan areas that focuses on differences in amenities across cities. It is assumed that wages will adjust to achieve a locational equilibrium in which workers are completely indifferent between living and working in different urban areas. The presence of urban amenities (or an absence of disamenities) creates lower wages in a city with otherwise identical characteristics. An amenity is anything that increases the relative attractiveness of a city, which thereby increases immigration to the city. This concept can be graphically represented by shifting the labor supply curve outward in the framework of a labor market (O'Sullivan, 80). Following from this theoretical framework, which relates labor supply and demand to wages and employment, a labor supply shift outward (as shown in Figure 1) will increase employment and, thus, put downward pressure on wages, all else being equal.

Examples of amenities include relatively clean air, clean water, short commuting time, low crime, a high amount of parks or undeveloped land per acre, high quality public education, a high number of cloudless days per year, coastal location, and a temperate climate. By definition, a metropolitan area includes workers who contribute to the city's economy. This means that citizens reside in the same metropolitan area where they work. Since the same amenities are desirable to most workers, average wages should be lower in areas with high levels of amenities to ensure locational equilibrium between

metropolitan areas. This study seeks to quantify the impact of various amenities on the average wage in major U.S. metropolitan areas.

Figure 1: The Effect of Urban Amenities on a Labor Market.



My research will be presented as follows. Section II will review noteworthy research on urban amenities. Section III will present my theoretical model. Section IV will discuss data sources. Section V will present the empirical model developed by applying available data to the paper's theoretical model. Section VI will show results obtained from the empirical model. And finally, Section VII will summarize conclusions from my study as well as their implications for public policy and future research.

II. Review of Literature

Research in this area began relatively recently and is fairly sparse. At first, studies presented conflicting results, and initially there was support both for and against the presence of regional wage differentials. Ladenson (1973), Coehlo and Ghadi (1973), Sahling and Smith (1983), and Cullison (1984) all conclude that after adjusting for human capital characteristics, job composition, and regional inflation, real wage differentials still exist, thus allowing the possible explanation of locational amenities. However, Coehlo and Ghali (1971), Bellante (1979), Gerking and Weirick (1983), and Dickie and Gerking (1987) all conclude that after these same adjustments, real wage differentials do not exist, meaning amenities do not impact income (Brown, 1994). Research by Roback (1982) and Benson and Eberts (1989) extend the affirmative findings to more substantially confirm real wage differentials. Their research suggests that the wage differentials are accounted for by differences in locational amenities and goes on to argue that workers will accept lower wages as compensation for greater amenities.

One widely accepted methodology for assessing an individual's willingness to pay for something is the hedonic technique. In general economic theory, the hedonic approach concerns a good with a number of components, each of which has an implicit price. The market price is then the sum of the prices of the individual components (O'Sullivan, 2007). However, only recently, as Katrin Rehdanz and David Maddison (2004) note, has the approach been deliberately applied to the valuation of amenities for households. Applied to urban economics, the hedonic approach rests on the assumption that each amenity attracting households to a particular location can be assessed an

implicit price. These implicit prices are quantifiable through the examination of households' locational decisions, since households will be willing to pay higher property prices and/or earn lower wages in order to benefit from urban amenities. This paper employs this hedonic technique to derive the willingness to pay for each amenity from a decrease in average wages.

David Clark and James Kahn (1987) present an interesting study on environmental amenities. The study uses a two-stage hedonic wage methodology in order to value environmental amenities. Ultimately this approach is applied to the recreational fishing amenity and the recreational fishing benefits of water quality improvements. The contribution made to the field of urban economics is the first application of a hedonic approach to estimate marginal willingness to pay and supply functions capable of being used to estimate social benefits.

Essentially, what Clark and Kahn (1987) argue is that by assuming a continuous wage opportunity locus, marginal implicit prices in the market will accurately reflect the marginal willingness for all residents to pay for an amenity. However, if instead, there is not a perfect matching between worker taste groups and the available amenity selections, the marginal willingness to pay for the amenity will only reflect the willingness to pay of a portion of the locality's population. With this weighty assumption in place, stage two of the hedonic wage approach can occur. In stage two, occupational dummy variables are used to control for different wage opportunity loci. This approach allows identification of a willingness to pay function (Clark and Kahn, 1987). The development of the two stage hedonic wage methodology shows its usefulness in order to determine marginal willingness to pay for amenities as long as its continuity assumption is reasonable. In this

paper, a hedonic approach is used. However, a two-stage model presents additional complexities and, in this author's opinion, unrealistic assumptions including homogeneity of tastes within a city, perfect information, and instantaneous adjustments to achieve short-run locational equilibrium.

After Clark and Kahn's (1987) study, literature on the impact of amenities shows widespread support for locational amenities compensating for regional real wage differentials of workers. This movement quickly gained momentum, and no single study published after 1987 denies the impact of locational amenities on workers' incomes. The resolution of this debate among economists ushered in a new era where researchers honed their econometric techniques, introduced new perspectives on amenities, and utilized better and more recent data sets.

We resume our discussion with a study by Ralph Brown published in 1994. In contrast to other studies, he uses amenity data for states rather than metropolitan areas in order to consider whether theories which showed utility equalization across metropolitan areas are also relevant to entire states. Brown's (1994) research supports the view that locational amenities are in fact utility equalizing across states. He uses aggregate state data as the unit of analysis and more recent data on the cost of living by state as well as a new amenity index, both of which were developed by Halstead in 1992. I include this study in my discussion because it provides further justification for this study's attempt to explain regional wage differentials through urban amenities.

In 1992, research by James Kahn and Haim Ofek argues that there is a positive relationship between wages and the population size of a city. Rather than appealing to compensating wage differentials, Kahn and Ofek (1992) rely upon a dynamic spatial

equilibrium. In the study, Kahn and Ofek (1992) convincingly point out that the theory of compensating wage differentials can provide misleading answers regarding the relationship between wages and city size. On one hand, theory predicts a positive relationship due to greater cost of living, crime, pollution, and congestion. On the other, we expect a negative relationship due to amenities such as cultural and recreational opportunities, economies of scale in consumption, and lower costs of a job search in larger urban labor markets.

Ultimately, Kahn and Ofek (1992) posit a long-term static equilibrium model in which there is no incentive for relocation and cities expand geographically until the residential rental price is equal to the agricultural rental price. However since private costs and benefits are not aligned with aggregate social costs and benefits, cities often expand past the point of optimal utility, generally becoming too large; both numerically in terms of population and geographically in terms of total area, so that each marginal immigrant makes the city a less pleasant place to live (this is later graphically represented in Figure 2). Since workers in a metropolitan area must be compensated for diminished utility due to each marginal immigrant and cities have populations greater than optimal, we can expect a positive relationship between metropolitan population and workers' wages (Kahn and Ofek, 1992). The ramification of this study is that urban growth can be reasonably expected to constitute an urban disamenity. By examining some interesting questions Kahn and Ofek (1992) have inspired the inclusion of each locality's population density as an explanatory variable for its average wage rate in this study.

In 1999, Stuart Gabriel and Stuart Rosenthal published a study which brought to light some important econometric issues which must be addressed while conducting

studies on amenities. Using data from the American Housing Survey for 1985 and 1989, the researchers conducted three regressions for each year to elucidate some important concepts. Their first regression is the least specific and ignores location, their second regression controls for SMSA (an earlier designation for MSA), and their third regression is the most specific, controlling for each neighborhood location within each SMSA. This approach is easily implemented through the use of dummy variables.

The results are instructive. The regression ignoring location suffers from omitted variable bias because it fails to control for the educational and demographic attributes of each location which affect worker skill level and worker geographic choice. On the other hand, the most specific regression, which controls for individual neighborhood, introduces a simultaneity bias because of "the endogenous choice of location on the basis of income" (Gabriel and Rosenthal, 1999 p. 445). Simultaneity bias occurs when the researcher controls for such a specific area that rather than measuring locational amenities as a function of income, income is being measured as a function of locational amenities. As with omitted variable bias, simultaneity bias produces biased and inconsistent coefficients. The regression controlling only for SMSA is an appropriate middle ground in that it suffers from neither omitted variable bias nor simultaneity bias.

This study illustrates that failing to use control variables for a sufficiently specific location results in a failure to consider many palpable yet directly unobservable locational attributes. For example, Gabriel and Rosental's study (1999) overestimates the black earnings deficit by six percent and overestimates the gender income gap by three to six percent. The reason for this seems to be that black workers and male workers more often live in cities that are expensive in relation to the amenities offered by those labor markets.

Conversely, controlling for a more specific geographical area than appropriate will result in simultaneity bias, possibly rendering the t-statistics of explanatory variables insignificant.

A study by Stephen Brown, Kathy Hayes, and Lori Taylor (2002) primarily concerned with the effects of public policy on factors of production and economic growth includes an equation which uses local amenities as an explanatory variable for the price of labor. This study includes taxes, the unemployment rate, and provision of government services such as health care, education, public safety, and transportation, as well as local amenities as important factors explaining an individual's overall utility in a location. Assuming long-run equilibrium and that income differences represent compensating differentials for locational amenities, Brown, Hayes, and Taylor's (2002) study reaches some interesting conclusions. They find that while sales and income taxes spent on transportation increase private employment (as a proxy for population), property taxes spent on nearly any government service (i.e. welfare, housing, public safety, higher education, and elementary/secondary education) decrease the number of workers in a location. The overall conclusion from the study is that citizens are generally taxed too heavily, since most types of taxation intended to raise money for government services ultimately leads to less employment in a location and consequently a reduction in the tax base (Brown, Hayes, and Taylor, 2002).

Brown, Hayes, and Taylor's (2002) study is unique in the thoroughness with which it addresses the efficiency of state and local government as an amenity. Their results clearly fit with general theory. Since citizens would like to be taxed only enough to provide for services they deem worthwhile, an efficient government represents an

amenity for which one must forgo some income to enjoy, while an inefficient government represents a disamenity that is rewarded with additional income in order to achieve locational equilibrium. Granted, government efficiency is difficult to measure and thus difficult to include as an explanatory variable in studies on average wages in metropolitan areas. Nevertheless, differences in the efficiency of local and state governments remain a valid explanation for unexplained variation in average incomes between metropolitan wages in studies on urban amenities.

Another important study, by Rehdanz and Maddison (2004), assesses the amenity value of climate to German households. Their paper cites several implications of climate conditions for households including the need for heating and cooling, clothing, housing, nutritional expenditures, recreational possibilities, and human health. Additionally, "Certain types of climate are also known to promote a sense of happiness and the sorts of fauna and flora supported by particular sorts of climate are also a source of pleasure to households" (Rehdanz and Maddison, 2004 p. 2). This line of reasoning shows that not only are moderate climates more desirable for comfort, but they also can reduce expenditures on home climate control, clothing, nutrition, and health problems. Rehdanz and Maddison (2004) leave us to consider to what extent, if any, citizens are actually paying for the benefits of comfort rather than simply accepting lower net wages in order to reduce future expenditures on these items.

Results show that climate variables exercise a statistically significant effect on wage rates, especially in East Germany (Rehdanz, 11). In particular, households pay a substantial premium, in the form of lower wages, for living in areas characterized by higher temperatures in January and lower temperatures in July (Rehdanz, 14). However,

the question I infer from their research is left unanswered: to what extend is the premium paid to alleviate future expenditures rather than for personal comfort. Climatic variation features prominently in my study. Evidence here that favorable climate has direct wage effects, other than the comfort it provides, further justifies its inclusion in my study.

A study by Gittleman (2005) illustrates the necessity of using a methodology that takes into account variation in employment concentrations across cities. His results, which use regression-based techniques and the National Compensation Survey of 2002, show that it can be misleading to measure wage differentials with mean hourly wage by area because this does not control for the fact that job characteristics differ from one area to the next. This is an important effect to consider, and despite the fact that it has only recently been acknowledged in the literature, its effect can be substantial when attempting to quantify the impact of urban amenities on wages.

Gittleman's (2005) study elucidates that a comparison between San Jose, an information technology capital, and Milwaukee, "The Blue Collar City," would inaccurately portray the monetary impact of urban amenities unless one was able to control for the unequal shares of skilled labor between the two cities. Using data from the National Compensation Survey, this study effectively controls for worker skill level by using the data's number codes of 1-15 to designate occupation skill level. Additionally, the data reveal whether or not the position is covered by collective bargaining agreement, which generally increases pay.

Gittleman (2005) also expounds a more technical reason why comparing overall mean salary information may be misleading. Surveys taken in the same year will produce different results based on what time during the year they were taken. Information on

wages at the end of the year will be misleadingly higher due to "inflation and other secular trends" (Gittleman, 2005 p. 1). In order to account for this discrepancy, Gittleman introduces a dummy variable for which quarter the census data was gathered.

Gittleman's study justifies my inclusion of worker skill level as a control variable to equalize job concentration across metropolitan areas. It is reasonable to assume that the skill set obtained by a worker through education will possess a strong positive correlation with the monetary compensation of that worker's occupation. The quarter in which data are collected, according to theory, should have an impact on wages. But such an effect would be miniscule and is often incapable of being controlled for, given most data sets.

In this study I will add to the existing research in several ways. I use more recent data in order to quantify the impacts of urban growth and climate on urban wages, which have been previously examined in the literature. Additionally, I will quantify the impacts of crime and travel time on urban wages. In contrast to urban growth and climate, crime and travel time have rarely been treated independently as urban amenities. Crime has only been examined as an amenity for corporate locational decisions (Gottlieb, 1995). Travel time has only been considered as commuting time. So rather than a travel time index, the explanatory variable would simply be the average time required to reach work. But even when commuting time has discussed it has still been omitted in studies on urban amenities (Gabriel and Rosenthal, 1999). As opposed to commuting time, a travel time index more closely serves as a measure of the efficiency with which each metropolitan area organizes its transportation network.

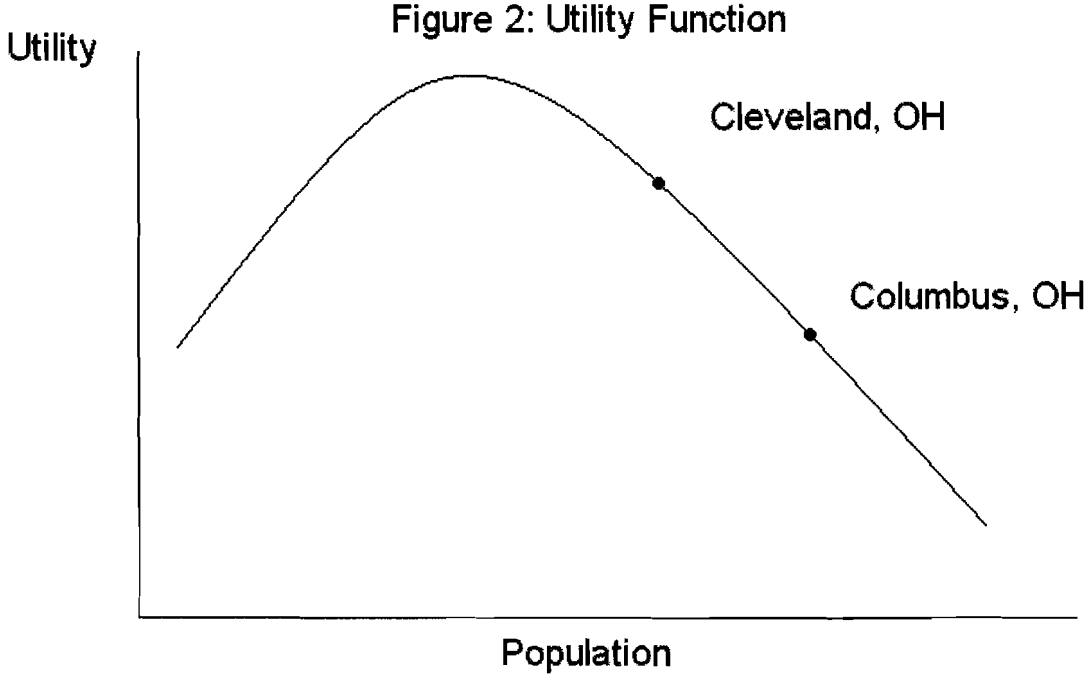
III. Theoretical Model

The theoretical model used in this analysis is first derived from a utility function. Utility is the term used for the total benefit to an individual when all the costs and benefits of living in a particular urban area are taken into consideration. In this model, the utility received by citizens of each metropolitan area is a function of income, amenities, and purchasing power. The individual values of these three factors will likely be different for each city; however, in order for locational equilibrium to exist, these three factors must yield the same utility for all MSAs (metropolitan statistical areas) when taken together. For example, if a representative person in Cleveland, Ohio experiences greater utility than a representative person in Columbus, Ohio, but both face identical utility curves, citizens from Columbus would move to Cleveland until both cities had identical utility levels. As we can see in Figure 2, and following from Kahn and Ofek's (1992) research, cities will generally be too large, so population growth will adjust utility to a point of equilibrium. In this case, average utility to citizens of Columbus increases as it experiences population decline and average utility to citizens of Cleveland's decreases as it experiences population growth.

This nationwide phenomenon also occurs if citizens of cities have different utility curves. The average utility for each city's resident simply reaches an identical level at different population levels. Locational equilibrium is represented for each city with the basic supply-demand model used to represent an individual city's labor market (see Figure 1). Based on this graphical model and the fundamental assumption in urban economics that wages and urban amenities are inversely related, I plan to test my hypotheses. It is also important to bear in mind that a change in amenities is not the only

factor which can change wages rates and total employment. A multitude of factors, such as a minimum wage increase, better education, more skilled labor, price of capital inputs, and technological advances, may shift these curves as well.

Figure 2: Utility Function



As previously discussed, urban amenities will be used to explain variation in average wages across metropolitan areas. In order to accurately assess the impact of these urban amenities, income must be adjusted for intercity cost of living differences. Additionally the model must control for variation in skill levels of workers in different metropolitan areas. By removing the impact that cost of living and skill level have on average wages, my study will be able to quantify the implicit value of several urban amenities using a hedonic model.

The hypotheses of my study are as follows:

After controlling for intercity cost of living and job composition differences,

1) Cities located in more extreme climates will pay higher wages.
2) Cities with higher levels of violent crime will pay lower wages.
3) Cities with greater populations densities will, on average, pay their residents higher wages.
4) Cities with longer commuting times will, on average, pay residents higher wages.

The theoretical justifications for each of the four hypotheses are as follows: first, as shown by Rehdanz and Maddison (2004), climatic discrepancies can have a significant effect on the locational decisions of households. The United States is a large country and weather patterns vary in different regions. Following from theory, desirable weather should entice households to accept lower wages in order to reside in such areas. Conversely, households residing in inferior climatic conditions will be compensated with higher wages or a lower cost of living for residing in inferior conditions. This arrangement will allow locational equilibrium. It is important to note that even if workers are not enticed to less desirable locations by higher wages, the resulting high population density in desirable locations would cause a greater cost of living and lower utility (Kahn and Ofek, 1992), ensuring locational equilibrium.

Next, we consider the impact of the crime disamenity on a household's locational decisions. Although individual weather preferences may vary, unanimous aversion to crime may be realistically assumed. So, who gets to live in crime free areas? It is the households willing to pay a premium to do so. Since high income households have more

to lose through injury and property loss from crime, as well as more money available to pay a premium, they should be the most willing to pay a higher premium to live in low crime areas.

But crime is more complex than this. Crime can be broken down into two categories: personal (violent) crime and property crime. Personal crime occurs when the victim is placed in physical danger. Examples include murder, rape, and assault. Property crime occurs stealthily and includes burglary, larceny, and auto theft (O'Sullivan, 2007). So, although high income individuals may be willing to pay a higher premium (in terms of lower wages or a greater cost of living) to live in areas with low property crime, the presence of high income individuals in a community creates a greater incentive for rational individuals to engage in property crime. The reason behind this is that the expected payoff resulting from the decision to commit a crime is greater (O'Sullivan, 2007). Thus, the impact of property crime on wages is ambiguous since there are two opposing effects in play.

When considering personal crime, the implications are not conflicting. Not only is it likely that high income households are willing to pay a higher premium to avoid personal crime, once this income segregation has occurred, there is no greater incentive to commit personal crime in high income neighborhoods. Since there are generally no monetary payoffs to committing personal crime, we solely consider the fact that high income earners face a greater opportunity cost for possible imprisonment which results in foregone income (O'Sullivan, 2007). Thus, personal crime should be much more concentrated than property crime. Additionally, this presents the possibility of self-reinforcing effects which would likely occur as follows. First, a lower income city

experiences higher personal crime since, on average, residents face lower opportunity costs for committing these crimes. This increase in crime compels more of the remaining high income households to emigrate as well. Following from this, even lower average income will produce higher levels of personal crime, and so on. These self-reinforcing effects ultimately produce severe income segregation across urban areas.

Thirdly, as previously discussed, past research suggests that cities are generally too large. As a result, cities with high population densities should be inhabited by residents who are paid higher wages to compensate for pollution, noise, more inefficient local government, and all other negative effects of a congested city with an overburdened infrastructure. But using the population size of a metropolitan area as an explanatory variable for this effect would be inaccurate. The negative externalities of population growth originate from population density (citizens per square mile), not sheer size. For example, a city may increase in population size through a proportionate increase in geographic area (urban sprawl) and as a result maintain the same concentration of air pollution, noise, and government efficiency while adding no additional burden to its infrastructure. Thus, population density, instead of population, is included in this study as an explanatory variable to most accurately account for the negative externalities of an overburdened city.

Finally, travel time is examined as an urban amenity. The efficiency with which each city government implements mass transit alternatives and organizes their transportation network should be a factor in locational decision-making. (For example, holding cost of living constant, consider a person deciding between jobs in two different cities with corresponding suburban homes. If one city's transportation network

necessitates a two hour commute while the other only a one hour commute, this would certainly impact that individual's choice of employment.) Although I expect travel time to increase with population density, prudent (or imprudent) city officials could produce a different outcome. Thus, since longer travel time is inherently undesirable, it will be included as an explanatory variable with an expected positive relationship to urban wage.

IV. Data

In order to test my hypotheses I gather data from 2003 to 2005. I use data from the U.S. Census and the Bureau of Labor Statistics for metropolitan wages in thirty-one U.S. cities (See Appendix 1 for list of Metropolitan Statistical Areas included). Income levels are adjusted for cost of living using the Sperling Cost of Living Index, which is derived from the Consumer Price Index from the Bureau of Labor Statistics.

The number of days with the minimum temperature falling below 32° F and the number of days with the maximum temperature exceeding 90° F are determined using The Weather Almanac produced by Gale Research. Personal crime and property crime data are taken from Sperling's Best Places and compiled from the FBI Uniform Crime Reports. Data concerning the percent of residents in a professional or management occupation are available through the U.S. Census Bureau. The percentage of uninsured citizens is compiled by the UCLA Center for Health Policy Research.

Finally, population densities and the travel time index of each metropolitan area are measured by the U.S. Department of Transportation.

My study includes complete data for thirty-one metropolitan areas, a relatively small sample size. There are several constraints which limited the breadth of my study.

The data sources mentioned above encompass different metropolitan areas. The thirty-one cities examined in this study are only those cities for which all data sources overlap (with values for every variable.) This number is significantly smaller than the ninety-five metropolitan statistical areas in the continental United States with populations greater than 500,000 excluding New Orleans, the original scope of my study.

V. Empirical Model

In order to explain the most amount of variation possible between different levels of urban amenities, I use the following independent variables defined in Table 1: population density, extreme temperature, the percent of uninsured citizens, travel time index, the percent of workers in a management or professional occupation, cost of living, violent crime frequency, and property crime frequency. The dependent variable in my study is mean hourly wage. This enables me to determine the monetary impact that urban amenities have on wages in a given urban environment.

As Gittleman's research illustrates, controlling for worker composition is essential in order to properly evaluate average wages in a metropolitan area. The way I have chosen to do this is by including the percent of residents employed in professional and management positions as well as the percent of residents without health insurance as independent variables. This approach holds constant for the number of citizens in the top and bottom tiers of society. So therefore, by holding these measures constant, the true effect of each urban amenity on metropolitan wages can be discerned.

Table 1: Empirical Model

Variable	Definition	Expected
Dependent Variable		
Mean wage	Mean hourly wage for civilian workers a metropolitan area.	
Explanatory Variables		
Pop Density	Average number of citizens per square mile in an MSA.	+
EXTRMtemp	Number of days each year where the minimum temperature falls below 32 ºF plus days where maximum temp. exceeds 90ºF	+
% Uninsured	Percent of citizens without health insurance in an MSA.	-
Travel Time Index	The ratio of travel time in the peak period to the travel time in free flow conditions (travel by road).	+
% Professional	Percentage of civilian workers age 25 or older employed in a professional or management position.	+
Cost of Living	The equivalent of 100,000 New York City dollars in each city.	+
Violent Crime	The severity of violent crime based on 1-10 scale by Sperling.	-
Property Crime	The severity of property crime based on 1-10 scale by Sperling.	?

I expect a positive sign for POPULATION DENSITY because most metropolitan areas have expanded past the point of optimal utility so that the undesirable effects of increasing density overcome any positive effects (Kahn, 1992). EXTRMTEMP should carry a positive sign in accordance with its climatic implications. Cities with more extreme weather should compensate residents with greater adjusted income. This follows from the assumption that on the whole, individuals prefer a temperate climate.

The sign for TRAVEL TIME should be positive because workers should be compensated for experiencing congestion, which creates a longer commute to work and signals inefficiency in the MSA's transportation network, in order to ensure locational equilibrium. Although other authors have not included this variable in studies, I chose to include it based upon general ideas about the concept of an urban amenity.

I expect a negative sign for VIOLENT CRIME as implied from the theoretical discussion. I predict a self-reinforcing effect between a concentration of low income residents and high personal crime. The sign for PROPERTY CRIME is unclear because

of the theoretical reasons previously discussed. High income households should be willing to pay a higher premium to avoid cities with high property crime, but as soon as these households congregate in an area, their collective presence will create an incentive for property crime to occur.

As a control variable, % PROFESSIONAL is expected to have a positive sign since a greater share of city residents in high paying professional and management positions should raise the average wage. Although having a relatively large share of citizens who are professionals and managers is considered an amenity, its effects will be negligible here. This variable's status as an urban amenity follows from the benefits of having neighbors who are generally more educated and professionally accomplished. People generally prefer well-educated, professional neighbors because of their inherent positive externalities. Namely, these externalities include connections to better job prospects, potentially discounted access to that individual's expertise, and the benefit of sending one's own children to school with peers who will generally be more intelligent and more motivated. However, this effect really only occurs within neighborhoods. Individuals and families would not experience benefits from well-educated and professionally accomplished workers just because they live in the same MSA. Thus, since the scope of this study is entire MSAs, and this variable's effects as an urban amenity will be insignificant, its status as a control variable is preserved.

Likewise, % UNINSURED is a control variable expected to have a negative sign since residents without health insurance are more likely to be unemployed or in less-skilled occupations and thus lower the average wage. Like the previous control variable, its status as an urban amenity is unimportant because we are examining entire urban areas

in this study rather than individual neighborhoods. Although residents prefer to not have less educated and less professionally accomplished individuals as neighbors the effects are diminished and the exclusive impact of % UNINSURED as a control variable is preserved.

VI. Results

The results of my regressions are shown in Table 2. The adjusted R^2 value indicates that the selected explanatory variables explains 83.1 percent of the variation in average wages across major U.S. metropolitan areas. Additionally, three of the five explanatory variables testing my hypotheses display significant results. All variables have the expected signs.

Table 2: Regression: Dependent = Annual Household Income adj. for Purchasing Power

Variables	
Constant	-6.37
	(-1.81)
Population Density	0.10
	(2.12)*
Extreme Temp	0.02
	(2.72)*
Travel Time Index	5.00
	(2.35)*
Violent Crime	0.25
	(0.53)
Property Crime	-0.84
	(-1.54)
Cost of Living	0.04
	(1.09)
% Professional	0.47
	(5.49)**
% Uninsured	-0.74
	(-1.20)
Adjusted R^2 value	0.83
Sample size	31

(t statistics in parentheses)
** Significant at 0.01 level
* Significant at 0.05 level

Because the dependent variable is average wage measured at an hourly rate, each variable's coefficients are numerically small. However, as is evident from Table 2, their significance is high.

The regression indicates an inverse relationship between PROPERTY CRIME and MEAN WAGE. As mentioned in this paper's theoretical model, literature shows conflicting forces at work in the relationship between PROPERTY CRIME and MEAN WAGE. The results of this study suggest that high income households may be able to successfully isolate themselves from property crime by paying a premium. Although, this effect is not even significant at the five percent level so it is unfounded to draw any firm conclusions.

Aside from these results mentioned above, in Model 1 we observe a significant positive relationship between POPULATION DENSITY and MEAN WAGE, a significant positive relationship between EXTREME TEMPERATURE and MEAN WAGE, a significant positive relationship between TRAVEL TIME and MEAN WAGE, and a significant positive relationship between the PERCENT OF MANAGERS/ PROFESSIONALS and MEAN WAGE.

An increase in population density of 100 people per square mile will increase the mean hourly wage by $0.10. An increase in the number of days of extreme temperature by 1 will increase the mean hourly wage by $0.02. An increase in the travel time index by 1 will increase the mean hourly wage by $5.00.[1] An increase in the rating of violent crime severity by 1 (on the 1-10 scale) will increase the mean hourly wage by $0.25. An

[1] An index increase of 1 could be, for example, an index increase from 1.5 to 2.5. This means a 20 minute trip in free flow conditions changes from a 30 minute rush hour trip to 50 minute rush hour trip. An increase from 1.0 to 2.0 changes a 20 minute trip under free flow conditions from a 20 minute rush hour trip to a 40 minute rush hour trip.

increase in the rating of property crime severity by 1 (on the 1-10 scale) will decrease the mean hourly wage by $0.84. An increase in the amount of local currency to equal $100,000 New York City by $1,000 will increase the mean hourly wage by $0.04 (only about $80 each year.) An increase in the percent of residents employed in professional or management occupations by one percent will increase the mean hourly wage by $0.47. An increase in the percent of residents without health insurance by one percent will decrease the mean hourly wage by $0.07.

The results of this study support my first, third, and fourth hypotheses. That is it has been shown that:

1) Cities located in more extreme climates will pay higher wages.
3) Cities with greater populations densities will, on average, pay their residents higher wages.
4) Cities with longer commuting times will, on average, pay residents higher wages.

On the other hand, this study found no support for the hypothesis that

2) Cities with higher levels of personal crime will pay lower wages.

VII. Conclusion

In conclusion, this index of urban amenities successfully accounts for most of the variation in average wages in metropolitan areas. This shows that because of citizens' willingness to forgo real income in order to benefit from these specific urban amenities, urban amenities can play a significant role in the locational decisions of households.

In the process of conducting this study I have come across two assumptions generally overlooked in studies on urban amenities which I would like to point out.

First, assuming that all households are completely mobile within the entire United States is unrealistic. I believe that, in order to achieve more accurate valuation of amenities, studies should only assume that households are willing to relocate within a smaller region. Would a household accustomed to living in Atlanta be willing to move to Honolulu or Anchorage because they expect to earn $200 more each year in either of those locations? My answer is certainly not. However, this study and many others are predicated upon the answer: yes. Each individual and family faces a set of moving costs. These include the time and energy to move one's possessions which can be readily quantified monetarily. But moving costs also include less quantifiable psychological resistance to leaving one's familiar area and the life one has become accustomed to. Perhaps further research should focus only on a single region, such as Great Lakes states, a single state, or a few hundred mile radius.

Secondly, studies on urban amenities often assume all citizens have perfect information. But are people really even aware of which sets of amenities are available and where to find them? After all, it seems unlikely that a Bostonian would know that in Los Angeles there is roughly 25 percent less property crime and, on average, 49 more days of sunshine per year. Admittedly, this effect has been diminished in recent years since much information has become widely available on the internet. Compensating for imperfect information concerning locational decision-making is something I have not encountered in the previous literature. However, the approach suggested above—only considering locational decisions within a smaller region—would at least partially address

this consideration since it's realistic to think that households have greater information about locations closer to their own. A second approach would be to consider that perhaps more educated or skilled workers have more information about other locations. These households probably have greater mobility as well. Furthermore, future research could address the unrealistic assumption of perfect information by incorporating a lag into the models. Citizens would not likely be immediately aware of current levels of amenities such as crime rates and government efficiency in other cities, but as this information is disseminated through the public a citizen will be more likely to become aware of it. This is especially true in extreme situations. Doubtlessly, many Americans became aware of the extremely high crime rate in New York City during the late 1980s and early 1990s. It is likely that it took some time after crime rates dropped for Americans not living in New York City to replace their previous impressions of crime in New York with current reality, if they have at all.

Turning back to this study, results support the theory of locational equilibrium which presents some implications for individual households. Since regression results present averages, if an individual is indifferent to travel time because they work from home or the number of days with extreme temperature they experience, for example, the individual would benefit by moving to a congested city with an unfavorable climate in order to be rewarded for their indifference with higher income or lower cost of living. Also, the results of this study allow citizens to take further assurance that however miserable conditions in their city are; they are most likely compensated for enduring them.

Finally, previous research has put forth very few policy implications for studies on urban amenities. However there are several I can discern. First, policies which improve urban amenities for private citizens will attract firms to the area. So if a city increased public safety, reduced crime, increased health care, or increased the amount of cultural and recreational opportunities without overtaxing its citizens, those citizens would be willing to accept lower wages to live in the metropolitan area. Firms would also be drawn by several of these amenities. For example, firms, especially elite firms, have been shown to locate in areas with low violent crime (Gottlieb, 1995). But, they would be further enticed by their ability to pay lower wages and still attract their required workforce.

It is clear that there are a number of ways a city government can use public policy to improve the welfare of its citizens. This study shows that urban population density that travel time make a meaningful difference to citizens and can be considered urban disamenities. In fact, all but one of the urban amenities in this study can be affected through well-constructed public policy. Additionally, the effect of public policy on unstudied amenities such as cultural opportunities, recreational opportunities, public parks, and public education is palpable. Overall, this study adds to the growing body of literature which indicates that improving urban amenities will put downward pressure on real wages, ultimately negating any improvement obtained from relocation. It is the task of private citizens to enjoy greater utility by selecting their optimal bundle of urban amenities, where the cost of each amenity is less than how much one is willing to pay for their benefit.

APPENDIX 1

Metropolitan Statistical Areas Studied:

AL – Birmingham
CA – Los Angeles
CA – San Diego
CA – San Francisco
CO - Denver
CT - Hartford
FL - Miami, Ft. Lauderdale
FL - Orlando
FL - Tampa, St. Petersburg
GA - Atlanta
IL - Chicago
IN - Indianapolis
MA - Boston
MI - Detroit
MI - Grand Rapids
MO - Kansas City
MO – St. Louis
NY - Buffalo
NY – New York City (Island and City)
NC - Raleigh, Durham, Chapel Hill
OH - Cleveland
OK - Oklahoma City
PA - Philadelphia
PA - Pittsburgh
RI - Providence
TN - Knoxville
TX - Dallas, Ft. Worth
TX - Houston
TX - San Antonio
VA - Richmond
WA - Seattle

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