Jaime Luque

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This book would not have been possible without the numerous contributions of students who took my "Regional and urban economics" course at the University of Wisconsin—Madison. To them I dedicate this book.

Preface

The approach to urban economics has become increasingly empirical in the last decade. The purpose of this book is to present in a comprehensive and concise way recent cutting-edge empirical research in the field of regional and urban land economics. The book is aimed at undergraduate students in Business or Economics and in particular undergraduate and graduate students in programs such as Real Estate, Urban and Regional Planning, Geography, and Development Studies.

Part I of the book discusses stylized facts about cities, their sizes and types, and their contributions to the economic and social development. Part II examines the role of trade, economies of scale, and agglomeration effects on the emergence of cities. Part III explores the causes of homelessness in the USA. Part IV explains the impact of regulations on urban development and land prices. Part V explores the implications of neighborhood choice on migration, schooling, and externalities. Part VI looks at the role that infrastructure plays in the modern city and in real estate markets with an emphasis on transportation. The final part of the book examines local and national drivers of housing and real estate activity.

Given the empirical nature of this book, we believe that it can serve as a good companion to other textbooks that adopt instead a more theoretical approach, e.g., O'Sullivan (2012), Brueckner (2011), and Zenou (2009). Also, the book complements Green and Malpezzi's (2003) premier on US housing markets and housing policy by explaining recent contributions to the literature on housing financing and government programs, such as financial and housing wealth (Hochguertel and van Soest 2001), real options (Cunningham 2006), low-income housing subsidies (Sinai and Waldfogel 2005), mortgage credit expansion (Mian and Sufi 2009), or the effect of government programs on local labor markets (Ham et al. 2011).

Madison, WI, USA — Jaime Luque

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Part I

Cities

The Rise and Fall of Cities

1

Joint Work with Patrick Bacon and Macauly Bauer

For decades now, professionals and academic experts have been predicting the death of American urban areas due to advancements in social technologies and the persistence of high levels of crime and poverty within cities. Edward Glaeser, professor of Political Economy at Harvard University, explores the future prospects of metropolitan cities in his 1998 research paper "Are Cities Dying?" published in *The Journal of Economic Perspectives*. The purpose of Glaeser's research was to understand the costs and benefits of urban life and determine whether the costs of congestive forces associated with cities were beginning to outweigh the positive agglomerating effects. Only when cities' costs outweigh their benefits, Glaeser believes, could the argument be made that urban areas are beginning to decay. After examining both the benefits and costs to individuals who live in cities, Glaeser concludes that relatively homogenous and low-density cities in the western portion of the United States are well positioned for future growth. However, Glaeser speculates that heterogeneous, impoverished, and decaying urban areas will decline due to their high costs of poverty and crime.

Glaeser created a model of regression results through which he used the logarithm of city size to analyze a variety of other city variables, such as annual earnings, cost of living, commuting times and pollution. The ultimate goal of this regression model is to help explain the agglomeration benefits and congestion costs associated with cities. Glaeser's data sources for the annual earnings and cost of living information came from the *Statistical Abstract of the United States*, the commuting information came from the Bureau of the Census, and the pollution information came from the EPA AIRS data set. A basic theory of economics is that individuals earn a wage that is equal to the amount of value they produce. If the wages paid to workers in cities are higher than the wages paid to the same workers in rural areas, the agglomerating effects of cities must result in increased marginal productivity of labor in urban workers. The model that Glaeser constructed revealed that, after removing non-essential variables, "*workers living in a metropolitan area surrounding a city with more than 500,000 people earn 30 % more than their non-metropolitan counterparts*" (Glaeser 1998, p. 142). While the wage premium

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workers earn is largely offset by the higher costs of living within cities, firms are willing to pay the wage premium because the benefits they receive from being located in urban areas outweigh the costs.

Most of Glaeser's publication, however, is less concerned with his model and more concerned with examining the benefits and costs of urban life, both now and in the future. Glaeser's model proves that firms value being located in cities, which he believes is due in large part to lower transportation costs, concentration of labor, informational spillovers, and labor education. Glaeser theorizes that these agglomeration forces are valuable enough to firms that they offset the wage premiums and costs associated with urban areas. Many of the benefits of urban life, according to Glaeser, are centered on the spread of ideas and the improvements in the labor force. As an example, Glaeser uses Silicon Valley to demonstrate the positive agglomerating effects of cities even as technology continues to advance. The growth of Silicon Valley can be explained by the concentration of firms in the area, allowing for a flow of information and workers across firms. Glaeser theorizes that this flow, in addition to the labor force being exposed to a myriad of unique learning experiences, has allowed for better idea development than would have occurred in rural areas.

Despite the benefits of urban areas to firms and workers, the publication points out that cities will continue to face negative costs associated with congestive forces, and how they deal with these costs will ultimately decide their future growth. The main costs that Glaeser believes to be most harmful to cities are high costs of living, pollution, crime and poverty. Of these costs, the high cost of living is one that Glaeser is skeptical about, which he believes can be significantly reduced because of the continued high demand for space in urban areas. Pollution, on the other hand, is a cost that technology and government policy have reduced to the point where pollution levels are roughly the same for city and rural residents. Crime is another cost that Glaeser believes can be reduced by technology, although he admits that a higher-level of crime will likely always exist in cities because criminals also benefit from agglomeration. Lastly, Glaeser explores poverty in cities and examines whether cities cause poverty or if poor individuals are more attracted to urban areas. To demonstrate that cities do not inherently cause poverty, Glaeser examines the poverty rate of immigrants in both urban and rural areas. His findings indicated that the poverty rate for immigrants in urban areas was lower over the long-term, indicating that high-levels of poverty in cities are due to poor individuals being attracted to cities.

As technology increasingly connects individuals across a multitude of platforms, the fears that urban cities could one day become unnecessary are not unfounded. Glaeser recognizes this, but states that he feels this would ultimately be a terrible thing for society. There is a tremendous opportunity to adapt cities in such a way that they enhance technological advancements, and serve as centers where information and people can flow freely. The rise of many American cities in the past decade alone has proven that cities can thrive even in an age of rapid technological growth.

While Glaeser's model was effective at proving his hypothesis that the benefits of cities are valuable to workers and firms, his model could be improved. Several of the agglomeration benefits and congestive costs he explains later in his publication are not included into his regression model. In some cases this is due to the more subjective nature of some of the benefits and costs, but his model could still incorporate more variables, such as poverty and crime levels, to see if the model still proved his hypothesis. The most glaring weakness of Glaeser's research, however, is its age. Because it was written in 1998, much of the paper's data comes from the 1990 census and is now almost a quarter of a century old. To better reflect current trends and to better evaluate the role of social technologies on urban demographics, a model would need to be created that includes census data from 2000 to 2010.

Glaeser realizes the importance of local governments in cities and therefore suggests what these governments should and should not do with regards to urban areas. He explains the complications associated with excess infrastructure, quantity controls and redistribution activities often used by local governments. Arthur O'Sullivan (2012) uses the example of a tax increase on the wealthy in order to help clarify local government's attempts to redistribute income and the problems it creates for cities. According to O'Sullivan, some wealthy households will choose to leave the city in order to avoid paying the tax. This in turn lowers the total tax revenue, which decreases the transfer payment per recipient. With the combination of the wealthy leaving and the poor arriving, the redistribution will not be successful. O'Sullivan (2012) advocates that income redistribution should be done on a national level to reduce the movement of the wealthy and poor between cities. Glaeser would agree with this suggestion in the hopes that this would eliminate income homogeneous cities that lack innovation and growth potential.

1.1 Multiple Choice Questions

1. According to Glaeser (1998), all of these tend to be common mistakes made by local governments except:

a) Income Redistribution
b) Excess Infrastructure
c) **Productive Efficiency**
d) Quantity Controls/Regulations

Explanation Income redistribution leads to the wealthy leaving the city and the poor entering the city making the redistribution less effective. Excess infrastructure tends to be extremely costly for the lack of value it provides a city. Quantity controls/regulations are costly and more harmful than would be comparable taxes or transfer policies. The right answer is productive efficiency because it is the point when the economy is using all of its resources efficiently and therefore is not used by local governments.

2. According to Glaeser (1998), all were findings of Glaeser's regression model results except:

a) **Poverty is 15 % more common in the city than small town locations**
b) Commuting times are longer for individuals in the city
c) City pollution is almost at the same level as small town pollution
d) City workers earn 30 % more than small town workers
e) All of the above were findings

Explanation Glaeser's (1998) regression model only looked at commuting times, pollution, annual earnings and cost of living. His model did not include data on either poverty or crime.

3. Which answer best describes Glaeser's (1998) reasons for why firms located in a city are willing to pay a wage premium to their workers?

a) They make more money in the city, so can pay their workers more.
b) **Cities offer firms lower transportation costs, connection of labor, informational spillovers, and labor education.**
c) Firms enjoy the social benefits that are offered to them for being in the city.
d) Firms believe that workers living in cities are better educated than workers who don't live in a city.

Explanation Glaeser's research paper clearly looks at cities and how bringing people and companies together in close proximity reduces transportation, therefore reducing the costs associated with transportation. With more firms within one industry, this attracts workers for that industry and therefore more people to fill those jobs. Geographic proximity created by cities also allows ideas to travel more rapidly; therefore cities reduce the cost of moving information. Lastly, cities are most effective in training workers because they are full of individuals with knowledge and experience. (a), (c), and (d) are not correct because Glaeser did not mention them.

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Reinventing Cities

2

Joint Work with Isaac Accola and Supanat Angsuwarangsi

Boston has had its fair share of triumphs and downturns as an economy. However, it has uniquely recovered through every cycle stronger than it was before. Examining Boston's historic timeline, Glaeser found that the city was able to recover as a direct result of their skilled work force, providing evidence that human capital is the ultimate economic driver for long-run urban health. In Professor Edward Glaeser's article, *Reinventing Boston*, he analyzes how Boston has survived and reinvented itself during each economic downturn.

During times of economic trouble in Boston's history, the workforce proved able to innovate and transform towards the next generation's economy. In the early nineteenth century, Boston championed a maritime economy in an unconventional manner. After realizing that New York and Philadelphia had superior ports, Boston instead provided the skilled work force needed to sail shipping boats all over the world. Soon, however, shipping switched from sail to steam powered boats in the late nineteenth Century. Around the same time period, there was a great influx of Irish immigrants to Boston. The Irish immigrants created an opportunity to turn the city into an industrial powerhouse and Boston capitalized, as it became a successful factory town. As technology improved, factories moved elsewhere, and the Boston economy declined. In the late twentieth Century, an innovative information economy sprung up driven by the dense mass of universities within Boston's boundaries and has led the city to its current economic success. Furthermore, students receive their degrees and decide to make Boston their home, placing the city among the highest percentage of residents with college degrees.

When analyzing a city's economic history, Glaeser states, "*Conventionally, there are 3 ways of measuring urban success: Population Growth, Income Growth and Housing Price Growth*." These three variables interact to create positive or negative correlation towards economic success. For example, in principle, increasing demand for a city leads to higher population, which ultimately causes housing

Nora Boneham has also significantly contributed to the elaboration of this chapter.

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prices to rise. High housing prices increase the household wealth of current owners, while also demanding a higher wealth from prospective residents who wish to settle in the city. This results in an overall population of residents with greater net worth. Glaeser also points out that greater productivity within a city correlates with all three factors increasing, as well. This basic economic principle can best be observed when the opposite is true. A failing economic driver such as the automobile industry caused Detroit to lose much of its population, alongside a vast decrease in income and housing prices. To further analyze these common measures of urban success, Glaeser adds one more significant variable to his research. He seeks to find significance in the relationship of schooling as it might correlate with the three common variables previously mentioned.

In *Reinventing Boston*, Glaeser analyzes the relationships between the traditional measures of urban success in Boston by taking data from the US Census, as well as from County Business Patterns Questionnaires. He first importantly discovers absolutely no significance between Boston's population and urban economic success. In fact, Boston's population rose steadily until 1950, when it declined until 1980, and has risen ever so slightly since then. However, when compared to the growth rate of the US overall, Boston's population growth has been on a steep decline since the turn of the twentieth Century. This can be attributed, Glaeser believes, to Boston's colder climate. As air conditioning became more popular in the 1950s and 1960s, there was an influx of people moving out of cooler states and into warmer ones. In addition, transportation became more accessible, meaning easier travel to see family and more convenient access to recognizable goods from your previous home in the colder climate. With a correlation coefficient of 48 %, Glaeser discovers that for every 1 % of temperature rise in mean January temperature, population growth rate increases by 2.3 %. However, it is important to note that there is no relationship between skills and growth in cities that received positive shocks because of warmer climate or immigration. Among cities that received negative shocks, such as cold weather, the correlation between growth and skills is over 70 %.

Boston has an extremely inelastic housing supply, meaning that small changes in population greatly affect housing prices. Consequently, with the recent increase in population, some urban success might be attributed to this inelasticity. At the time of the study, there was very little increase in new housing supply, partly due to construction costs being greater than housing prices. In addition, Boston's very strict zoning constraints, directly impacts the city's housing elasticity. To give further evidence of the effects of housing elasticity, Glaeser provides the counter-example of Texas. The state, overall, has very little zoning constraints, allowing for a huge increase in housing supply with a small effect on housing prices, despite the increase in demand. While there is a strong possibility that inelasticity has been a driver for Boston's housing prices, the highest correlation Glaeser found was the relationship between housing prices and college degrees within the state of Massachusetts as a whole. With a correlation coefficient of 78 %, the results show that for every 1 % rise in the population with college degrees, housing prices

increase by 1.5 %. Therefore, Glaeser concludes that schooling has an extraordinarily significant impact on Massachusetts housing prices.

Taking all of Glaeser's research into account, three important lessons can be learned from Boston's urban success. The first is that rising population does not automatically result in a booming economy. Rather, housing prices can be a greater indicator. The second, more important lesson is that skilled and highly educated workers result in greater potential for economic recovery. Finally, economies should be more diverse, rather than relying on a single industry, such as the automobile.

It is important to note that Glaeser's paper was written in 2004, providing opportunity for further research to analyze Boston's economy during the great recession. Was the information economy able to thrive as measured by the common urban success variables? Was the economy still diverse enough to adapt and bounce back, as it has shown throughout history? These are important questions to answer as the United States looks towards revitalizing the country's troubled cities through an emphasis on human capital and economic diversification.

Glaeser's article forms an intriguing connection to Chap. 1 of Arthur O' Sullivan's book, *Urban Economics* (2012). In the opening chapter, O' Sullivan points out the three conditions that must be satisfied for a city to exist: agriculture surplus, urban production, and transportation for exchange. Throughout the article, Glaeser touches upon each of these characteristics. Boston's initial survival depended on the agricultural surplus the town could provide to other colonies and the West Indies. Urban production is illustrated in the sailing and financial skills the population provided in the early nineteenth century and the factory success provided by the end of that century. Boston's convenient location to the Charles River and the Atlantic Ocean allowed for both local and global transportation exchange.

2.1 Multiple Choice Questions

1. According to Glaeser (2005), what is the most important aspect of Boston's consistent economic recoveries?

a) Population Growth
b) Geographic Location
c) Immigration
d) **Human Capital**

Explanation Boston's human capital has been critical throughout Boston's history. Skills with sailing ships enabled the city to reinvent itself as a global maritime center. Yankee technology and Irish labor together fueled industrialization. And today more than ever, Boston's skills provide the impetus for economic success in technology, professional services and higher education. Human capital is most

valuable to a city during transition periods when skills create flexibility and the ability to reorient towards a new urban focus.

First, it is important to note that there isn't a correlation between population and urban economic success, when it comes to Boston. Boston's population saw huge growth until about 1950, when it declined until 1980. During the decline, however, Boston recovered itself by utilizing its educated human capital to introduce an economy that thrives on information, which includes law and financial sectors. This illustrates that a decline in population doesn't necessarily produce urban success. Second, geographic location wasn't the reason why Boston recovered in the early nineteenth Century since seafaring human capital from Boston was what kept the economy going. Lastly, immigration only assisted Boston during the late nineteenth Century economy crisis with the influx of Irish immigrants. However, the other two recoveries didn't depend on immigration but consistently on human capital instead.

2. According to Glaeser (2005), what factors cause the Boston population growth to significantly lag behind the United States population growth in the early twentieth century?

a) Technological improvements improved life in hot states to a greater extent than colder states.
b) Transportation technology eliminated the advantages of northern states, which had once thrived because of proximity to natural resources and rivers.
c) Urban population density declined as the rise of the automobile allowed for sprawling in the Boston area.
d) Manufacturing left the dense cities for the suburbs for the advantages of cheaper labor cost and lower transportation costs.
e) **All of the Above**

Explanation A series of technological improvements disproportionately improved life in hot states. Most obviously, the air conditioner made it possible to live comfortably. As the cost of moving goods plummeted by over 90 % in real terms during the twentieth century, advantage in locating themselves close to natural resources disappeared and people/firms moved to places that were distinguished mainly by their advantages as consumer cities instead. The rise of the automobile inevitably meant that people would increasingly move to lower density communities that could be designed around the new technology. Indeed, much of twentieth Century urban histories can be seen as the rise of decentralized communities. The correlation between a city's density in 1920 and its use of public transportation 60 years later is more than 50 %. Manufacturing firms left cities for suburbs, which could easily be accessed by trucks since transportation and labor costs are cheaper in the suburbs.

3. According to Glaeser (2005), what factors contribute to the extremely inelastic housing supply in the Boston area?

a) Construction cost being greater than housing prices.
b) Strict zoning constraints by the Boston government.
c) Lenient zoning restriction for new development.
d) **a and b**
e) a and c

Explanation Housing supply is completely inelastic when the cost of constructing a new home is more expensive than the resulting house price, which is the case in Boston for most of the 1980–2000 period. The other factor for the inelastic housing supply is the strict zoning constraints imposed by the Boston government. The comparison Glaeser utilizes with Texas explains this point clearly as in 2002 Texas approved 160,530 construction permits while Massachusetts only gave out 16,875. In Texas, the zoning restrictions are lenient which results in more housing developments and a more elastic housing supply. In Massachusetts, the strict zoning leads to less development and less housing which is a primary factor in the inelastic housing supply of Boston.

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O'Sullivan A. (2012), *Urban Economics*, Boston: Irwin/McGraw-Hill, 8th edition.

The Consumer City Center

3

Joint Work with Sam Jagodzinski, Marena Janke, and Ryan Grunwald

The paper, *Consumer City*, challenges the notion of traditional research that cities are formed due to production. Glaeser et al. (2001) claim that although production is an important factor for the formation of cities in cities, cities are driven by the demand for consumption.

Research for this paper was performed mainly with U.S. data: however, some analysis of cities in France and England was done was well. The data from the article is from numerous sources, including the Census Bureau, Freddie Mac, the Bureau of Labor Statistics, the Urban Institute, as well as the Transportation Foundation.

Several models were used in the authors' research. These included comparing the growth of different commuting patterns over time, analyzing the correlation between population growth and amenities in a city, and analyzing population and wealth distribution with respect to the distance from a city's central business district.

In Glaeser et al.'s (2001) article, "Consumer City," published in the Journal of Economic Geography, the authors assert that cities are attractive places to live, in large part because they are fantastic consumption centers. This represents a major paradigm-shift from the prominent school-of-thought that cities emerge because agglomeration economies make them efficient places to produce goods. The authors proceed to outline the major attributes of a burgeoning consumption center. These results are gleaned from the growth patterns of both American and French cities between 1980 and 2000.

Glaeser et al. (2001) stress the importance a thriving consumption scene as a necessary condition for rapid growth of cities in the United States and France. To bolster this point, the authors note that, "between 1950 and 1990 the share of personal income in the United States spent on transportation and housing rose from 24 % to 35 %" (Glaeser et al. 2001, p. 28). The authors attribute this increase to people spending more to live in a desirable place. The implication, if this trend continues, is that cities must be able to provide attractive places in urban areas for increasingly wealthy workers who are not tethered closely to their location of employment.

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There are two assumptions of the future that the authors mention as relevant to the given argument. One of the assumptions is that income in cities will continue to rise, creating income and price effects and, in turn, a higher demand for both normal and luxury goods in the city, therefore, increasing consumption. The other assumption is that transportation technology for people, goods, and ideas will continue to improve. These technologies have increased significantly in the past couple of decades making it easy for people to commute in and out of the city. However, because the rise in income is making the opportunity cost of time higher, the authors believe that this will outweigh the benefits of transportation technology. These phenomena would also increase urban consumption of things that are at a closer proximity to one and other, because it is costly to take the time to travel to consume goods.

Glaeser et al. (2001) found from the research they conducted that high amenity cities are generally more prosperous, successful, and attractive to consumers. This demand parallels the increase in demand for urban amenities. They found that there were four critical urban amenities: a rich variety of services and consumer goods, aesthetics and physical setting, good public services, and speed of transportation. Based off of what was said earlier about the demand for consumer goods, services that urban areas provide are key in making each city uniquely attractive. Because of the income effect, consumers feel as if they have more money to spend on not only consumer goods, but also services. Through regression analysis, the authors have found that city climate is an important factor in determining city growth. Architectural designs that are visually appealing, rather than simply a block building, are becoming increasingly valuable to the urban population. Furthermore, the authors state that good schools and less crime are also linked to urban growth. Lastly, the authors have found that areas close to the CBD have succeeded, while outer areas of the city have floundered. An example of this success is areas close to Wall Street in New York City. These reasons for why living in the city is desirable lead to a new phenomenon called reverse commuting.

The authors note timeframe and the implications of the rise of reverse commuting. Prior to 1960, commutes from the city center to the suburbs were very rare. In the time from 1960 to 1990, the number of these reverse commuters increased threefold. It is noted, that although this trend is, in part, explained by the rise of suburban office parks and more workplaces in the suburbs, the primary driver is the recognition that the city is an excellent consumption center. This appeal of cities as a place to consume has resulted in rent growth outpacing income growth across many of the mentioned cities both in the U.S. and in Europe.

Contrary to much of the accepted research in urban and spatial economics, the article *Consumer City* asserts that it is cities' function as consumption centers—not production centers—that is the primary driver of growth. Glaeser et al. (2001) break down the factors that make a city a great consumption center to live in. Having a large number of bars, restaurants, and theaters is a major factor in city growth; cities with disproportionately large numbers of both of the institutions, as a whole, experienced more rapid growth. Another key component the authors delve into is that cities with temperate climates, as measured by average January temperature,

and generally dry climates, experience greater levels of growth. A third component to city growth identified by the authors is good public schools and strong police departments. The final crucial component leading to growth identified by the authors in the article is simply how long it takes people to traverse a city. These four factors lead to city growth which in turn results in a number of phenomena such as reverse commuting and an increase in population of many vibrant cities in Europe and the U.S.

Consumer City is an interesting take on what makes a city grow which runs counter to the conventional wisdom in the U.S. As far as the methodology is concerned one may raise several critiques. First of all, there seemed to be no reason or rhyme for the cultural amenities that are hypothesized to make a city a vibrant consumption center. Performance theaters and restaurants are positively correlated with growth, while art museums and movie theaters are correlated with negative growth. As these are relatively similar cultural amenities, it is unclear how restaurants and live theaters could be so connected to growth while their cultural cousins are distinctly not. Another criticism of the article is the use of lack of precipitation and January high temperatures as representative of the climate. Based on this criterion a hot desert would be the ideal place for growing cities, but deserts rarely have large cities, with the possible exception of Phoenix and Las Vegas. A better measure would be the average high temperature throughout the year and taking average precipitation as a criterion out altogether. We would like to see the minor tweaks coupled with updated data, and feel this could yield many insights.

O'Sullivan (2012) notes that cities first started to appear because agricultural surplus and efficient transportation systems allowed an interchange of goods. The text emphasizes the production advantages, all sorts of economies of scale, of urban production. This represents the conventional wisdom of the factors leading to urban growth that the authors of *Consumer Cities* are critiquing.

3.1 Multiple Choice Questions

1. According to Glaeser et al. (2001), which of the following is not a reason the authors give as a critical urban amenity?

a) a rich variety of services
b) good public services
c) **access to manufactured goods**
d) the speed of transportation

Explanation The traditional production based city model includes access to manufactured goods as one of the main reasons to live in a city. However, Glaeser et al. contend that access to manufactured goods is no longer as important for locating in a city as it used to be due the emergence of e commerce and telecommuting. To support this point, they point out that many manufacturers have relocated to areas outside of cities. Furthermore, the other factors are all

important critical urban amenities for the reasons that a rich variety of services that provide the consumers with entertainment, good public services, and speed of transportation are all essential to a successful consumer based city because those factors revolve around the consumer and what the consumer wants out of a city.

2. According to Glaeser et al. (2001), which of these amenities did not contribute to a higher growth rate in cities?

a) temperate climate
b) **bowling alleys per capita**
c) live performance venues per capita
d) restaurants per capita

Explanation Table 3, which is located on page 35 of the article, shows that a temperate climate, restaurants, and Live Theaters are all correlated with population growth. However, U.S. Bowling alleys have a sharply negative correlation with city growth. This and other amenities negatively correlated with growth are noted by the authors to be amenities that attract less educated workers.

3. According to Glaeser et al. (2001), what type of commuting pattern saw the most consistent growth in the latter half of the twentieth century?

a) city to city
b) suburb to city
c) **city to suburb**

Explanation This question addresses the topic of a recent rise in reverse commuting. Since cities are attracting consumers based on the four critical amenities, people are drawn towards living in the city regardless of where they work. Reverse commuters live in central cities and work in the suburbs. Since they are generally paying higher rent to live further from where they work, the natural explanation for this is the demand for consumption value in central cities.

References

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Urban Decline

4

Joint Work with Lea Yamaguchi and Justin Puisis

Urban decline is not merely the opposite of urban growth. In fact, the nature of urban decline is substantially different from that of urban growth. At the root of this difference is the durable characteristic of housing. In order to understand the nature of urban decline, it is therefore essential that one understand the impacts of durable housing.

In their article "Urban Decline and Durable Housing," Edward L. Glaeser and Joseph Gyourko (2005) present a model that examines implications of urban decline with durable housing. The main implications of their model include: (1) City growth rates are skewed so that cities grow more quickly than they decline; (2) Urban decline is highly persistent; (3) Positive shocks increase population more than they increase housing prices; (4) Negative shocks decrease housing prices more than they decrease population; (5) If housing price are below construction costs, then the city declines; and (6) the combination of cheap housing and weak labor demand attracts individuals with low levels of human capital to declining cities. This paper will examine the first five of these implications drawing upon the results of Glaeser's and Gyourko's model.

In order to test their implications Glaeser and Gyourko used a sample of municipal jurisdictions with at least 30,000 residents in 1970. Collected from the decennial censuses Glaeser and Gyourko identified 321 cities with consistent core house prices and population data over three decades: the 1970s, 1980s, and 1990s. Furthermore, particular implications required additional data. The mean January temperature data within implications 3 and 4 was collected from the 1992 County and City Data Book. The house price data used to test implication 5 was taken from IPUMS and the construction cost data was taken from R. S. Means. Additionally, both the college graduate shares and the family poverty rates used to test implication 6 were collected from the County and City Data Book and Housing and Urban Development's State of the Cities data system.

As the framework of their model, Glaeser and Gyourko use a kinked-supply curve characterizing the housing market. Above the kink in the supply curve, housing prices are above construction costs, resulting in an elastic supply of

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housing. At any point below the kink the supply of housing is highly inelastic. The kinked-supply curve illustrates an asymmetric response where negative shocks to demand (resulting in the demand curve to fall below the kink) decrease prices and have little effect on housing supply and where positive shocks to demand (resulting in the demand curve to rise above the kink) produce a smaller effect on prices and increase the supply of housing. A description of the exogenous shock used in this model is provided in the section covering implications 3 and 4, among examples of other potential exogenous shocks. The kinked-supply curve assumes that there is a direct positive relationship between population and housing prices. From this assumption, we can predict that a decrease in population will lead to a significant decrease in housing prices, and that an increase in population will lead to only a small increase in housing prices.

In order to test their implications through regression analysis, Glaeser and Gyourko utilized the Rosen-Roback equilibrium concept where utility derived from wages and amenities minus the disutility of housing costs must equal the household's reservation utility, as it derives the asymmetry illustrated in the kinked supply curve. The Rosen-Roback equilibrium concept derives a spatial equilibrium where differences in housing costs across cities are offset by differences in wages or differences in amenities, forming a "no-arbitrage" relationship. When regressing their data utilizing the Rosen-Roback equilibrium, Glaeser and Gyourko often introduced unique variables that were only relevant to the particular implication being tested.

Implication One "*City growth rates are skewed so that cities grow more quickly than they decline*"

According to Glaeser and Gyourko (2005), because of durable housing there is a skewed distribution of city growth rates, meaning cities will grow faster than they will decline. This skewed distribution refers to an asymmetric model where the mean is greater than the median. The authors looked for evidence to show how the mean is indeed greater than the median, indicating population growth rates are faster than population declining rates. To test their theory, Glaeser and Gyourko (2005) examined 963 population growth rates each decade between the years 1970 and 2000 of 321 cities. They found the mean growth rate was 86 % higher than that of the median. The mean growth rate was 9.1 % and the median growth rate was 4.9 %. This finding shows that cities increase much more quickly than they decrease. They also analyzed 642 20-year and 321 30-year growth rates to see if results were similar for long-run data. The outcome is consistent with the 10 year-growth rate patterns and even yielded a mean twice the amount of the median. The skewness supports the authors' theory. The change in size of declining cities would be more prominent and the model would look more symmetric if housing was not durable. However since this is not the case, we see increasing population growth rates are higher than declining population rates.

Implication Two "*Urban decline is highly persistent*"

The durability of housing implies that urban decline is more persistent than urban growth. This is because the durability of housing results in urban population levels taking a long time to fully reflect negative urban shocks. From the regression, Glaeser and Gyourko found that the coefficient of past negative growth was twice that of past positive growth, verifying their implication that urban decline is more persistent than urban growth. In this instance, growth was a measure of population. Specifically, their regression translated that cities that experienced urban decline in the previous decade had a 1 % greater population loss associated with a 1 % larger population decline this decade. This means that for every percent the population declined in the previous decade, there was an additional decline in population of 1 % this decade. This verifies that urban decline is persistent.

Implications Three and Four "*Positive shocks increase population more than they increase housing prices & Negative shocks decrease housing prices more than they decrease population*"

Durable housing causes positive external shocks (e.g., warmer average weather or better air conditioning technology) to have a greater effect on population growth more so than the effect on housing prices and negative external shocks (e.g., colder average weather) to have a greater effect on housing prices in comparison to changes in the declining rate of a population. Another example of an exogenous shock can be a relocation of a corporation to or from a city. The relocation of a corporation to a city would be a positive shock and the relocation from a city would be a negative shock. Using a regression, the authors first hypothesize and test the existence of a concave relationship between changes in housing prices and population. The model implies a strong correlation between population decline and decrease in prices, although a weak relationship between population growth and price increase. When looking at cities that lost population, the elasticity of price change with respect to population is 1.8. This means that as the rate of population decline increases by 1 %, there is a 1.8 % increase in the decline of housing prices. For cities with growing populations, change in price to change in population is 0.23. This is not significant in comparison to declining cities.

The authors apply two different regression models to examine the effects of positive and negative shocks on changes in housing price and population. To illustrate, the authors use weather shocks to support their theory because warmer weather makes a city more attractive while colder weather deters people away from a city. The weather shocks were determined from data captured at a time when air conditioning made living in warmer areas more attractive. The authors interpreted that the increases in population at this time in warmer cities was attributed to the new attractiveness of warmer climates. The first regression displays the effects on population growth and successfully supports their model. Cities with cold shocks have a coefficient of 0.008 (implying that there is not much correlation) whereas cities with warm shocks have coefficients of 0.0069. Coefficient 0.0069 means that

with a 16° increase in temperature, there is a 10.8 % growth rate in population. This shows a much greater effect on population growth than a cold weather shock. The second regression shows the concave relationship between price changes and weather shocks and successfully supports their model. According to the model, negative shocks should have a greater effect on prices than positive shocks. In the regression, housing prices grew by 6 % in colder areas when there was a 10° increase in temperature. However, when there was a 10° increase in temperature in warmer places, there was only a 2.3 % increase in housing prices. The regressions support the third and fourth implications of the model.

Implication Five "*If housing price are below construction costs, then the city declines*"

Durable housing is a predictor of urban decline. Reflected in the kinked-supply curve, cities experiencing decline realize decreasing housing prices. From their model, Glaeser and Gyourko verify that a large and often times increasing (attributed to the persistent nature of urban decline) portion of housing stock priced below construction cost statistically predicts future decline. From the data that they collected, Glaeser and Gyourko determined that in 1980 42 % of single unit housing within US cities was priced below the cost of new construction. In 1990, it was 31 %. It should be noted that they observed significant variation across cities. From their regression, with a standard error of 0.042 they obtained a highly statistically significant result that implied that the population growth rate decreases by 2.7 % for each additional 10 % of housing stock that is priced below the cost of new construction.

In conclusion, Glaeser and Gyourko (2005) in "Urban Decline and Durable Housing" examine the physical nature of cities and the role it plays in understanding the nature of urban decline. The influence of durability on the supply side of the housing market explains why cities decline at a slower rate than the rate at which they grow. Durable housing also explains the persistence with which a city declines. "Durable housing predicts that exogenous shocks lead to different asymmetric responses of population and prices" (Glaeser and Gyourko 2005, p. 26). Additionally, durable housing implies that house prices are a predictor of future population growth. Furthermore, Glaeser's and Gyourko's model helps explain why the combination of cheap housing and weak labor demand attracts individuals with low levels of human capital to declining cities.

It is difficult to locate any weaknesses, as the model that Glaeser and Gyourko present is well formulated. They've chosen to verify concise implications with sensible data. In addition to forming and verifying their implications soundly, they propose any logical doubts that may dispute their implications, which they counter with data. One weakness may be that they did not test the implications with multiple representations of the variables. This especially pertains to implications 3 and 4, where the exogenous shock incorporated into the model was represented by only weather. For the sake of obtaining consistency in the results, it would have been beneficial to represent the exogenous shock with other factors. For instance

the authors could have utilized a corporation's relocation from or to a city as a potential representation of an exogenous shock.

In their article, Glaeser and Gyourko (2005) verify through their model some very important implications of durability and urban decline; however, they do not include an in-depth-look at cities where these implications can be observed. Providing a case example, where these implications can be observed within a real context would be a great complement to this article. Another suggestion for future research is determining whether the relationship of urban decline and low levels of human capital is self-reinforcing. Furthermore, another suggestion that is relevant to the article is to provide an examination of the role that government intervention plays on the persistence of urban decline.

In his book, O'Sullivan (2012) also recognizes the durable nature of housing and the implications this poses on the housing market. Much of what he says is reflective of the kinked-supply curve; however, unlike Glaeser and Gyourko (2005), O'Sullivan clarifies how the quantity of housing supplied increases and why the supply of housing becomes inelastic. He acknowledges that an increase in the price of housing will lead to an increase in the quantity supplied. Though, he adds that the quantity of housing supplied increases in three ways: through the building of new dwellings, through increased maintenance on used dwellings, and through the upgrade of used dwellings. Again, he also acknowledges that at a certain point a decrease in the price of housing will lead to an inelastic supply of housing. He recognizes that supply becomes inelastic at this point for two reasons: no new construction is occurring, and homeowners are not as willing to maintain, remodel or renovate their homes. In turn, this will lead to a halt in the quantity supplied. The durability of housing then implies that this will lead to an inelastic supply of housing.

4.1 Multiple Choice Questions

1. Which of these is not one of the implications of Glaeser and Gyourko's (2005) model?

a) City growth rates are skewed so that cities grow more quickly than they decline
b) **Urban decline is not persistent**
c) Positive shocks increase population more than they increase housing prices
d) Negative shocks decrease housing prices more than they decrease population
e) If housing prices are below construction costs, then the city declines (population)

Answer/Reason Option b is not correct, as it is actually the opposite that is true. That is, urban decline is highly persistent. The other four options are all true implications of the author's model. The other implication of their model that is not listed as an option in this question is implication 6: "the combination of cheap

housing and weak labor demand attracts individuals with low levels of human capital to declining cities". The implications of their model form the basis of Glaeser's and Gyourko's (2005) article and are all verified with data.

2. According to Glaeser and Gyourko's (2005), urban decline is:

a) Less persistent than urban growth
b) Equally persistent as urban growth
c) **More persistent than urban growth**
d) Not persistent at all
e) None of the above are correct answers

Answer/Reason The durability of housing implies that urban decline is more persistent than urban growth. This is because the durability of housing results in urban population levels taking a long time to fully reflect negative urban shocks. From the regression, Glaeser and Gyourko found that the coefficient of past negative growth was twice that of past positive growth, verifying their implication that urban decline is more persistent than urban growth. In this instance growth was a measure of population. Specifically, their regression translated that cities that experienced urban decline in the previous decade had a 1 % greater population loss associated with a 1 % larger population decline this decade. This means that for every percent the population declined in the previous decade, there was an additional decline in population of 1 % this decade.

3. According to Glaeser and Gyourko (2005), which of the following statements are true regarding the effects of exogenous shocks on population growth and housing prices? (There may be more than one)

a) Positive external shocks have a smaller effect on the rate of population growth than on housing prices.
b) **Negative external shocks have greater effects on housing prices than on the rate population growth.**
c) **Positive external shocks have greater effects on the rate of population growth than on housing prices.**
d) Negative external shocks have smaller effects on housing prices than on the rate of population growth.
e) None of the above are true

Answer/Reason The authors apply two different regression models to examine the effects of positive and negative shocks on changes in housing price and population. The first regression displays the effects on population growth and successfully supports their model. Cities with cold shocks (negative external shock) have a coefficient of 0.008 (implying that there is not much correlation) whereas cities with warm shocks (positive external shock) have coefficients of 0.0069. Coefficient 0.0069 means that with a 16° increase in temperature, there is a 10.8 % growth

grade in population. This shows a much greater effect on population growth than a cold weather shock. The second regression shows the concave relationship between price changes and weather shocks and successfully supports their model. According to the model, negative shocks should have a greater effect on prices than positive shocks. In the regression, housing prices grew by 6 % in colder areas when there was a 10° increase in temperature. However, when there was a 10° increase in temperature in warmer places, there was only a 2.3 % increase in housing prices. With these results, we can conclude that b and c are true while a and d are incorrect.

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Urban Crime

5

Joint Work with Zach Breit and Annamarie Bjorklund

The link between higher crime rates and urban areas is an issue that has been considered since the formation of cities centuries ago. Metropolitan areas have a staggering 79 % more crime than smaller cities and up to 300 % more crime than rural areas. In their research paper Edward L. Glaeser and Bruce Sacerdote, professors in economics at Harvard University and Dartmouth College respectively, seek to analyze why cities have perpetually higher crime rates. According to their findings, the major disparities in crime rates arise from factors such as pecuniary returns, classic deterrence, crime-prone individuals, agglomeration economics, and population density. In addition to simply defining these concepts, Glaeser and Sacerdote's goal is also to examine the above factors and determine how they each contribute to an increased crime rate in big cities.

In order to back up their findings, the authors reference three statistical databases in various sections throughout the paper. The first is the National Crime Victimization Survey, which is a survey administered by the Department of Justice's Bureau of Justice Statistics. The second source is the National Longitudinal Survey of Youth, a survey conducted throughout the 1970s and 1980s by the Bureau of Labor Statistics. Finally, Glaeser and Sacerdote draw information from the Uniform Crime Reports (UCR). These reports are published by the FBI and include data on states, agencies, arrests, clearance, stolen property, etc.

The paper begins by introducing the concept of a "criminal equilibrium". The idea behind this "equilibrium" revolves around the basic economic concept of costs and benefits; if an individual thinks the benefits of a potential crime outweigh the potential cost of punishment and cost of the crime itself, then the individual will most likely commit that crime. However, if the individual decides the costs of the crime outweigh the benefits, then the chances of the individual committing that particular crime are much lower. In the regression equation, the authors also consider various qualities of the individual committing the crime.

The main findings of Glaeser and Sacerdote reveal five major contributors to the high crime rate in big cities. One is pecuniary returns, which simply means that there is more money circulating in big cities than smaller cities and rural areas. In

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addition, this wealth in urban areas is usually much more observable due to higher contact between upper and lower classes. Criminals also tend to not travel very far to commit a crime and, as cities have more developed transportation systems, this also aids pecuniary rewards. Due to all of these factors, bigger cities simply offer more opportunity for individuals to seek monetary rewards through illegal actions.

The second is classic deterrence, which are forces preventing crime and punishing criminals. Unfortunately, for various reasons, sources of classic deterrence simply aren't as powerful in big cities. One key reason is that there are more suspects for every crime committed, thus making it much more difficult for law enforcement to track down every potential suspect and find the actual perpetrator. When comparing cities to suburbs there are also fewer neighborhood watch communities deterring crimes in local/residential areas. Finally, in densely populated urban areas, it is near impossible for the law enforcement officials to personally know all members of the community, therefore incentivizing crime due to the fact that "cities are more transient or more anonymous" and "social cohesion appears to decline in big cities" (Glaeser and Sacerdote 1999, p. 17).

The third major contributor is the fact that crime-prone individuals are far more prevalent in big cities, as there are an abundance of advantages for criminals living in urban areas. Some of these advantages include a lower chance of being caught, more vulnerable victims, and cheap transportation. It is in this section of the paper that the authors examine various data tables relating personal characteristics to an individual's likelihood to commit a crime. Some of these characteristics include ethnicity, years of education completed, age, state of family affairs and how often the offender attends church (Glaeser and Sacerdote 1999, p. 24).

One debate that the paper seeks to investigate is whether or not cities attract these particular crime-prone individuals or create them. Glaeser and Sacerdote do include some data showing that people who grew up in cities are much more likely to commit crime even when they have moved out of the urban area. Although there is still no conclusive evidence for either side, this particular study does favor the idea that cities are creating crime-prone individuals, rather than attracting them.

The fourth important finding presented is that cities are agglomeration economies. The main idea here is that a lot of the qualities that make cities great, such as high production, booming economy, and a high density of people also make cities more vulnerable to crime. Agglomeration economies also strongly correlate with population density—the fifth factor examined in this paper. Because there are so many people in a small amount of space, criminals are given an advantage in multiple ways. One key advantage over rural areas is that criminals are given a wider range of targets, and, as mentioned earlier, it is far less likely that they will know their victim personally. That being said, population density and agglomeration economies also offer a much higher flow of information on potential victims, allowing criminals to research potential targets and reap the greatest reward for their crime. Lastly, city populations are often out of the safety of their homes due to work, social functions or commuting. The constant presence of people on the streets gives criminals ability to simply wait for a "suitable" victim to come across their path whereas in rural/suburban areas, this method would not be nearly as effective.

After analyzing all of the above factors, Glaeser and Sacerdote conclude that all factors discussed previously influence crime levels in urban areas to varying degrees. At the end of the paper, the authors determine more affluent cities account for 25 % of the reason for higher crime rates, relating to the finding of pecuniary returns. However, violent crime not involving monetary reward also increases in urban areas, indicating that a mix of the characteristics of offenders, victims and the city itself all contribute to higher crime rates in cities.

At the conclusion of the paper, the authors also attempt to expand upon the idea that female-headed households and single-parent families were among the biggest contributors to high crime rates in big cities. Since the correlation between this characteristic and high crime rates were found to be very strong, future research needs to be done on this subject to pursue the validity of these connections. In addition, Glaeser and Sacerdote state the need for additional research considering whether cities create or attract single-parent families.

Although crime rates in cities remain markedly higher than in rural or suburban areas, recent studies reveal that urban crime with respect to other areas in the US is actually on the decline. Since statistical data play such a key role in demonstrating these different trends, it can be said that the biggest weakness of this paper is how dated the statistics used are. A lot of the data in this paper was based upon populations during the 1970s–1980s, despite the fact that this paper was written in 1999. In order to convey the most conclusive and applicable results, additional up to date research would have been beneficial.

According to "Urban Economics" (2012) by Arthur Sullivan, there are three specific conditions that have to be satisfied in order for a city to develop: agricultural surplus, urban production, and transportation for exchange. Although these conditions are essential to the success of a city, they are also a major reason why there is so much more crime in cities than rural and suburban areas. Due to a steady agricultural surplus and a high amount of urban production, cities are very desirable places to live, as there are an abundant amount of opportunities to make money, compared to the fewer opportunities in suburban and rural areas. Additionally, transportation is both cheaper and more convenient in urban areas compared to rural and suburban areas. Although an efficient, easily accessible transportation system has many upsides, it also is a major reason why there is so much crime in cities. Criminals know the transportation system in urban areas decreases their chances of being caught from a crime they commit, as they can flee the scene of the crime extremely quickly without being noticed, due to the high density of people living in an urban area. So the very conditions that are necessary for a city to develop and survive are also the conditions that cause such high crime rates in urban areas compared to rural and suburban areas.

5.1 Multiple Choice Questions

1. According to Glaeser and Sacerdote (1999), one reason classic deterrence is not as effective in urban areas is. . .

a) Ratio of police officers to citizens is higher
b) **More possible suspects**
c) Lower confidence in not being caught
d) Crime force is more familiar with individuals in urban communities than rural/suburban areas

Explanation The ratio of police officers to citizens in urban areas compared to rural areas is actually lower, due to the incredibly high population density in major cities, rendering answer (a) incorrect. (c) is also incorrect because criminals in an urban area know that there are so many more suspects per crime and that there is usually a weaker police force, meaning they usually have a much higher confidence in not being caught. (d) is incorrect because the crime force in suburban and rural areas is actually more familiar with individuals in their communities compared to urban areas. Due to a higher population density and more transient population in general, it is much more difficult for crime force officers to be familiar with their potential suspects. Therefore, (b) is the only correct answer.

2. According to Glaeser and Sacerdote (1999), urban population density contributes to higher crime rates. Which of the following is *not* a reason why?

a) Lower transportation costs
b) **More banks**
c) Greater flow/availability of information
d) Proximity of individuals
e) Easier resale of stolen goods

Explanation A is incorrect because lower transportation costs actually make it easier for criminals to commit crimes and flee the scene without being noticed by outsiders. (c) is incorrect because greater flow/availability of information makes it easier for criminals to analyze their victims and take advantage of the most opportune time to commit the crime. The proximity of individuals makes it easier for criminals to find victims or simply sit and wait for a potential victim to pass, whereas this method would not be effective in a rural or suburban area, meaning that (d) is also incorrect. (e) is incorrect because it is actually much easier for criminals in urban areas to quickly cash in on stolen goods without having anyone recognize them or ask as may questions along the way. Finally, although there may be more banks in urban areas than rural/suburban areas, that does not necessarily contribute to the high crime rates. Therefore, (b) is the correct answer.

3. According to Glaeser and Sacerdote (1999), which of the following is a reason for higher crime rates in urban areas?

a) Higher presence of individuals that are more likely to commit crimes
b) Lower probability of arrest
c) More potential victims due to higher population
d) More sources of wealth
e) **All of the above**

Explanation The higher presence of individuals that are more likely to commit crimes naturally leads to more crimes in urban areas than rural/suburban areas, meaning that (a) is correct. This idea directly relates to the debate of crime-prone individuals Glaeser and Sacerdote examine earlier in their paper. (b) is correct due to the issue of classic deterrence discussed in the essay. The lower probability of arrest makes it more desirable for individuals to partake in criminal activity, as their chances of being caught in an urban area are lower than being caught in a rural/suburban area. (c) is correct because more potential victims in urban areas means that is easier for individuals to successfully find victims and commit crimes against those people in urban areas compared to rural/suburban areas, due to a much higher population density. (d) correlates to the main findings of agglomeration economies and pecuniary returns in urban areas. Urban areas have more sources of wealth meaning there are more affluent sources to steal from compared to rural/suburban areas. Therefore, the answer is E, all the above.

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Part II

Agglomeration

Agglomeration Spillovers

6

Joint Work with Will Crittenberger and Chad Dove

Have you ever wondered why California's Silicon Valley is such an attractive region for high tech firms to start-up? Or perhaps, why the Financial District in New York City is home to so many of the largest financial institutions in the world? The answer to these questions can be explained in authors Michael Greenstone, Richard Hornbeck, and Enrico Moretti's work "Identifying Agglomeration Spillovers: Evidence from Winners and Losers of Large Plant Openings."

Greenstone et al. (2010) analyzed data on "winning" and "losing" counties for large plant openings in 47 counties. They defined "winning" counties as those that actually landed the plant's business and "losing" counties as that plant's runner-up choice. They hoped to answer the question of: What, if any, spillover benefits arise to incumbent (existing) firms from agglomeration when a new million-dollar plant (MDP) opens in their county? Furthermore, how are these spillovers made possible and by what factors? The authors sought out to test and prove four proposed hypotheses. These hypotheses included: (1) the opening of a MDP increases Total Factor Productivity (TFP) of incumbent plants, (2) density will increase as new firms enter the area to take advantage of the spillovers created by the MDP opening, (3) the increases may be larger for firms that are economically closer to the new plant, and (4) the price of locally supplied factors of production will increase.

The authors studied data on the opening of 47 MDPs across the United States. The MDPs used in the data involved various economic sectors. The authors looked to compare the differences in manufacturing performance of the incumbent plants in winning counties with the plants located in the losing counties leading up to, during, and after the introduction of a new MDP plant.

The model applies a simplified Cobb-Douglas productivity model measuring total output value based on labor, human and machine capital, and input price. There are two counteracting effects at play: (1) increases in factor productivity as agglomeration and economies of scale plays on incumbent firms, and (2) diseconomies of scale as input prices increase with more firms entering and thus increasing demand for land, labor, and capital.

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After a MDP opening, incumbent plants in winning counties experienced a sharp increase in TFP. Five years after a MDP opening, incumbent plants experienced a 12 % increase in TFP when compared to their losing county counterpart. Considering the fact that prior to MDP openings, there were insignificant differences in TFP between winning and losing counties, this data confirms that MDP openings are directly responsible for economic spillovers that result in higher TFP. The data also showed that spillovers are larger for incumbent plants in industries that share worker flows with the MDP industry and/or use similar technology. Winning counties experienced a 2.7 % wage increase after a MDP was established (Greenstone et al. 2010, p. 579). This leads to the authors' elaboration on attrition and the eventual closing of certain plants. Many believe a new MDP would shut down an incumbent plant with declining TFP in the same county, but their findings actually suggest that the new MDP kept the declining plants open, and instead caused the declining TFP plants in losing counties to shut down instead (Greenstone et al. 2010, p. 586).[1] In conclusion, the opening of an MDP in a winning city has a relative benefit on its incumbent firm productivity. The spillovers from a new MDP opening are found to only affect incumbent firms that use similar technologies and share labor pools. For this, the most relevant factor of spillovers relate to the sharing of labor inputs to smooth over hiring frictions as well as the sharing of technological information and ideas.

One weakness of the paper was the absence of any discussion of natural advantages with agglomeration. A few examples of natural advantage include coal mining areas, coastal accessibility, and oil drilling. Places with such beneficial resources attract plants and can influence their agglomeration. The study did not mention the geographic location of any of the counties, so it is possible that natural advantage may have resulted in more economic spillover, causing the authors to underestimate the changes in TFP and spillover in the 47 counties studied. It also would have been a more interesting read if the authors used specific examples.

After reading the study, a few follow-up questions for future research have arisen. If a business decides to agglomerate on a coastal city, does its spillovers include coastal counties on other continents or in other countries? The data used related only to the 47 counties studied in the United States, but the economic reach of an MDP opening across the ocean would be an interesting follow up to this study. Or, do countries in Europe or Asia experience the same effects of agglomeration as The United States? The European Union's influence on MDP plant openings across other European incumbent MDP's would add an interesting dynamic in the international economics realm and the relations among countries economically in Europe. The authors made it clear that the MDP's studied were in the United States. This brings about the question of whether or not other countries experience the same effects of new MDP's on incumbent plants in Europe or Asia. Or if a new

[1] The spillovers from a MDP keeps declining plants open in the winning counties, whereas, in losing counties, firms that were declining ended up getting shut down (and potentially could have been "saved" by the introduction of a MDP).

MDP in Germany would affect a plant in France. How far, geographically, does the influence of a new MDP stretch?

Greenstone, Hornbeck, and Moretti's research contains many identical theories, models, and findings in Arthur O'Sullivan's (2012) book "Urban Economics". In Chap. 4 of that book, O'Sullivan explains that agglomeration economies experience educational spillovers. These spillovers benefit low-skilled laborers the most by increasing their knowledge and productivity. In turn, the overall increase in labor productivity requires firms to pay higher wages—competitive labor market wages reflect productivity.

Educational spillovers parallel Greenstone, Hornbeck, and Moretti's third potential reason for a firm to agglomerate: faster spread of knowledge and information (Greenstone et al. 2010, p. 544). By taking advantage of faster spread of knowledge, firms are able to increase efficiency and productivity at a faster rate than if they were isolated or no part of an agglomeration economy. The spread of knowledge and information can be seen as a benefit which firms do not directly need to pay for because it will happen naturally with laborers living near and around other laborers. In other words, agglomeration economies are a source of economic growth because "*Physical proximity increases productivity through input sharing, labor pooling, labor matching, and knowledge spillovers*" (O'Sullivan 2012, p. 93).

Greenstone, Hornbeck, and Moretti's third prediction for heterogeneous firms states that "*The density of economic activity in the county will increase as firms move in to gain access to positive spillovers*" (Greenstone et al. 2010, p. 550). This parallels a point made in Chap. 3 of O'Sullivan's book. When discussing "*The Profit Gap and the Size of the Cluster*", O'Sullivan states, "*Firms will continue to join the cluster as long as the profit gap is positive, that is, as long as the cluster location is more profitable than the isolated location*" (O'Sullivan 2012, p. 52). O'Sullivan's example using profit is a specific example of a positive spillover mentioned in the article. Both the article and O'Sullivan believe that as long as there is something to gain through agglomeration (clustering) then firms will continue to agglomerate until the positive spillover, or more specifically, profits, are diminished. If the benefit of a firm agglomerating is less than the cost it takes to move, then many firms will remain where they are or pick a different location.

6.1 Multiple Choice Questions

1. According to Greenstone et al. (2010), which of the following is a benefit of agglomeration spillover?

a) Workers are attracted to areas with a high concentration of other firms and larger labor markets
b) Wages will increase in winning counties
c) The sharing of knowledge and skills through formal and informal interaction may generate positive production externalities

d) Firms located in denser areas are likely to enjoy cheaper and faster delivery of local services and intermediate goods
e) **All of the above**

Explanation The answer to this question is (e) "all of the above". Workers are attracted to areas with a high concentration of other firms because there are many firms offering jobs, which provide insurance for workers that they will be able to find work. Thus, (a) is correct. Agglomeration spillover will also increase wages due to the increase in economic activity and with a local labor supply curve that is upward sloping (Greenstone et al. 2010, p. 540). Thus, (b) is also correct. Answer (c) is correct because the sharing of knowledge and skills through formal and informal interaction generates positive production externalities—particularly in high-tech industries. Finally, (d) is correct too because firms can be more productive when they are densely located due to the fact that the transportation costs of suppliers are lower when they are centrally located amongst homogenous firms.

2. According to Greenstone et al. (2010), under which of the following conditions are economic spillovers considered the largest?

a) **Between plants that share labor pools and similar technologies**
b) Between plants that are physically close to each other
c) Between plants that require low-cost labor
d) Between plants that require high-cost labor

Explanation The answer to this question is (a) because an agglomeration of plants that share labor pools and similar technologies leads to higher rates of TFP. This higher rate of TFP occurs due to improved efficiencies of worker-firm matches as well as the formal and informal sharing of the industry's information and knowledge. These intellectual externalities are embodied in workers who move from firm to firm. Evidence for economic spillovers affecting plants being physically close to each other exists, however, the effects of these spillovers are more insignificant than those plants which share labor pools and similar technologies. Finally, there is no significant data that differentiates between firms with high-cost and low-cost labor.

3. Which of the following is a result of agglomeration in local counties following the introduction of a MDP?

a) Higher profits
b) Lower employment rate
c) Smaller firms to shut down
d) **Higher local prices**

Explanation Spatial equilibrium requires that increases in TFP be accompanied by increases in local input prices, so that firms are indifferent across locations. The increased levels of economic activity cause an increase in demand to locate in the

winning county, which leads to higher local prices and a new equilibrium. While profits are positive in the short run, letter (a) is not correct because these profits will disappear over time as the price of local factors, such as land and labor is driven up by demand. Even though agglomeration of firms lowers the risk of unemployment for workers as well as lowers the risk of unfilled vacancies for firms, the data did not show a MDP lowering the overall county's unemployment rate. Finally, MDPs did not cause smaller firms in their counties to shut down. Instead, the data shows that similar numbers of winning (72 %) and losing plants (68 %) remained in the sample at its end.

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Geographic Concentration of Industry

7

Joint Work with Jacob Bjornson and Mark Cage

If I wanted to manufacture aluminum, I would set up a factory in Washington. Why? Aluminum production involves heavy use of electricity and Washington has the lowest electricity prices in the country. That brings us to the question: does natural advantage explain agglomeration? In other words, do industries become geographically concentrated due to locational proximity to inputs that contribute to higher and more efficient production?

The main goal of Ellison and Glaeser's (1999) article, "The Geographic Concentration of Industry: Does Natural Advantage Explain Agglomeration" is to answer just that; is there a relationship between natural advantages and agglomeration economies? Ellison and Glaeser seek to find out if an industry will be agglomerated if firms locate in areas because of natural cost advantages. In 1983, Dennis Carlton found that firms' locations are highly sensitive to cost differences (Carlton 1983, p. 443). This finding leads Ellison and Glaeser to hypothesize that a substantial portion of observed geographic concentration may be due to various natural advantages. As the paper states, a natural advantage could mean a wide variety of things in this context. One example they give involves shipbuilding. Due to the lack of locational access to the ocean, there is not a prominent shipbuilding industry in Colorado, Montana, or South Dakota. Another example is related to climate and how wine makers only produce in climates that are optimal for growing and harvesting grapes.

Ellison and Glaeser focus primarily on four-digit manufacturing industries for their study. They use data collected in 1987 by the U.S. Census Bureau regarding state-industry shares of employment. Ellison and Glaeser then construct a model using multiple variables with the primary goal of identifying how much geographic concentration of industry can be attributed to the types of natural advantages previously noted.

The first step taken by Ellison and Glaeser is to create an index that measures geographic concentration. More specifically, this index will measure only the concentration that is not accounted for by observed natural advantages. In other words, this index measures the unobserved natural advantages as well as localized

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industry spillovers. Next, they want to address how natural advantage affects industry location. They look at the expected industry employment shares by state, and use this to chart 16 natural advantage variables. These variables are then used to measure the effect natural advantages have on input costs. Finally, they seek to find out if natural advantage explains agglomeration. So they create a table showing the effect on measured geographic concentration accounting for observed natural advantages. Each row reports on a distribution of industry agglomeration indexes which were obtained from a previous model of natural advantage created by Ellison and Glaeser (1997, pp. 892–905).

Ellison and Glaeser found a strong correlation between natural advantages and agglomeration. They measure 16 natural advantages and the majority of them were verified to contribute to geographic concentration of industries. Out of the 16 natural advantages, 6 were inputs for manufacturing. These consisted of cost of electricity, of natural gas, and of coal, and the amount of agricultural farmland, of timberland, and of cattle. Industries that use these inputs, such as milk and cheese factories for cattle amount, concentrate close to the input source based on the high, positive coefficients calculated by Ellison and Glaeser. A second finding was that industries will locate closer to their customer base as a natural advantage to reduce transportation costs. They also discovered that low-skill labor industries will locate in low-wage and low-education states such as Missouri and Kentucky, while executive and professional jobs will locate in high-educated states such as Massachusetts and Connecticut. Ellison and Glaeser did not find a relationship between heavy good importing and exporting industries and agglomeration on the coasts to reduce transportation costs nor did they find that export industries locate in low-wage states for competitive labor costs.

It is clear that industry locations are affected by a wide variety of natural advantages, both observed and unobserved. A main conclusion that is made by Ellison and Glaeser is that around 20 % of observed geographic concentration can be explained by their set of natural advantage variables. This is a significant result that can surely lead to new and more in-depth economic research. The authors acknowledge that their explanatory variables are somewhat limited.

There are a few weaknesses in Ellison and Glaeser's findings in addition to the limitations. First off, the data used in the paper is from 1987 which is almost 30 years old given the current year. New advancements and progress in technology may have reduced or eliminated transportation costs for some of these industries making proximity to natural advantages no longer a necessity which will in turn reduce agglomeration. In addition, there are many concentrated areas of industry than can only be explained by industry spillovers and not natural advantage. For example, "*simple cost differences cannot explain why the fur industry, the most agglomerated industry in* [Ellison and Glaeser's] *sample, is centered in New York*" (Ellison and Glaeser 1999, p. 316).

The authors hope their initial research findings can lead to more complex research papers on this topic. Specifically, that others may be able to create models with more variables than they used so better estimates can be made about this question. They speculate that up to 50 % of agglomeration could be due to natural

advantages. They also see opportunities to clarify the sources of localized industry spillovers.

In the appendix of Chap. 5 in Arthur O'Sullivan's textbook, "Urban Economics" (2012), there is an example of how natural advantage can lead to agglomeration and eventually lead to locational equilibrium which relates to Ellison and Glaeser's article. Suppose the northern half of the U.S. has large deposits of iron ore and coal. Production of steel, which uses iron ore and coal, would become cheaper in the North because of the elimination of transportation costs where the South would have to import from the North. The advantageous access to materials for steel production will cause a migration of steel workers to the North. The North's economy will then increase. As a result of the superior access to materials in the North, steel workers in the North are more productive which creates higher marginal revenue productivity (MRP) (O'Sullivan 2012, p. 120). If workers' wages match MRP, the migration will continue to the North for higher wages. As more workers enter the North steel economy, productivity decreases due to diminishing returns to labor. The wages in the South increase due to increased productivity among the remaining steel workers. Even though the North has a larger steel economy than the South, MRP equalizes which makes North/South wages equivalent and locational equilibrium is restored.

7.1 Multiple-Choice Questions

1. According to Ellison and Glaeser (1999), which of the following natural advantages was not proven to cause agglomeration?

a) Low electricity cost for aluminum production
b) Low cost of coal for cement production
c) Higher acreage of timber for sawmills
d) **Coastal location for heavy good exporters and importers**
e) All of these natural advantages were proven to cause agglomeration

Explanation (d) is the correct answer. (a), (b), and (c) were natural advantages all proven to cause agglomeration, making E incorrect as well given that (d) was not a natural advantage proven to cause agglomeration. Aluminum production involves heavy use of electricity to produce which will cause industries to concentrate in states with low electricity costs such as Washington. Cement production uses high amounts of coal which will motivate firms that produce cement to locate in areas with low costs of coal such as Montana. For sawmill factories to be successful, they need to be located by land that is abundant in timber so they will naturally concentrate in these areas. States high in timberland are Arkansas, Montana, and Idaho. Location on the coast was a natural advantage not proven to cause agglomeration for exporting and importing industries. Coastal location for heavy good exporters and importers does not significantly reduce transportation costs so there is not enough of an incentive to concentrate in those areas.

2. According to Ellison and Glaeser (1999), what amount of agglomeration do Ellison and Glaeser attribute to natural advantages in their results?

a) 10 %
b) **20 %**
c) 35 %
d) 50 %

Explanation (b) 20 % is the correct answer. Ellison and Glaeser conclude that at least 20 % of agglomeration can be attributed to natural advantage so that eliminates (a) 10 %. Both (c) 35 % and (d) 50 % are possibly true and Ellison and Glaeser speculate that agglomeration due to natural advantage is actually upwards of 50 %. However, as a result of the limitations of the variables and data in the study, 20 % is the most that can be concluded in regards to agglomeration and natural advantage.

3. According to Ellison and Glaeser (1999), which of the following is another factor that could lead to industry agglomeration, and not a natural advantage?

a) Industries will locate closer to their customer base
b) Low-skill industries will concentrate near or in low-education areas
c) **Industries will agglomerate if spillovers are geographically localized**
d) Manufacturing industries will cluster near their most important input

Explanation (c) is the correct answer because it is not a natural advantage. (a), (b), and (d) are all proven in Ellison and Glaeser's (1999) article to one, be natural advantages, and two, a significant reason for industries to agglomerate. A firm's customer base is recognized as a natural advantage and locating in close proximity to their customers will generate lower transportation costs and in turn allow to the firm to produce more product for cheaper. Low-education areas are also a natural advantage for industries, specifically low-skill industries. Low-skill labor industries, which generally pay low wages, tend to locate in low-educated areas because higher educated areas require higher wage jobs. For a low-skill labor industry to be successful, they have to pay low-wages and locate where their labor force is most prominent, which is in low-educated areas. Manufacturing inputs created the highest correlations between agglomeration and natural advantage in Ellison and Glaeser's study. Industries that use manufacturing inputs such as electricity, natural gas, coal, etc. will cluster near their respective input to cut transportation cost and increase production. That leaves C. as the right answer. Spillovers are not considered a natural advantage by Ellison and Glaeser. Spillovers are benefits or costs that an industry can experience but did not contribute to, similar to externalities. An example of a spillover would be a knowledge spillover which is an exchange of ideas among industries. Although this can cause agglomeration, it is

not considered a natural advantage it something that will usually occur once agglomeration is already taking place whereas as a natural advantage is an input or situation that exists before industries start to agglomerate.

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Subcenters

8

Joint Work with Daniel Ebsen and Stephen Grimm

In their article "Subcenters in the Los Angeles region" published in *Regional Science and Urban Economics* (1991), Genevieve Giuliano and Kenneth Small investigate the employment subcenters in the Los Angeles region using 1980 Census journey-to-work data. They attempt to answer the question of why the composition of LA is so different relative to other major US cities, such as New York and Chicago, and whether there are measurable economic rationales for this economic makeup. The paper presents an empirical analysis of employment and population patterns of subcenters in the Los Angeles region. The goal of their research was to explain the regions urban economics by addressing LA's employment density and work commute patterns in order to show exactly how much of the city's industry is subject to urban sprawl. Giuliano and Small have three objectives within their essay: (1) to develop a method for systematically identifying employment subcenters; (2) to apply it to data from the Los Angeles region; and (3) to analyze the functions and distribution of centers and their associated commuting flows.

Contemporary metropolitan areas are characterized by decentralized patterns of employment, some dispersed along with population and others concentrated in activity centers. Throughout the history of urban economics there have been varying definitions of what constitutes a 'subcenter.' Given the variety of methods, studies have obtained vastly different employment and population results for the same metropolitan area. Giuliano and Small recognize this difficulty and set out to provide an objective definition in order to gain better consistency and comparability. Their study draws on previous research of similar cities and applies similar methodologies to the LA region. In particular, they used the 1980 census journey-to-work data to establish a consistent definition. This data allowed for a systematic method of employment center identification that is applicable to other regions. The journey-to-work census data provided insights on population characteristics, employment, and travel flows. Giuliano and Small conclude that "employment, not population, is the key to understanding the formation of urban centers; and that

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a center is best identified by finding a zone for which gross employment density exceeds that of its neighbors" (Giuliano and Small 1991, p. 166).

LA was chosen as the area for study because it is historically viewed as a region of endless urban sprawl, with employment and population dispersed throughout. The areas included within the study encompass 3,536 square miles and cover the urban portions of Los Angeles, Orange, Ventura, Riverside, and San Bernardino Counties. It includes the second largest statistical metropolitan area in the nation, Los Angeles, and 150 other municipalities consisting of 10.7 million people and 4.65 million jobs. Giuliano and Small discovered that the region of LA's overall employment pattern conforms to the notion of a dense center surrounded by areas of gradually declining density. "Downtown Los Angeles, with just over one-half percent of the region's land area, contains 10 % of its jobs and fully 31 % of all jobs within centers. The five core centers together contain more than half of all jobs located in centers" (Giuliano and Small 1991, p. 170). Most centers have high population densities in and near them, and their workers' commutes are just 2.4 miles longer than other workers' commutes. Although this finding may seem fundamental, it was essential in identifying the clusters within the California region.

A cluster analysis of employment by industry reveals several interesting types of centers within the LA region, and a wide dispersion of sizes and locations within each type. The authors used hierarchical clustering and iterative partitioning to identify the clusters, aiming to minimize dissimilarities between them. The results of their experiment found specialized manufacturing, mixed industrial, mixed service, specialized entertainment, and specialized services best describe the employment of the subcenters. While there seems to be several distinct types of centers in the LA region, there is a wide dispersion of sizes and location within each type of employment. Clusters focusing on mixed services, mixed industrials, and specialized services composed the spectrum of work that the core's demographic fits into. Giuliano and Small found this result quite interesting because such an allocation is unique for a metropolis such as LA when you consider New York and Chicago, where almost all of the centrally located work is in services. Besides the entertainment cluster, each cluster contains a wide array of locations and densities, with the narrowest range is for the highly specialized manufacturing centers. Also, there is some tendency for the service-oriented jobs to be located in the downtown and areas with higher densities. The high-density central areas tended to be more service-oriented with specialized industries surrounding and manufacturing located on the periphery.

As a whole, Giuliano and Small conducted a precise study that effectively answers their stated objectives. They prove that LA is distinct in its employment distribution and they have results showing LA's uniqueness in its industrial allocation, commuting patterns, and business district's significance. It would also be interesting to look closely at other large American cities to compare and contrast their findings. In particular, the study would benefit from in-depth studies of New York and Chicago in order to uncover and analyze their employment densities, relative to LA. Since Giuliano and Small created a replicable blueprint to determine subcenter densities, this additional research would not demand extensive modeling.

Uncovering this data would make the evidence Giuliano and Small discovered more convincing.

Considering this study is nearly 25 years old, using recent census data would improve the research and make the findings more applicable to LA's current economic landscape. Future research should also focus on the relatively new idea of "walkable cities," and the effects suburban sprawl has on the LA region. Made popular by city planner/urban designer Jeff Speck, 'walkable cities' focuses on the reorganization and creation of landscape around the urban environment. Seen throughout the development of suburban America, people living outside of the city rely on the use of the automobile to live their daily lives. Speck argues that demand for these types of sprawled developments is decreasing, and that in the future people will place a premium on places that promote the 'useful walk.' Cities in Europe can serve as an example because many of these older towns consist of boutiques, small shops, extensive public transportation, and are extremely walkable. Speck argues that moving the towns closer to the city center will result in more economically resilient, healthier, and environmentally stable dwelling places. Future research investigating how the demand for housing outside, and within, LA will change in response to Speck's (2013) idea of a "walkable city" would make a captivating study.

O'Sullivans book *Urban Economics* (2012) presents several models that are verified through this paper. It makes sense that the largest centers have the largest commutes, based on their central location. Secondly, these employment centers are based upon agglomeration economies. And while some of these economies only apply within an industry (the localization economies of manufacturing clusters) or across industries (Hollywood actors, prop builders, and movie agents) they are significant. "Furthermore, the spatial distribution of centers should depend upon how they interact with each other, how they use land as a factor input, and the extent to which they produce services for subregional populations" (Giuliano and Small 1991, p. 175). LA is a unique American city that allows for a close study of industry clusters based on its historical dispersion, and the effects this dispersion has on transportation times, employment, and industries is clearly outlined in this paper.

8.1 Multiple Choice Questions

1. According to Giuliano and Small (1991), which of the following is not a hypothesis about the effects of big centers on commuting:

a) Clustered employment requires longer commutes than dispersed employment
b) Larger centers require longer commutes
c) The main center (Downtown LA, in this case) requires a longer commute than subcenters
d) **People working in big centers have shorter commutes than those working outside of the centers**

Explanation Table 4 in Giuliano and Small (1991) present evidence in favor of option (d). Regarding option (a), commutes to jobs within centers are longer than commutes to jobs outside of centers. The main center has a longer average commute, 13.9 miles, than all other categories of centers. Average commuting distance to centers in Los Angeles County is almost 2 miles longer than to centers in more suburban Orange County, and 5 miles longer than to centers in the outer counties. Lastly, people living in centers have shorter commutes than those living outside centers.

2. According to Giuliano and Small (1991), what type of occupations tends to be located in cities with higher densities and located close to the core area?

a) **Service-oriented**
b) Manufacturing
c) Mixed Industrial
d) Specialized Entertainment

Explanation The employment in subcenters occurs in recognizable industry-mix patterns ranging from highly specialized to diversified. The more service-oriented centers tend to be at higher densities and somewhat closer to the core area, but there are many diversified, somewhat service-oriented centers that are downtowns of older cities scattered throughout the region. High-density areas tended to be more service-oriented with specialized industries surrounding and manufacturing located on the periphery.

3. According to Giuliano and Small (1991), which of the five cluster iterative partitions would best describe a traditional downtown?

a) Specialized Manufacturing
b) Mixed Industrial
c) **Mixed Service**
d) Specialized Entertainment
e) Specialized Service

Explanation These cities functioned as independent centers before they were absorbed into the larger metropolitan area, and they apparently have retained these functions. This is also the largest cluster, with 11 members, and it contains the full range of sizes, from the very largest to the smallest. These centers are dispersed through the region, indicating that this type of center plays a role at all scales and locations.

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Sprawl

9

Joint Work with Erica Fleming, Melissa Furman and Bradley Glendenning

A survey conducted by the Pew Center for Civic Journalism (2000) concluded that 18 % of Americans feel that urban sprawl and land development were the most important issues facing their local communities, tied with crime and violence. Respondents to the survey were almost evenly split between wanting local government to limit further development to already built-up areas and those wanting more scattered development in previously undeveloped areas. However, spatial development patterns are the aspect of urban sprawl that researchers know least about. What causes urban sprawl and how much is urban development sprawling taking place in the United States? The paper "Causes of Sprawl: A Portrait From Space" by Burchfield et al. (2006) examines the extent to which the United States urban development is sprawling and what determines differences in sprawl across space.

The data focuses on the spatial patterns of residential land development and whether or not residential land development is spatial or compact. The article stated that research was conducted using remote-sensing data to track the evolution of land use on a grid. In terms of overall development, it was found that only 1.9 % of the United States was built up by 1992. Burchfield et al. describes factors that impact urban sprawl. The monocentric city model generalizes that cities sprawl less if they have job specialization such as business services that take place in the city center. This is a result of the commute to the central business district. The authors also consider the impact of physical geography, which explains 25 % of cross-city variation. Sprawl increases with the presence of water-yielding aquifers and scattering increases with the presence of hills and terrain. There are also political determinants of sprawl. More sprawl takes place in cities with a large proportion of undeveloped land outside of a city. These factors aid in the explanation of variation in the data conducted.

To look at how sprawl has changed, photographic maps were used from 1976 and 1992. The maps from 1976 were high altitude aerial photographs where the initial land use boundaries were drawn directly. In 1992, the maps came from satellite images where reflectance values were grouped together to determine the land use and aerial photographs were used to refine the boundaries and assign land

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cover codes. The land is categorized as residential development, commercial development, industrial development, transportation networks, water, bare rock, sand, forest, range, grassland, agricultural land or wetlands. This resulted in 8.7 billion square cells that were each 30×30 m situated on a regular grid.

A measure of sprawl was constructed for every metropolitan area as the percentage of open space in square kilometers surrounding a residential development. The measure of sprawl was calculated for each developed cell in the metropolitan areas and then averaged for each state. The authors were able to calculate indices between 1976 and 1992 as well as a dynamic index for new development that occurred between 1976 and 1992. The results showed that Atlanta had the highest urban sprawl index of 57.8 in 1976 and 55.6 in 1992.

In comparison, Miami had the lowest urban sprawl index of 20.0 in 1976 and 20.7 in 1992. The changes between 1976 and 1992 indicate that some cities increased in sprawl while others decreased. They also completed a correlation matrix to determine that there was a strong positive relation to median lot size and a slightly positive correlation to the miles driven per person.

There is also a regression model to test the relation between the sprawl-index, the dependent variable, with several measures from urban economic theory. There are four columns of dependent variables used. Columns (1), (2) and (3) use the sprawl index for 1976–1992 development that has a mean 64.51 and standard deviation 10.90. Column (4) uses the sprawl index for 1992 development with mean 46.54 and standard deviation 10.82. The regressions are run on all 275 metropolitan areas in the United States.

First, the regression model looks at the monocentric city model and its generalizations. The regression model shows that cities sprawled more if employment is not located at the city center and if the city is car-friendly. In addition, a fast population growth will decrease sprawl. However, uncertainty regarding the future city growth will increase sprawl. Next, the regression model considered physical factors that affect sprawl. Rugged terrain increased sprawl because the cost of development is cheaper where the terrain is flat. However, mountain ranges tend to make cities more compact. Additionally, when aquifers are underneath the urban fringe, it increases sprawl because residents can put in low-cost private wells and not pay to be connected to the city water line. Temperate climates were found to have no effect on urban sprawl. Finally, the regression model looked at the political factors impacting sprawl. Sprawl will be increased when there are unincorporated areas on the urban fringe that developers can escape from municipal regulation by building outside the municipal boundaries. In addition, sprawl will occur when local taxpayers pay a smaller share of the local government expenses. The authors go on to make the political recommendations about the negative external costs of sprawl on aquifers should be regarded and regulations between the municipality and county should be similar to decrease sprawl.

A variety of conclusions were found within the research done for this paper. To begin with, one conclusion was that roads did not make the amount of difference people once thought. It was originally believed that sprawl would follow easy roadways and increase sprawl of cities. While more sprawl was shown in cities

with more dense roadways, it was minimal. What was found to be more important was if the city center was built before or after the advent of cars and how well their public transportation was set up. In cities where public transportation systems were set up very early, there was less sprawl. There was an increase in sprawl for cities with easily accessible roadways. Another conclusion was that internalization the fiscal externalities of new development limited urban sprawl. And lastly, it was found that two of the most important factors causing urban sprawl are the landscapes of the fringe area around a city and the fact that there were policy implications from disparities between county and municipal.

Weaknesses will always arise in a national survey such as this. To begin with, it is difficult to look at every cities sprawl so some assumptions were based on a smaller population. Because it is difficult to look at this land, research is done very rarely so some data might have been missed over the years or undocumented.

The next time research is done on sprawl we would suggest surveying a population to determine why they moved out of cities. Also, it would be helpful to update the data more regularly. Another suggestion would be to compare sprawl in America to Europe. Many cities in Europe are functional without cars and very compact. Therefore, it would be an interesting to compare the more spread out American cities to the more compact cities in Europe who do not rely on cars.

"Urban Economics" (2012), a book written by Arthur O'Sullivan, describes cities as either "growing up", or "growing out". As populations of cities increase the city will either grow taller, or the residents will go out of the city and occupy more land. Sprawl is when the residents of the city leave and occupy more land around the city. Relating this to the suggestion to the article, the book points out that cities in America are much less dense than cities in Europe and the rest of the world. Both the book and the article stated that sprawl is caused by the low cost of travel and how this allows workers to live far from their jobs, shops, and places of social interaction. They also both focused on the political factors that affect sprawl. The article points out that this is a large factor, but the book takes it a step further and breaks down some of the policies that create sprawl. The main policies pointed out where congestion externalities, mortgage subsidy, underpricing of fringe infrastructure, and zoning all impact sprawl. The consequences of urban sprawl include: suburban households require 58 % more land but are newer and more efficient, and workers in suburban areas drive an average of 30 % more.

Jeff Speck, a city planner, gave a TED Talk on urban sprawl, and more specifically the idea of a walkable city.[1] One of Speck's main focuses was the fact that in cities around the world where sprawl is relatively low, their energy consumption is half as much or less than that of cities in America. He brought up a variety of reasons as to why a walkable city would be beneficial, but focused on three main parts: exercise from walking, the decrease in greenhouse gases, and the decrease in car crashes.

[1] Speck, Jeff (2013), "The Walkable City", TED. October 2013, Lecture at University of Wisconsin–Madison, 2014 Biennial Wisconsin Real Estate Conference.

9.1 Multiple Choice Questions

1. According to Burchfield et al. (2006), which of the following does not explain a factor that can impact urban sprawl?

a) The monocentric city model generalizes that cities sprawl less if they have centralized jobs.
b) The physical geography in the area such as water aquifers and terrain.
c) **The climate in the area.**
d) Political determinants.

Explanation The answer to this question is (c) because the following impact urban sprawl: the monocentric city model, physical geography, and political determinants. The monocentric city model (a) generalizes that cities sprawl less if they have job specialization such as business services, that tend to be centralized in the average city. The commute to the city also plays a role, with cities built around public transportation more compact than cities built around the automobile. Cities with higher historical population growth rates sprawl less. The physical geography (b) also affects sprawl because sprawl increases with water-yielding aquifers. Aquifers allow people to sink a well and not bear the costs of municipal water lines. In addition, high mountains close to development constrain urban expansion and make development more compact. Finally, political determinants (d) impact sprawl because there is more sprawl in cities where a large proportion of undeveloped land lays outside the municipality. Public finance also plays an important role. Climate (c) doesn't affect sprawl because it is not a top priority for people and therefore does not impact urban sprawl.

2. According to Burchfield et al. (2006), which of the following will not increase sprawl:

a) Cities where employment is not located at the city center
b) Car-friendly cities
c) **Fast population growth**
d) Uncertainty about the future city growth

Explanation The answer to this question is (c) because fast population growth does not increase sprawl. In the article, the regression model proves that fast population growth does not increase sprawl. In areas where the population is growing fast, nearby vacant land is developed sooner and will not have additional commuting costs when gaining access to the open space. In fact, it was found that faster population growth rates cause cities to become more compact. Answers (a), (b), and (d) were all proven to increase sprawl according to Burchfield et al. Cities sprawl if employment is not located at the city center. Sprawl will also increase

when cities were built around the car rather than public transportation. Finally, higher uncertainty of future population growth increases sprawl.

3. According to Burchfield et al. (2006), which of the following geographical features does increase sprawl?

a) Rugged terrain
b) No mountain ranges
c) Aquifers underneath the urban fringe
d) **All of the above**

Explanation The answer to this question is (d) because all answers were proven correct in the article. Burchfield et al. determined that rugged terrain causes cities to naturally sprawl. This happens because steep hillsides are more costly to develop than flat portions of land. Therefore, this proves that answer (a) is correct. The article also proved that mountain ranges will make a city more compact because it is costly to build in the urban fringe. Therefore, answer (b) is correct because cities will sprawl more if there are no mountain ranges present. Additionally, having aquifers present will increase sprawl. When there are aquifers present under the urban fringe, water can be obtained through a low-cost well instead of the large cost to be added to the public water line. Therefore, answer (c) is correct. Because we have determined that answers (a), (b), and (c) are all correct answers, we can conclude that answer (d) is the correct answer for the question.

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Part III

Homelessness

A Comparison of Homelessness Across Cities

10

Joint Work with Kelsey Goffman, Brian Hennig and Jacob Heitland

State Street is a University of Wisconsin landmark filled with great shops and restaurants, and is also home to some of Madison's notorious homeless people. For example, "Piccolo Pete" can be found sitting outside the University Bookstore playing his piccolo, and "Scanner Dan" has the reputation of shouting gibberish about UW Madison's sororities. Students walk past these infamous characters on a daily basis, and many offer spare change or food as a temporary remedy. However, instead of offering temporary solutions to the current homelessness problem, one can dive deeper into the rooted causes of homelessness in order to derive a viable solution to this overwhelmingly present problem.

The article *Causes of Intercity Variation in Homelessness*, by Marjorie Honig and Randall K. Filer, recognizes the severity of the problem of homelessness in America. Throughout the paper, the authors present findings that measure the underlying causes of homelessness in order to provide a framework for discussion of policies to reduce homelessness. Honig and Filer define homelessness as a person that has no permanent address, "crowding" as more than one person per-room, and define "doubling-up" as households containing more than one nuclear family, defined as parent and their children. Although crowding and doubling up are often cited as causes of homelessness, Honig and Filer believe they are manifestation of the same underlying causes of homelessness. The main goal of this paper is to identify who is homeless, crowding, and doubling-up, and use this information to define the causes of homelessness in America.

Honig and Filer use the data collected by the US Department of Housing and Urban Development (HUD), as well as information collected from a 1980 and 1990 US census. HUD is a US governmental association that aims to create suitable living environments for citizens through the improvement of local communities and the enforcement of housing laws. HUD uses four independent methods to study the amount of homelessness including: (1) estimates from local studies, (2) 500 key informant interviews in 60 different metropolitan areas, (3) surveys of 184 shelter operators in the different metropolitan areas, and (4) estimates of ratios of shelter and street populations. The data that Honig and Filer examines throughout the paper

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concludes that the amount of homeless individuals has declined, as there were approximately 500,000 homeless individuals according to the 1980 Census, between 250,000 and 350,000 homeless individuals in 1984 according to HUD data, and an estimated 250,000 homeless individuals according to the 1990 US Census.

The authors used a linear regression to show how various independent variables affected the three dependent variables in question—homelessness, crowding, and doubling-up. They used their data to assess the relative importance of independent variables such as vacancy rates, housing availability and costs, income levels, non-institutionalization of the mentally-ill, and public transfer payments through local policies, on the incidence of homelessness. The model gives incidence rates of all three independent variables per 100,000 population or households and also offers explained variation (adjusted R^2) showing how much of the variation is attributed to each dependent variable.

There were several main results of the study. When looking at rent levels in the lowest tenth percentile, the higher the rents the larger the rate of homelessness was. A small increase of one standard deviation in rents raised the number of homeless persons 78 per 100,000. The authors suggest that the subsidization of rents from municipalities could have a large effect in deterring this cause of homelessness. Vacancy rates of the same percentile of rents were cited as having an increase on doubling-up but had no effect on crowding and a non-statistically significant effect on homelessness.

Looking at the labor markets, growth in private sector jobs was attributed to a negative relationship between the number of jobs and homelessness and crowding (with imprecise results on doubling-up). The demand for low skilled jobs, assumingly related to low paying jobs, had a small impact on both homelessness and doubling-up but did positively affect crowding rates. Intriguingly, the authors found that the unemployment rate, over long and short terms, had no direct impact on homelessness.

The researchers had predicted that household incomes below the poverty line would be a strong indication of homelessness but actually correlated to only crowding. They also predicted that the level of government expenditures on social services would decrease homelessness but found instead that they only affected crowding and doubling-up while only program-specific benefits, like Aid to Families with Dependent Children (AFDC) decreased homelessness. Programs like Supplemental Security Income (SSI) were actually shown to increase the incidence rate of all three forms of homelessness. The authors attributed the auditing and ultimately higher accuracy rates of these programs to an increase crowding as those who should not have been participating in the program were cut off and no longer being funded.

Moving onto their findings on the mentally ill, the authors discovered that the number of inpatients at state ran facilities had a correlation with homelessness and that since the decrease in institutionalization of the mentally ill in the 1960s, an increase of homelessness was observed. It has also increased the doubling-up rates as those patients are either forced to live at home, on the street, or at a state ran

facility. The authors admitted, however, that much of the data was imprecise and up for interpretation.

The effect of births to teenage mothers was also tested showing that it increased the chance of doubling-up but actually had no effect on homelessness. The model also showed that the larger the size of the black population in a given area, the higher the rates of homelessness and doubling-up. Lastly, the researchers were able to find that the incidence of crowding and homelessness was greater the larger the metropolitan area was.

Honig and Filer conclude that the main factors that explain the variations in homelessness, crowding, and doubling-up, include housing markets, labor markets, and public policies regarding the mentally ill and low-income population.

One of the major weaknesses of this article is the validity of the HUD data. At various points throughout the article Honig and Filer warn the reader about the weakness of the HUD data and the large variation in the incidence of homelessness and other poor housing outcomes across metropolitan areas.

Due to the outdated nature of this article, future studies should be conducted to follow up on the conclusion of this article. Conducting further research based off of data from the currently century could provide a more conclusive explanation of the causes of homelessness in America today. In addition, future research should distinguish HUD data between components of the homeless population. Because the HUD data did not distinguish between the major components of homelessness, which are single males and single females with families, the effectiveness of this data was flawed. Furthermore, due to the puzzling inverse results of the data regarding Supplemental Security Income benefits and homelessness, crowding and doubling up, future research could be useful. This future research would be helpful in order to clarify the relationship between SSI and homelessness.

Honig and Filer's argument also directly correlates with the information found in the book *Urban Economics* (2012) by Arthur O'Sullivan. O'Sullivan cites the causes of homelessness when stating, "a person will be homeless if his or her income is low enough relative to the price of housing that it is not sensible-or not even possible—to purchase housing services" (O'Sullivan 2012, p. 397). Similarly, Honig and Filer see homelessness as a result of an imbalance between the cost of available housing and household income.

In conclusion, the real estate industry's inability to effectively deal with the overwhelming problem of homelessness today provides a large opportunity for growth in the future. For example, an increase in federal government grants to local governments to address each cities unique homeless population and a reassessment of current housing policies. Due to the diverse and complicated qualities of the homeless population, each local city would be better educated on the most efficient way to reduce the number of homeless individuals in their city. Policies that improve the functioning of the low end of the housing market could have a mitigating effect on the issue of homelessness in the United States today.

10.1 Multiple Choice Questions

1. According to Honig and Filer (1993), HUD's estimate of the national homeless population based on the 1990 Census is:

a) 250–350 homeless people
b) 2,500–3,500 homeless people
c) **250,000–350,000 homeless people**
d) 2,500,000–3,500,000 homeless people

Explanation This answer comes directly from the HUD's 1990 estimate, although is mentioned to be controversial several times throughout the article. Although it was said to be controversial, the authors were unable to find contradicting data and even citied other studies that all produced homeless figures somewhere within HUD's range.

2. According to Honig and Filer (1993), which of the following is the definition of the term "crowded"?

a) A city that is not able to support its current commuting population
b) A house where five or more nuclear families live
c) **A dwelling where there is more than one person per room**
d) Chasers after 10:00 p.m. on Thursday

Explanation This is the definition that Honig and Filer (1993) cited to describe a different type of homelessness, as it has not previously been captured in studies such as this one. This term is used throughout the study and is crucial to understanding the entire model. The authors view it as a type of homelessness that sprouts from similar reasons as both homelessness and doubling-up (another important term to know).

3. Which of the following did Honig and Filer (1993) conclude were causes of homelessness?

a) An imbalance between housing prices and income levels
b) Slack labor markets
c) Public policies regarding treatment of the mentally ill
d) **All of the above**

Explanation All of these reasons were found to have a statistically significant impact on the incidence of homelessness as shown by the model. When there is a gap between income levels and housing costs, it inherently leads to homelessness, as people are not making enough money to pay for a given rent. This can be

amplified by lacking labor markets if there are not enough jobs or the pay is lower than needed. Lastly, the lower rate of institutionalization of the mentally ill has been shown to increase homelessness, specifically doubling-up as this puts more strain on family and friends to take care of those individuals versus a state ran institution.

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Poverty and the Role of Public Transportation

11

Joint Work with Meixiao Gong and Daniel Frechter

This paper, published in 2008 and featured in the Journal of Urban Economics, was authored by Edward Glaeser, Matthew Kahn, and Jordan Rappaport and investigates the influence of access to public transportation on the urbanization of poverty. The authors sought to explain why the poor tend to populate dense cities within metropolitan areas versus the surrounding suburbs. Through the use of statistical regression and selected data from surveys and censuses the authors were able to prove with statistical significance that, while not the only factor, access to public transportation is the primary reason for central city poverty. The goal of the research was to develop a theory of urban centralization that should explain the separation of the poor and non-poor, and, given this relationship, why the poor choose to live in the center of cities.

According to a 2000 census tract from the Urban Institute and Census Geolytics' Neighborhood Change Database (Baum-Snow and Kahn 2005), the average poverty rate for people living within 25 miles from a Central Business District (CBD) is 11.7 %. The average poverty rate for people living 0–10 miles from the CBD is 14.5 %, while for people living 10–25 miles from the CBD, the average poverty rate is 8.3 %. Distance to the CBD and income are inversely related at a decreasing rate as this data indicates.

The Alonso-Muth-Mills's (AMM) model—see the pioneering work Alonso (1964)—explains that the poor live in cities because the rich can maximize their real estate in the suburbs where land is cheaper. In essence the elasticity of demand for land with respect to income is greater than the elasticity of the value of time with respect to income. Under the bid-rent gradient, the price of land must decrease with distance just enough to compensate commuters for the cost of their time. The AMM model suggests that three-quarters of the sorting of poor into the city center is explained by public transportation, with the remaining one-quarter stemming from the demand for land.

Through a series of statistical regression analyses the authors discerned that public transportation strongly predicts poverty and explains a substantial amount of the connection between proximity and poverty. In particular, including public

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transportation access in the regression increases explanatory power and eliminates one third of the positive relationship between distance and income for sectors that are less than 10 miles from the city center.

Using data from three censuses (U.S. Census Bureau 1980, 1990, and 2000), Glaeser, Kahn, and Rappaport studied rail transit expansion constructed from 1980 to 2000 and found that tracts within a mile of a rail station have 4 % higher poverty rates. Furthermore, tracts that are treated with increased rail transit incur a 0.0004 % increase in poverty relative to an untreated tract that is equidistant to the CBD and within the same metropolitan area. These results, while small, are statistically significant. The expansions were constructed to connect wealthier city suburbs to the CBD but the ultimate effect was that these now more accessible suburbs attracted poorer individuals. As an example the authors used the Harlem neighborhood of Manhattan, New York. Due in large part to the arrival of public transportation in Harlem, a large contingent of African-Americans moved into the neighborhood due to its increased accessibility and proximity to the city center.

In addition to the main thesis of the paper regarding public transportation and urban poverty, the authors also discuss and statistically test three additional implications. The first of these is that the existence of multiple modes of transportation is imperative for the reasoning behind the poor congregating in cities. A log regression of tracts between 5 and 15 miles from the CBD designated as "car zones" shows a significant negative relationship between distance from CBD and income in these areas. Richer individuals live closer to the city center in these car zone areas.

The second implication is the relationship between a tract's income and distance from the CBD in subway vs. non-subway cities. For older, subway cities including Boston, Philadelphia, and New York the median income declines in the 3 mile range from the CBD center but then increases as distance increases. However in non-subway cities such as Los Angeles, Phoenix, and Atlanta, there is a gradual, inverse relationship between distance from the CBD and income. In old cities there is a positive correlation between income and public transportation, but in new cities the opposite is observed. Finally, the paper covers the decentralization of employment in new cities versus old cities. 55 % of employment within 25 miles from the CBD is more than 5 miles from the CBD for old cities, but in new cities this percentage is far greater at 81 %. In these newer cities individuals both work and live outside of the central city and do not commute to the CBD each day. In these cases, where employment is decentralized, rich people tend to live further away because the cost of commuting is less.

The last area the authors touch on is the history of public transportation and the consequent centralization of poverty. U.S. cities like Boston and New York followed very similar paths in the nineteenth century in that the rich in both cities were concentrated in the immediate vicinity of city centers until the arrival of omnibuses and horse-drawn carriages. As these modes of transportation evolved and spread, the rich were able to relocate to areas that were previously not feasible to live in due to proximity and commute times. The flight of the rich from the city centers of Boston and New York to the city limits and suburbs caused a counter reaction of the poor moving from the outskirts of town to the center. Unlike these

two U.S. cities and London, Paris was able to maintain its centrally-located rich population thanks to efforts that public housing outside the city serviced by subsidized public transportation and the development of amenities to keep the rich from moving.

Modes of transportation play a much larger role in the distribution of socioeconomic segments than the overall housing market does within metropolitan areas. Factors like racial congregation, tendencies of the poor to centralize, and availability of less expensive apartment housing are merely exacerbations of the main influence that public transportation has on the urbanization of poverty. Cities form in order to maximize benefits from economies of scale and agglomerations and also to minimize costs. Naturally, transportation is structured in a way to maximize and minimize these factors in the most optimal way possible. The distribution of rich and poor citizens is largely a byproduct of the resultant transportation infrastructure.

The research relies heavily on statistical regression analysis and makes some large assumptions, especially regarding distances and proximities (for example, the thresholds used to define each section in relation to the CBD of a city are 0–3 miles, 3–10 miles, etc.). Not all cities are the same and some of their data may be jaded due to these generalized distances that likely stray from the actual layout of a city.

Since the composition of the paper a lot has changed in the cities of Los Angeles and Atlanta (described as "new cities" in the paper) in regards to their public transportation. Los Angeles, in particular, is in the middle of a massive rail transit project that will likely reshape the distribution of the poor and rich populations as areas previously only accessible by car become reachable by train.

This paper relates to Urban Economics (O'Sullivan 2012) in its recognition of the automobile as a barrier to entry for the urban poor in regards to suburban employment. Chapter 10 of O'Sullivan explains that the centralization of the poor in city-centers is due largely to their lack of automobiles, which makes the reverse commute to suburban jobs very costly. Urban Economics cites that the government should facilitate and subsidize the acquisition of an automobile for the urban poor to entice them to pursue suburban jobs (O'Regan and Quigley 1998).

11.1 Multiple Choice Questions

1. According to Glaeser et al. (2008), under which circumstance will the poor live in the closest area to city center?

a) **The elasticity of demand for land with respect to income is greater than the elasticity of the value of time with respect to income for the poor**
b) The elasticity of demand for land with respect to income is smaller than the elasticity of the value of time with respect to income for the poor
c) It takes more time to commute to the city center for the poor
d) The rich is willing to pay more on land rather than on transportation when their income increases compared to the poor

Explanation The income elasticity of demand for land (i.e., the rate of change in the land spending divided by the rate of change in wages) represents how the change in income affects the money spent on the land for an individual. So when the elasticity of demand for land with respect to income is greater than the elasticity of the value of time with respect to income, the poor will pay more on the land when income rises. Therefore, they will live in the city center where price of land is relatively high.

2. According to Glaeser et al. (2008) in which of the following cities does the urbanization of poverty result from subway transit?

a) Los Angeles
b) Chicago
c) **Boston**
d) Miami

Explanation Boston is one of the old cities that have the subway as a means of public transportation, while the other three are all new cities without subway.

3. According to Glaeser et al. (2008) which of the following can explain why Paris has not yet become a poverty-centralized city?

a) Public housing outside the city serviced by subsidized public transportation
b) The development of amenities for the rich in city centers
c) Paris has very low poor rate
d) **Both (a) and (b)**

Explanation Unlike these two U.S. cities and London, Paris was able to maintain its centrally-located rich population thanks to efforts that public housing outside the city serviced by subsidized public transportation and the development of amenities to keep the rich from moving.

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Homeless in California

12

Joint Work with Veronika Heimerl

Anyone who lives in a metropolitan area is very likely to encounter homelessness every day, it constitutes a part of city life often considered normal. But have you ever wondered what drives people into homelessness? What could be the cause or reason for someone to live on the streets rather than in a home?

These questions are the starting point of the paper "Homeless in America, Homeless in California" by John M. Quigley, Steven Raphael and Eugene Smolensky published in 2001 in "The Review of Economics and Statistics". The authors observed a crucial increase in homelessness throughout the 1980s in the United States and were not completely satisfied with the explanations that had been published by the early 2000s, most of which focused on "societal factors", as the authors call them. These factors are widely believed to be causal for homelessness and are primarily comprised of changes in the handling of the mentally ill (a deinstitutionalization, during which many mentally ill were released from hospitals), as well as drug and alcohol addiction and usage.

The authors claim that in all previous work the effects of pivotal "monetary" factors had been downplayed, namely those of housing prices and income inequality. Thus the article tests "the alternate hypothesis that variations in homelessness arise from changed circumstances in the housing market and in the income distribution" (Quigley et al. 2001, p. 37) rather than from changes in society.

This hypothesis is based on theory models that emphasize the rational choice among the extremely poor. According to these models at the lower end of the income distribution only low-quality housing can be consumed and individuals have to make a choice between minimum quality housing and homelessness. If income inequality increases, so does the demand for low-quality housing, thus bidding up the prices for it. If the market rents are higher, this implies a "higher cutoff-income level, below which homelessness is preferred to conventional housing" (Quigley et al. 2001, p. 40). Consequently, this theory views homelessness as the result of rational decision-making under extreme income constraints, where a choice has to be made between low-quality housing, which consumes a big share of someone's income and homelessness with no housing cost and the possibility to

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spend the saved income on other goods. Hence a person will only be homeless if the market rent for housing exceeds their bid price. Another implied result of this analysis is that an increase in income inequality will lead to an increase in the incident of homelessness.

The biggest challenge that the authors faced in testing these hypotheses was undoubtedly the poor data availability, mostly due to problems in measuring the prevalence of homelessness.

Quigley, Raphael and Smolensky used four different data sets, two on a national and two on a state level from California. All four of them were believed to systematically under- or overestimate the prevalence of homelessness due to the methods used and thus to lead to different results (the generally accepted numbers lie between 0.1 and 0.3 % homeless people of the whole population). The data sets used were as follows:

1. *S-Night Enumeration*: This enumeration was part of the 1990 Census and aimed at counting all homeless people in all urban areas in the US in one single night. It is believed to underestimate homelessness, since the list of places where counting took place was predetermined—thus probably incomplete—and the reliability of the enumerators can be questioned.
2. *Burt Survey*: In all urban areas the available beds in shelters for the homeless were counted. The biggest critique concerning this measure is that it mirrors a policy response rather than the phenomenon itself. Moreover it necessarily underestimates homelessness simply because not every homeless person stays in a shelter. However the advantage is that the data is very carefully selected.
3. *Continuum-of-Care Homeless Counts for California*: This measure is based on the HUD's information provided by counties seeking funding to subsidize housing for homeless people. These counties must submit an estimate of their homeless population in order to be eligible. This has led to at least 12 different methods of estimating used, which necessarily results in a noisy dataset. The number suggested by this method is 1.1 % of the state population, which is believed to be an overestimation.
4. *California Homeless Assistance Program*: This data looked at homeless families with children eligible for financial aid. However, the program regulations changed several times (e.g., in 1996 families were only eligible once in a lifetime), which blurs the data.

To test the correlation and causality between the incident of homelessness and housing prices or income distribution the authors run different regressions. The four different measures of homelessness serve as the dependent variables. The explanatory variables include measures of the rental vacancy rate, the median rent, the household or per capita income, the share of poor residents (income less than $15,000), the unemployment rate, and the deinstitutionalization (change in state mental patients and prisoners). Furthermore, measures of January temperature are included and controlled for—suggesting that homelessness is a less attractive option in colder regions—as well as income from SSI (disability income).

Results using the S-Night Data are similar to the expectations. Rental vacancy has a negative effect on homelessness, while the median rent has a positive effect. Moreover, poverty and income inequality, as well as the January temperature, are positively correlated with homelessness.

The Burt data suggests similar results. In addition, the data suggests that median household income is positively correlated with homelessness.

When using the Continuum-of-Care Data the only variable that is significant is the January temperature. Consequently, this dataset does not support the authors' hypothesis that all housing market and income variables are not significant.

The results using the California Homeless Assistance Program measure provide the strongest evidence in favor of the hypothesis and are believed to be the most reliable due to the ability to control for inter-county heterogeneity within a state. Vacancy rates and per capita income have a significant negative effect, while rents have a significant positive effect. January temperature is positively correlated to homelessness in all the datasets.

This study looks at homelessness from different data expressions, and uses different explanatory variables than in the past to make better assumptions about homelessness as a whole. However, there are weaknesses present in the study. One weakness results from the authors emphasizing vacancy rates and rents to describe homelessness without factoring in income inequality even though they found income inequality to be causal. It may be safe to assume that, in order to decrease homelessness, income inequality should be decreased. However, this point is not stressed. Moreover, measuring the prevalence of homelessness is tough, as indicators are often studies of policy indicators, areas where homelessness was over accounted for, or state-based studies. The four data sets either underestimate or overestimate homelessness, which makes it difficult to study causal relationships.

A suggestion for future research would be to integrate the knowledge and hypothesis about "societal factors" like alcohol and drug abuse, and deinstitutionalization of the mentally ill with the new findings of this study. To completely rule out these factors would not be an accurate way of studying the issue, as many homeless people do struggle with alcohol or drug abuse and mental illness. Alcohol may not be the main driving force that causes homelessness, but there might still be a relationship between these factors and homelessness.

The representation of the topic of homelessness in O'Sullivan (2012) reflects the current state of research and poor data availability. While his analysis on homelessness is brief, he claims the same reasons for the incident as Quigley, et al. and emphasizes the influence of economic factors such as housing prices.

Homelessness in the US is a problem that leaves many people in a tough position. There was a huge surge in homelessness in the 1980s, a surge that left researchers to wonder what was causing people to live on the streets. As more data became available to researchers, typical conventional thoughts about homelessness shifted from societal factors to housing prices, income inequality, and rational choices.

12.1 Multiple Choice Questions

1. According to the theory model used by Quigley et al. (2001), increasing income inequality leads to:

a) **an increase in homelessness**.
b) a decrease in homelessness.
c) this can only be answered in combination with other factors.
d) income inequality and homelessness are not correlated.

Explanation According to the theory model the authors use, the demand for housing of households whose incomes have declined will decrease and they will enter the lower-quality housing market. Thus the demand for middle-quality housing decreases and the demand for low-quality housing increases, which will bid up the prices for low-quality housing. This means that the income level, in which individuals prefer homelessness over housing is higher than before.

2. Which of the following variables is never used as an explanatory variable by Quigley et al. (2001) to explain the incidence of homelessness?

a) January temperature
b) Change in state mental patients
c) **Alcohol usage**
d) Median household income
e) Median rent

Explanation The authors try to prove the effect of median rent and income inequality (measured by median household income) on homelessness. They control for January temperature, because they believe it to have a relevant influence. They claim that the reasons most often stated to explain homelessness are the deinstitutionalization of the mentally ill and alcohol (or drug) usage, which they call societal factors. However, only the deinstitutionalization—measured by the change in state mental patients—is controlled for and included in the model. Alcohol usage is not included and controlled for, probably because it is very hard to measure and find data about it.

3. What would be good means to decrease homelessness according to Quigley et al. (2001)?

a) **increase housing vacancy**
b) decrease January temperature
c) deinstitutionalize the mentally ill
d) decrease the unemployment rate

e) **decrease market rents**

Explanation The quantitative analysis leads to the conclusion that the most effective way to decrease homelessness is to change housing prices and vacancy rates. According to the authors, a big decrease in homelessness can be achieved by relatively small decreases in market rents and increases in the housing vacancy. Optimal would be achieved by a combination of both these policies.

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Part IV

The Effect of Regulation on Housing and Land Prices

Land Use Regulation

13

Joint Work with Jared Kaufman, Sarah Hovde and Sonia Tan

Land use regulation and zoning laws are all around us. From neighborhood covenants to local Madison (Wisconsin) law forbidding buildings to be taller than the Capitol—these types of restrictions show their effect on both current homebuyers and the general public every day. Keith Ihlanfeldt's paper, "The Effect of Land Use Regulation on Housing and Land Prices," was published in 2007 in the *Journal of Urban Economics* to investigate the effects of land use restrictions on housing and vacant land prices, as well as on house and lot sizes. Literature on this topic previously existed, but Ihlanfeldt felt it had many shortcomings and uncertainties, and wanted to further analyze the topic with a new and improved model. His main goals of the paper were to find out whether increased land use regulation restrictions did in fact have a monetary effect (and if so, in what ways) on developed houses and vacant land.

The data acquired and used in Ihlanfeldt's modeling included sale transactions in Florida that occurred between 2000 and 2002 in 112 jurisdictions (located in 25 counties). The transactions analyzed included 68,000 single-family homes and 75,000 parcels of vacant land. Supplementary data came from county tax rolls, the 2000 census, parcel maps, the Florida Department of Financial Services (millage rates and per capita public service expenditures), and a survey that was sent to the chief planner in each jurisdiction. Ihlanfeldt identified 13 different land use restrictions (most common were: development impact fees, annual limits on building permits, and the prohibition of zero lot line housing) and summed the total number present in each jurisdiction to create a measure of restrictiveness (defined as 'R' throughout the paper). Particular weightings were placed on each restriction pending the magnitude of their influence on prices per jurisdiction. On average, jurisdictions used about 3.6 techniques for restrictiveness, and 30.4 % of jurisdictions used two or fewer techniques.

Ihlanfeldt (2007) began his model with an estimated *Single Family Home* price equation. This equation uses *Price* as the dependent variable, with a large set of independent variables including: R (the land use regulation restrictiveness measure), S (structural characteristics*), N (neighborhood characteristics**),

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J (jurisdictional controls***), *Y* (sale year dummy variables), *M* (county dummy variables), *dCBD* (distance between property and the Central Business District), and *dCOAST* (distance between property and the coastal country).[1] These independent variables are multiplied and summed to create the sales price for a Single Family Home. Through the model, we can see that an increase in R is positively correlated with an increase in the price of a Single Family Home. This proves the fact that an increase in the regulatory restrictiveness of a county leads to higher single-family home sales prices.

The paper continued to find that while more restrictions increase house prices, the magnitude of R's effect is smaller in counties that contain a greater number of cities. This is due to the fact that there is more elasticity of demand in larger counties. In a city located within a county with the average number of cities (seven), a one-unit increase in restrictions increases the home price by 7.7 %. One additional restriction reduces vacant land prices by about 14 %, which represents a $5,200 reduction for an average single-family lot. Each restriction also increases the average house size by about 61 square feet (3 %) and increases the average lot size by 0.02 acres (5.7 %). In conclusion, when using his model in which land use restrictions are treated as exogenous, Ihlanfeldt finds that restrictions increase the price, square footage, and lot size of homes while in turn reducing the price of vacant land.

Aside from the arithmetic modeling used to prove that increased land use regulation restrictiveness is positively correlated with Single Family Home price and house/lot size, Ihlanfeldt's findings can also be explained intuitively. With increased regulation, property developers' costs increase (due to the requirement to abide by the new, usually difficult laws). The developers, wishing to offset their increased expenses to the future homebuyers, will increase the house sales price. The increased house and lot size is a means to hide the increased house price behind the apparently nicer (larger) house. On the other hand, land prices decrease because the vacant land now has less potential for development (the developers can no longer do whatever they wish) and the development cost is still high. Developers will chooses not to build in these regulated areas, therefore driving down land prices.

The paper contains several methodological shortcomings, including the arbitrary exclusion of data from 42 of Florida's 67 counties and the overall emphasis on Floridian real estate (which may not be representative of the entire country). Building on Ihlanfeldt's study, future research could delve into the costs and benefits of specific regulations or analyze the factors that explain variation in individual jurisdiction's degree of restrictiveness.

The ideas presented in Ihlanfeldt's paper expand the concept of residential development regulation explored in Chap. 9 of O'Sullivan (2012) by providing a more detailed analysis of land use regulatory restrictiveness on house and vacant

[1] * S (structural characteristics) measures log of square feet in living area, log of lot size in acres, & age, ** N (neighborhood characteristics) measures median income, % black, % Hispanic, and % renter of census tract in 2000, and *** J (jurisdictional controls) measures % change in population 1990–2000, form of government, school crowding, and per capita public service expenditures.

land prices, as well as house sizes. As mentioned in both Ihlanfeldt (2007) and O'Sullivan (2012), land use regulations decrease the price elasticity of supply of housing and generate higher housing prices. O'Sullivan uses the Wharton Residential Land Use Index (WRLUI), which reflects the stringency of housing regulations (average stringency indexed as 0; above-average stringency indexed as more than 0), whereas Ihlanfeldt (2007) uses the land use regulation restrictiveness index which measures the number of land use management techniques that have been adopted by the jurisdiction. Furthermore, unlike the endogenous land use regulation restrictiveness index, WRLUI is exogenous to housing price as it is directly correlated with household wealth. According to Ihlanfeldt (2007), the different use of the index in studies that have investigated the effects of land use regulation on housing prices is just one example among many other problems that have led to the inconsistency in results of existing studies.

As a conclusion, Ihlanfeldt suggests that land use regulation has important effects on the prices of housing and vacant land, as well as house sizes. The price of housing increases as more land use regulations are adopted. This is because an increase in land use regulation restrictiveness increases the developers' costs, causing developers to transfer the additional costs to homebuyers. This is done by developers building and selling luxurious, large and expensive homes. This effect however, has a smaller impact on counties of larger sizes due to more elasticity in demand. Homebuyers in larger counties have more market choices and are more sensitive to price change. On the other hand, an increase in land use regulation restrictiveness decreases vacant land prices. The greater regulation restrictiveness increases developers' costs and decreases land potential, hence decreasing the value of the vacant land. The explanation of the inverse relationship between restrictiveness and land value by Ihlanfeldt (2007) is that regulations tend to increase costs by more than increase in house price. The increase in land use regulation restrictiveness will also further increase house prices and house sizes, as developers believe that their higher regulatory costs can more easily be shifted forward to the homebuyer if the house is large in size.

13.1 Multiple Choice Questions

1. According to Ihlanfeldt (2007), what were the findings about the effects of land use restrictions on housing prices?

a) **Increased land use regulation restrictiveness increases housing prices**
b) Decreased land use regulation restrictiveness increases housing prices
c) The level of land use regulation restrictiveness has no impact on housing prices
d) Land use restrictions are illegal.

Explanation The correct answer is (a): Increased land use regulation restrictiveness increases housing prices. We can see through Ihlanfeldt's model that an

increase in 'R' (the regulation restrictiveness index—also one of the independent variables in the Single Family Home Pricing equation) is positively correlated with an increase in housing prices (the dependent variable of the equation). Intuitively, greater regulations increase the developer's costs, who then wish to transfer the additional costs to homebuyers. The regulations may also reduce housing supply and increase demand through the amenity effect (preference of smaller more exclusive city).

2. According to Ihlanfeldt (2007), what were the findings about the effects of land use restrictions on vacant land prices?

a) Increased restrictiveness increases vacant land prices.
b) **Increased restrictiveness decreases vacant land prices.**
c) Land use restrictions eliminate all value of vacant land.
d) The level of restrictiveness has no impact on vacant land prices

Explanation The correct answer is (b): Increased restrictiveness decreases vacant land prices. Greater regulatory restrictiveness decreases land potential (seeing as developers can no longer build whatever they choose), therefore decreasing the value of the vacant land. In addition, regulation tends to increase costs (construction costs) more than the increase in housing prices. Seeing as the vacant land is no longer as attractive for the developers, vacant land prices fall.

3. According to Ihlandfeldt (2007), what were the findings about the effects of land use restrictions on house and lot sizes?

a) Land use restrictiveness has no impact on house and lot size.
b) The greater the land use restrictiveness, the smaller the house and lot size.
c) **The greater the land use restrictiveness, the larger the house and lot size.**
d) The larger the counties, the larger the house and lot size.

Explanation The correct answer is (c): The greater the land use restrictiveness, the larger the house and lot size. The reason for this is that the developer attempts to shift his/her extra costs to the homebuyer. By constructing these huge expensive homes on large lots they are able to sell higher priced houses. The higher selling prices offset the higher development costs.

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Regulation and Housing Prices in Manhattan

14

Joint Work with Erika Suyeon Lee, Andrew Laboz, and Tucker Iverson

Over the last few decades, Manhattan has been a highly desirable place to live. It offers residents higher wages, unparalleled amenities, and the benefits of agglomeration. However, throughout the 1990s, housing prices in Manhattan soared to the point where prices were more than twice their supply costs. Historically, growth in the housing supply used to keep prices down, but this has not been the case in recent decades. For example, in 1960 alone, 21,000 new units were permitted in Manhattan whereas only 21,000 new units were permitted throughout the entire 1990s. Furthermore, since 1980, the housing stock in Manhattan has grown by less than 10 %. In this paper, Glaeser et al. (2005) argue that the limited supply of housing in Manhattan is the consequence of an increasingly restrictive regulatory environment and strict land-use restrictions.

The paper is split into four sections. The first section discusses the gap between housing prices and construction costs in Manhattan. This section includes a neighborhood breakdown that shows housing prices across the various neighborhoods of Manhattan. The second section provides other evidence on supply restrictions in the Manhattan market. The third section contains an analysis of 21 metropolitan areas with information from the *American Housing Survey*. In this section, the authors look to examine their theory across various housing markets within the United States. The fourth and final section describes the authors' welfare analysis, which assesses what positive benefits, if any, arise from land-use restrictions and government regulation in the Manhattan market.

The information regarding construction in Manhattan comes from the 1977 *Economic Census, County Business Patterns,* and the *New York City Housing and Vacancy Survey (NYCHVS)*. However, the primary sources for construction costs were the R.S. Means Company, Marshall & Swift, and the NYU Center for Real Estate and Urban Policy. Information about housing prices in the various Manhattan neighborhoods came from the First American Real Estate Corporation and condominium sales records from the *American Housing Survey*.

Since housing market regulation has become extremely difficult to measure, the authors use an alternative approach to measure the impact of regulation on housing

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prices. To do so, they observe the difference between regulated and unregulated markets by measuring the gap between prices and marginal costs. Their theory states that, in unregulated markets, buildings will rise to the point where the marginal cost of adding an additional floor equals average costs (market price). However, if a market is regulated, prices and average costs will be above marginal costs, assuming an increasing marginal cost function. The authors refer to this difference between housing prices and marginal costs as the "regulatory tax" in Manhattan.

The authors found a large gap between the market price of condominiums and the marginal cost of producing another floor in such units. In 2004, average condo prices exceeded $600 per feet. However, data on physical construction costs showed the upper bound for a luxury-type condo unit is less than $300 per feet. This presented a strong arbitrage opportunity for developers, yet new supply remained low during these years. This lack of supply can only be attributed to land use restrictions and heavy government regulation that severely challenged new development.

The authors based their results on a large sample of 23,060 condominiums spread throughout Manhattan. They noticed significant variation in prices due to the physical infrastructure of apartments as well as the differences in neighborhood amenities. One drawback of their sample was that the authors were not able to measure all aspects of the physical apartment quality. However, the variation in prices due to neighborhood amenities did not affect their results because these amenities would not create a gap between construction costs and prices. Overall, the authors found prices in Midtown, the Upper East Side, and Upper West Side to be the highest at $494–$515, and neighborhoods like Harlem, Morningside Heights, and the Lower East Side to have much lower prices, showing that the hot housing markets in the city were extremely localized at the time.

In order to understand the gap between prices and production costs in New York, the authors analyze construction cost data that specifically pertains to multi-unit buildings, as opposed to single-family home data that is used to analyze most other US cities. The results that emerged justified the gap between prices and production cost. According to the R.S. Means Company and Marshall & Swift, the reason for such high construction costs for high-rise residential buildings in Manhattan is because of high labor costs. The average installation costs (includes labor) in Manhattan are 1.633 times the national average. However, this construction cost data included somewhat fixed costs, whereas the authors' goal is to assess the gap between price and marginal cost.

The authors also provide other evidence for the regulatory causes of New York's high prices, all of which involve supply restrictions in the Manhattan market. The authors attribute the high prices to the Battle of Carnegie Hill and other case studies, to the commercial real estate in Manhattan, and to permitting (the authors provide background to understand what the Battle of Carnegie Hill was, but to be brief the community opposition that occurred resulted in the low densities of newly constructed residential buildings). The authors also anayzed the price-to-construction ration in non residential markets in order to understand constraints in the

commercial real estate market. This P/CC ratio, despite a surge in development, is below the P/CC ratio for the condominium market. This evidence aligns with the author's thesis that the supply in the market still responds to demand with a lag. Permitting involves the zoning and building height restrictions in Manhattan, which has also contributed to the lag of housing supply in response to demand.

Housing requires both land and structures. The authors used the *AHS (American housing survey)* data from 21 metropolitan areas to estimate the standard hedonic price of land that expresses the value of a land as a function of its various characteristics, and found that there is an overwhelming quantity of cheap land in America; in 16 of the 21 metropolitan areas, the estimated price is below $1 per square foot. This illustrates the value of land is quite small, both in absolute terms and relative to the physical costs of building. Therefore, the prices and availability of land alone do not explain high housing prices.

The authors have come to believe that changes in land use regulations may be the most important transformation in the real estate market in the US. Their primary hypothesis is that housing prices have gone up so much because land-use regulations such as a "zoning tax" push prices far above construction costs. To test the hypothesis, the authors looked at whether regulatory tax as a percentage of average house values is higher in metropolitan areas. It is notable that the tax is zero or negligible in over half the markets but is much higher in nine market areas (Boston, LA, New York, Norfolk-Newport News, Oakland, Salt Lake city, San Francisco, San Jose, and Washington, DC), exceeding 10 % of average home price. In fact, the tax constitutes a large part of the total property value, meaning regulations have a tremendous effect on prices.

The Wharton Land Use Control Survey examined the regulatory environment such as the time it takes to get a building permit to see if it correlates with high housing costs. The simple correlation is 0.74 between the regulatory tax and average time delay from application to permit issuance, which is very high. They also ran a regression of regulatory tax on the average time of delay between application and approval, and also yielded a significant result that a unit-increase in the categorical permit issuance lag (the value of 1 indicating the permit issuance lag less than 3 months; 2 indicating 3–6 months; 3 indicating 7–12 months; 4 indicating 1–2 years; and 5 indicating time frame more than 2 years) is associated with 15 % point increase in the amount of regulatory tax. It can be inferred that an inelasticity of house supply is a result of a touch regulatory environment that deters new construction.

In order to examine if regulations might be economically justified, the authors first examined the value of views and sunlight lost when new buildings are built. Then they examined the costs of extra congestion in traffic and public transportation. Finally, they examined fiscal externalities from new construction through government expenditure to see if new residents require more local government expenditure than they pay in taxes. By their calculation, all these costs taken together cannot explain such a high regulatory burden on development. In other words, the tax is much higher than the cost to existing residents of having new people in the neighborhood.

Rising housing prices over the past 10 years can always be explained by another omitted shifter of demand. However, evidence on construction suggests that demand alone cannot provide the answer. If the rise in housing prices during the 1990s was the result of demand pushing along a stable supply curve, then surely we would see an explosion in new construction as we did in the past given that there is no technological barrier to entry. Using a variety of different sources, the authors argue that the inelasticity of housing supply is the result of an increasingly tough regulatory environment that deters new construction. Without regulation, the price of housing in Manhattan should stay close to the marginal cost of supply.

O'Sullivan (2012) also discusses the effects of housing regulations on housing prices. According to O'Sullivan (2012), housing regulations decrease the price elasticity of supply of housing and generate higher housing prices. This statement goes along with the findings of Glaeser et al. (2005), who determined that housing regulations and land-use restrictions cause a lag in the supply of housing relative to demand that ultimately pushes housing prices upwards. O'Sullivan also presents the Wharton Residential Land Use Regulatory Index, which shows the housing premium generated by residential building regulations for various metropolitan areas. This is similar to the authors' model for measuring housing regulation, which used the marginal cost of building another housing unit (apartment) to determine the effects of regulation on housing prices, relative to construction costs. According to Glaeser et al. (2005), the housing price premium resulting from regulations highly depends on the restrictiveness of a city's regulations and land-use restrictions.

14.1 Multiple Choice Questions

1. According to Glaeser et al. (2005), what is the main reason why housing prices in Manhattan soared to such astronomical levels?

a) Rising incomes of current and new residents
b) Low interest rates
c) **Lack of supply due to land use restrictions**
d) New industries relocating to Manhattan

Explanation The correct answer to this question is (c). Glaeser, Gyourko, and Saks argue that it is uncommon for a city's housing prices to be more than twice their supply costs (that is, the cost of building a new apartment), as was the case in Manhattan. Although rising incomes and low interest rates do increase demand for housing, thus raising prices, they are not the main reasons sighted in the paper. Rather, the authors argue that an increase in demand for housing need not result in large price increases because a resulting increase in the supply of housing will offset any new demand. Similarly, the authors made no mention of the existence of new industries in Manhattan, and even if they did, this would be another demand-side factor that would be offset by an increasing supply in housing. Therefore, the

correct answer is (c) because the lack of supply in the Manhattan housing market can only be attributed to land use restrictions and government regulations on new development. The extent of this regulation is measured as the difference between the market price of a housing unit and the marginal cost of that same unit, absent any government barriers.

2. According to Glaeser et al. (2005), all were causes of New York's high prices from supply constraint except:

a) **Relatively high P/CC ratio in office and other non-residential real estate compared to residential real estate**
b) Permitting and zoning restrictions
c) Commercial real estate in Manhattan
d) Community opposition, such as the Battle of Carnegie Hill
e) All of the above were findings

Explanation (b), (c), and (d) were all causes of the high prices in New York. Although the non-residential real estate's P/CC ratio has been increasing over time, it is still lower compared to residential real estate. Remember, this indicates that even non-residential real estate development (supply) is lagging behind the market demand, which results in a higher price.

3. According to Glaeser et al. (2005), which of the followings justifies high regulations in Manhattan?

a) High density of population that increases congestion
b) Increasing government spending
c) The value of view destroyed by new construction
d) **None of above**

Explanation

a) Authors examined the costs of extra congestion of new public services such as schools, public transportation, etc. They argue that net congestion cost rather be positive. Because of high densities or congestion in traffic, only 11 % of Manhattan residents drive alone or carpool to the work; a large portion of residents take public transportation or walk, thus reducing net congestion rather than increasing it.
b) Author also examined fiscal externalities from new construction through government expenditure if new residents require more local government expenditures than they pay in taxes. If the new residents create a net fiscal drain in New York City, then it is sensible that they are charged; however, people new residents tend to be rich so they rather increase average income of

the city, and as they usually send their children to private schools, so they don't use taxes they paid for using public schools. It is a benefit to government budget.

c) New construction does not eliminate the view of existing residents as tall buildings are spaced far enough from one another in order to not block the views.

d) By their calculation, all these costs taken together cannot justify such a high regulatory burden. In other words, the regulatory tax was much higher than the cost to existing residents of having new people in the neighborhood.

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The Cause of Urban Regulation

15

Joint Work with Elizabeth Orbon, Ryan Lewis, Kevin Phelan

Land use regulations can be seen all across the United States, but what causes more or less regulation and how can we measure it? Joseph Gyourko, Albert Saiz, and Anita Summers provided a current ranking of communities based on the regulation in the housing market in their survey from the *Urban Studies Journal Foundation* titled "A New Measure of the Local Regulatory Environment for Housing Markets: The Wharton Residential Land Use Regulatory Index" (2008). The goal of the authors is to explain this measure of regulation and the underlying data in order to provide a basis for future analysis of housing markets with regard to regulation.

First, Gyourko et al. (2008) acquired data through a survey sent out to 6,896 municipalities across the United States. The authors looked at 11 sub-indexes to create the Wharton Residential Land Use Regulatory Index (WRLURI) to measure the stringency of the local regulatory environment from each community. Nine of these sub-indexes pertain to the local characteristics of the environment, while the final two pertain to state and court behavior. A low value reflects less restrictive approaches to regulation, and then a factor analysis creates the aggregate index, which is standardized so the sample mean is zero and the standard deviation equals one.

Next, the authors found that overall the more pressure groups have a say on zoning and growth control, the more likely the market is a highly regulated market. In their report you can see the correlation of the LPPI, which is Local Political Pressure Index, and the WRLURI score. The higher the correlation, the higher the 'effect' of a single digit on the local regulatory environment, so the Approval Delay Index, or ADI, which has the highest correlation can be extrapolated to be: the longer you have to wait to get things approved or the more people who have the chance to say 'no', the higher the chance your project gets a no.

Furthermore, there is a strong correlation between levels of regulation and community wealth; however, this was not found to be causation only correlation. According to Gyourko, Saiz, and Summers "Land scarcity is not the primary motivation for strict land use controls, [meaning strict regulations], and there is a strong correlation with community wealth proxies [meaning strict regulations and community wealth is correlated]" (Gyourko et al. 2008, p. 712). Community wealth is a

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combination of the communities' totals of college degrees, high incomes, and high home prices. The data is so strongly suggestive that the authors flat out state that the higher the community wealth of an area, the higher the regulation restrictiveness used in the area. This leads to the belief that the land regulation isn't necessarily because the community is 'running out of land', but that the community doesn't want the land to be misused, and therefore highly controls what can and cannot be built.

Gyourko et al. (2008) go on to show that communities in the Northeast of the USA and the West Coast of the USA are primarily high regulation areas, whereas the Midwest and South tend to be lower regulation areas. The authors propose this is because of the larger amount of non-super rich type of communities in these locations. It is suggested that areas that are already densely populated are therefore attempting 'growth control' in order to keep their cities from expanding too much, or expanding in a non-communally conducive manner. Therefore, cities such as Boston, New York, San Francisco will have a higher WRLURI score.

All the different tables of data combines to tell how higher regulatory communities actually have less of a population density than lower regulatory communities. These densities can be explained by lot size control, or limits on height of large high-rise apartments and general strict laws about public utilities or amount of water per area will all lead to less population in a specific area.

Gyourko, Saiz, and Summers had several conclusions from their 2008 paper; first, coastal cities along with Hawaii were found to be more highly regulated than southern and Midwestern cities (Gyourko et al. 2008, p. 713). Furthermore, the more local pressure groups interested in regulation and the more approvals necessary then the higher the level of regulation. This is to say, the more approvals necessary for a project, the more potential "no's", therefore the greater the regulation level. This was evident in the strong positive correlation of the LPPI and ADI with high regulation. The authors found there to be a strong positive correlation between community wealth and high regulatory environments, however there was no causation found. Also, there was variability in level of regulation across the metropolitan areas, but less within a community. In addition, more regulatory communities have less population density. Finally, the authors concluded highly regulated markets were highly regulated in multiple areas or sub-indexes and the same goes for lightly regulated markets. This paper shows that highly regulated markets are highly regulated in multiple areas, is most likely located on the coast, and has multiple local pressure groups.

On the other hand, some weaknesses of the paper include missing data, data that is not relevant to the survey, and the lack of certain aspects of a city that would have an effect on the regulatory environment. First, not all of the municipalities that received the survey answered the survey or only answered part of the survey. The authors plugged in the most likely number when this occurred. Also, the definition of a Metropolitan area is based on 1999 boundaries so the data is not all that relevant. Next, the data doesn't take into account political beliefs of cities, nor of areas for the study. Being republican or democratic state would seem to have an important effect, and it's not even touched upon. The thought of 'more regulation' and 'less regulation' are the cornerstones of the two political parties. They also

never took landmarks into account. The Northeast of America was the first settled and therefore has almost a hundred more years of revolutionary historic facts/sights that are protected by the US government, making renovations and regulations regarding them more important to that community. This research also doesn't take into effect migration of immigrants to America, whether legally or illegally, and how their living situations may throw off some of the major cities statistics, specifically related to growth.

Obviously with a survey there are new topics to be explored and areas that require further research. Our suggestion for future research is to find a way to breakdown the aspects of community wealth to link it to the motivational factors of regulation. Because land scarcity is not the primary motivation for strict land use controls and there is a strong correlation between regulation and community wealth proxies, researchers should find a way to measure the exclusionary desires as a motivation. This is one way to create a stronger connection between these two topics, and furthermore, it will strengthen the results of the survey.

Gyourko et al. (2008) discuss how each of the eleven sub-indexes through zoning, and other requirements impact the level of regulation in a city. Arthur O'Sullivan, in his book *Urban Economics* (O'Sullivan 2012), explains the reasons for zoning that a regulatory body could use. The text only goes into detail about zoning. O'Sullivan believes that zoning is used to fix the inefficiency caused by the externalities of residential and industrial land use and to raise money for public goods through a fiscal surplus (O'Sullivan 2012, pp. 186–189). Minimum lot zoning gives people more space in between their houses and more space for their houses, which results in a higher utility in most neighborhoods. Also, cities zone to fix the inefficiency caused by pollution from industrial firms, so that the pollution does not affect residential land; however, as O'Sullivan explains this is just moving the pollution and not stopping the pollution. Finally, zoning can be used fiscally. Cities often zone to create a fiscal surplus. According to O'Sullivan (2012, p. 187) "that is when a land user's tax bill exceeds the cost of public services provided." The cities often use these excess funds to fund other projects to increase the social utility like roads and schools. Zoning is one of the most popular regulatory exercises; it should be used to increase the welfare of the people by fixing the inefficiencies caused by externalities and raising money for other social utility improvement projects.

15.1 Multiple Choice Questions

1. According to Gyourko et al. (2008) how does community wealth correlate with regulatory environment?

a) **More wealth, more restrictive environment**
b) less, wealth, more restrictive environment
c) more wealth, less restrictive environment
d) less wealth, less restrictive environment

Explanation The answer is (a) because one of the motivations for zoning is to generate a fiscal surplus through taxation. Governments would increase regulation to raise funds on their wealthier residents. Local governments use this money to increase public goods.

2. According to Gyourko et al. (2008) a democratic approach to regulation (voting) leads to what level of regulation?

a) **High regulation**
b) Low regulation
c) No effect on regulation
d) Democracy never works

Explanation The answer is (a) because requiring more votes on regulation issues tends to mean the area requires full votes of the populace on all issues, increasing the chance of zoning/projects/buildings being voted no instead of an informed committee voting on it.

3. According to Gyourko et al. (2008) what population density correlates to a highly regulated area according to this study?

a) High level of population are in highly regulated areas
b) **Low level of populations are in highly regulated areas**
c) Population levels are the same in both highly and lowly regulated areas
d) Regulation leads to no changes in population levels.

Explanation Answer is (b) because of either lot restrictions, or restrictions for height of apartments, or other similar regulations, the population density is lower in highly regulated areas. These highly regulated areas can be seen to almost be using 'exclusionary' tactics in order to control growth and population size in their communities.

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Rent Control

16

Joint Work with Aaron Konop and Mari Lehman

Rent control policies are a system implemented by the government intended to establish rent price ceilings for rental properties. In the past, many studies have been conducted on the consequences of rent control on efficiency and equity. In their 2005 paper, "*The Effect of Rent Control on Commute Times,*" Robert Krol and Shirley Svorny instead explore the impact on household location decisions, as evidenced by long commute times. The main basis for this research is the assumption stated by economic models that predict utility maximizing households will weigh the benefits of moving against the costs. Svorny and Krol theorize that rent controls limit mobility and extend commute times, therefore ruling out otherwise beneficial moves.

The costs associated with moving from a residence in a rent-controlled area include the rent differential between the initial location and a new residence in an unregulated area as well as increased search costs. The benefit is a shorter commute from home to work. Often times there is a quite large rent differential, which rules out many moves that would be otherwise beneficial. This can be compared to staying in the rent-controlled area, which includes the benefits of the cheaper rent and the costs of a longer commute, gasoline, and automobile wear and tear.

Svorny and Krol use these ideas to prove their hypothesis of the relationship between rent control and commute times. From their research, they gathered that rent control does in fact distort housing markets. This results in an inefficient allocation of resources, and consequently a decline in the quality of job matching in the market.

The Urban Institute/Geolytics Neighborhood Change Database provided New Jersey Census Tract data for the years 1980 and 1990, and the New Jersey Apartment Association provided a town-by-town analysis of rent control policies for the year 2000. From their analysis of data from these two sources, Krol and Svorny concluded that the use of rent control discouraged movement of households closer to employment, therefore increasing commute times. In one analysis, they found that the percentage of commuters with a commute of 45 min or more increased by 0.8 % in 1980 (19,402 additional commuters), 1.2 % in 1990

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(33,019 additional commuters), and 1.8 % in 2000 (48,469 additional commuters). When shortening the commute to 25 min or more, the results were amplified with an increase of 2.3 % in 1980 (55,782 additional commuters), 1.5 % in 1990 (41,161 additional commuters), and 2.5 % in 2000 (67,319 additional commuters).

The New Jersey Apartment Association data provided a deeper look into the effects of multiple rent control policies dealing with variations of vacancy decontrol. Vacancy decontrol is defined as the allowance for landlords to raise rents upon unit turnover; that is, when tenants move out, landlords can raise rent for the incoming tenants. The four policies analyzed, from least constraining to most constraining, were permanent vacancy decontrol, limited vacancy decontrol, vacancy decontrol followed by recontrol, and no vacancy decontrol. Krol and Svorny found the latter two to be consistently related to a positive increase in commute times seeing as they allow for the least adjustment in rents.

Using the New Jersey census tract data and regressions, Krol and Svorny found a positive and statistically significant relationship between rent control and commute times for 1980, 1990, and 2000. The regressions also supported the hypothesis that more constraining types of controls have an even greater impact on commute times. Rent controls increase commute times by reducing mobility of households, as the cost of moving is much higher when moving from a rent-controlled area to a non-controlled area. This distorts housing markets and reduces the efficient allocation of resources. Moreover, Krol and Svorny also found that the control variables mainly conformed to expectations. Poorer communities, densely populated areas, wealthier census tracts, and populations with a higher percentage of black residents all experience longer commute times. Conversely, service workers and Hispanic communities generally experience shorter commute times. Job opportunities for service workers are plentiful and generally comparable in terms of wages because they do not require an advanced skill set. Therefore, service workers are better off finding a new job rather than commuting to their current job upon moving, whereas a worker with advanced skills would be willing to commute for higher wages. As for the inverse relationship between Hispanic communities and commute times, Spanish-speaking firms can be held responsible. They locate near Hispanic neighborhoods for the sake of improved job matches.

Why do the Spanish-speaking firms take it upon themselves to do the moving? Because communities with rent control are less mobile. Therefore, they are likely to bear additional costs. These include the opportunity cost of time spent commuting to work, additional fuel needed to commute, automobile wear and tear, highway maintenance, pollution, and congestion externalities. Also, because these communities are less mobile, the quality of job matches is negatively impacted because of the fact that the average service worker will settle for a nearby job if possible.

Although Krol and Svorny did an extensive job in their research, a few weaknesses were present in their study. One is that only data from New Jersey was utilized. It would be interesting to see if the same results are found when analyzing data from another city where rent control is present, such as Los Angeles. Another weakness is that only 40 % of the sample population rents. This leaves

60 % of the population unaccounted for, which could significantly impact the data and results. The study could be improved if a variable for non-renters was added. For example, they could analyze how mortgage rates affect homeowners' commutes. Adding such a variable would increase the quality of a prediction about locational equilibrium. If mortgage subsidies are available, it is important to take them into account just as a consumer would do in deciding whether to rent or buy. Lastly, the two categories "commutes of 25 min or more," and "commutes of 45 min or more," are constraining in that they exclude people that fall outside of them. As for future research, as walkable cities become more prevalent, an intriguing comparison would be how the 2010 census tract data compares to the results of this study.

This study touches on two of the five axioms of urban economics presented in O'Sullivan's *Urban Economics* (2012). Prices adjust to achieve locational equilibrium, but rent control certainly impacts the ability for prices to fully adjust and consequently prevents moves from happening (moves that would happen in an unregulated area). An unexpected equilibrium will emerge in which there may not be strong relationships. For example, someone who lives in point A might commute to point B, and vice versa. Logically, this is not efficient, but rent control does not always allow for logic to be the creator of equilibrium. Second, externalities cause inefficiency. Entire communities endure the costs associated with increased pollution, congestion, highway maintenance, etc. that are a result of longer commutes.

Overall, Krol and Svorny's research on New Jersey census tract data proved a relationship between rent controls and commute times. They were able to conclude that the most constraining provisions were no vacancy decontrol and vacancy decontrol followed by recontrol, which were empirically associated with longer commute times. These rent control provisions greatly limited mobility of households, and resulted in such communities bearing additional costs such as increased automobile maintenance and negative externalities. Economically, this affected the communities through inefficient resource allocation as well as a poor quality of job matching in the workforce. From these conclusions, research faults aside, it can be said that rent controls hinder overall economic growth and hurt society.

16.1 Multiple Choice Questions

1. According to Krol and Svorny (2005), the most constraining rent control ordinances, which are consistently related to a positive increase in commute times, are (*two answers*):

a) **Vacancy decontrol followed by recontrol**
b) Vacancy control
c) Vacancy decontrol
d) **No vacancy decontrol**

Explanation Vacancy decontrol (option c), the least constraining, is when rents are permitted to rise when tenants move out (although there may be restrictions on this). So therefore, no vacancy decontrol (option d) is the most constraining choice because rents never have the ability to near market rents. The other heavily constraining ordinance is vacancy decontrol followed by recontrol (option a), because it allows for rents to increase at turnover, but subjects new tenants to control. Option b, "Vacancy control," does not exist.

2. According to Krol and Svorny (2005), communities with rent control are likely to bear all of the additional costs except:

a) Lost time in commute
b) Automobile wear and tear
c) Highway maintenance
d) **Less professional-service employees**
e) Gasoline

Explanation Many of the additional costs associated with rent control are automobile related due to the fact that rent control increases commute times. Longer commutes lead to more wear on cars, more wear on roads, and more money spent on fuel. Although it may be possible that a community with rent control will experience lower professional-services revenue, Krol and Svorny did not conclude this as a cost in their research. This stems from the idea that people with professional skills living in rent-controlled areas will take on a longer commute in order to garner higher wages associated with a good match. However, unskilled laborers will not commute for a job and will simply accept one of the many service-oriented opportunities within the community.

3. According to Krol and Svorny (2005), an inverse relationship exists between commute times and:

a) Income
b) Percentage of community population that is black
c) Laborers' skills
d) **Percentage of community population that is Spanish-speaking**

Explanation Krol and Svorny found that residents of wealthy census tracts have longer commute times, so there is a direct relationship between income and commute times. A direct relationship also exists with communities that have a higher percentage of blacks due to housing discrimination, which leaves them with limited options. Furthermore, professionals or those with more advanced skill sets have longer commute times as a result of finding a solid job match. They are willing to drive to wherever that job may be to garnish those higher wages, leading to yet

another direct relationship. However, firms in which Spanish is spoken tend to locate near Hispanic neighborhoods, resulting in shorter commute times for communities with a higher percentage of Spanish-speaking residents.

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Part V

Neighborhood Choice

Weather and Migration

17

Joint Work with Bennett Johnson, Ulrik Meibom, and Brian King

Why do people seem to move to nicer weather in higher rates? Within Jordan Rappaport's article, "Moving to Nice Weather", Rappaport attempts to determine what factors influence the decision to move to nicer weather in the United States.

Rappaport introduced his hypothesis with the four major factors he believes have influenced the migration in the United States towards nicer weather. The first factor is the decline of agricultural employment and the decrease in the importance of weather characteristics in agricultural productivity. He also felt that the technology of air conditioning and improved heating efficiency decreased the disutility from extreme temperatures. Third, the rising income per capita has made it financially feasible for more people to move to nicer weather, and that has increased the relative valuation of temperature weather. Finally, the increased numbers of affluent and mobile retirees have boosted the value of temperature weather.

One of the variables used in Rappaport's models is the annual growth rate of population density from 1970 to 2000. He collected this from the US Census Bureau (data from 1890 to 1960, 1947 to 1977, 1980, 1990, and 2000) and the US Bureau for Economic Analysis (data from 1969 to 2000). Furthermore, the model uses the same data sources to use regression on growth rates of population subgroups and house prices. To control for increasing returns to scale some of the regressions include different variables measuring population density and surrounding population. Some of Rappaport's regressions also included geographic controls measuring coastal proximity and topography.

The weather variables are results from data purchased from The Climate Source Inc. (www.climatsource.com). This source is based on weather observations over the years 1961–1990, and constructed from more than 6,000 meteorological stations over the United States. The country's weather values are created as the mean overall of the 4-km^2 grid cells that are within it. In the regressions, weather variables enter with both a linear and quadratic term. "The quadratic terms have had their linear sample mean subtracted prior to squaring. Doing so allows the coefficient on the linear term to measure the marginal effect of an increase in the variable from the sample mean" (see Rappaport 2007, p. 384).

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First, winter weather is based on January daily maximum temperatures, which is the average daily maximum temperature based 930 January days from the period 1961 to 1990. The daily maximum temperatures is used for this model instead of the daily minimum temperatures for the month of January because it is suggested that the daily temperature highs are more important to citizens than the daily low temperatures, since the daily low temperatures usually occur at night.

Next, summer weather is based on July maximum heat index as well as July average daily mean relative humidity. The average relative humidity is based on the mean daily maximum and minimum humidity levels. Also, the inclusion of humidity entered independently in addition to its contribution to heat index is motivated by its strong marginal power to account for population growth's sample variance.

Rappaport developed a statistical model to incorporate the many variables that needed to be considered in his research. He first discussed the steady-state population with a log function. Next, he incorporated population density and growth trends. This data is used avoid skewing the results so that he could find statistically significant factors in the shift to nicer weather, these are known as control variables. Ultimately, the consideration of these important controlled variables, as well as increasing returns to scale and time varying attributes, lead Rappaport to his conclusions that we will be discussing below.

17.1 Population Growth, 1970–2000

Rappaport's findings concluded that population growth is positively correlated with winter temperature and negatively correlated with summer temperature and humidity. The following conclusions will help to show that rising incomes and the use of air conditioning have played a large role in the move to nicer weather in the latter part of the twentieth century. The results of the regression analysis from 1970 to 2000 show a positive coefficient between January temperatures and growth rate. This suggests that expected population growth increases as maximum temperatures in January increase, so in turn warmer winters have led to increased growth. The data also suggests that growth and summer heat and humidity are negatively correlated. The combination of the two results show that people tended to move to locations with warmer winters and cooler/less humid summers.

17.2 Alternative Growth Rates

Any single demographic group does not drive the migration to nice weather locations; instead it is affected by growth's positive partial correlation with winter temperatures, as well as, negative correlations with summer heat index and summer humidity levels. Rappaport's findings conclude that the magnitude of the negative coefficient on linear January temperature is moderately smaller than in the population growth regression, a difference that statistically differs from zero. Also, summer heat and summer humidity are approximately equal across the two

regressions. It is also concluded that both the positive correlation with winter temperature and the negative correlation with summer heat index are the strongest for elderly population growth (those aged 65 and up) compared to the working-age population growth (those aged 25–54). With that being said, it can be observed that the elderly can only account for part of the migration to nice weather locations. The other part of the population that is migrating to warmer weather locations is immigrants, compared to those who are native born. Likewise, it can be concluded that there is not a large difference in migration between college graduates and non-college graduates. Overall, it is seen that the migration to nice weather locations are not dependent on one variable, but instead the movement is based on a combination.

17.3 Population Growth by Decade

From 1890 to 1910 people moved to places with bad weather, while during those four decades agriculture's employment share was declining. This suggests that the shift in the employees in agriculture might not have had an effect on moving to nicer weather. Rise in migration to nicer weather from 1920 and forward despite an increase in manufacturing employment during the 1920–1940 (and stable from 1940 to 1970) suggests that the decline in manufacturing employment happening post-1970 did not have a substantial effect on migration to nicer weather. Furthermore, the rise in migration to nicer weather from 1920 to 1940, despite predating the mass adoption of air conditioning, means that air conditioning did not have an impact on the initial rise in migration to nice weather. The timing of introducing easier and cheaper transportation means that improved transportation might have increased the migration effect later; however, it was not a main component of the initial shift in population to geographical areas with nicer weather.

The first conclusion made by Jordan Rappaport is that during most of the twentieth century there has been migration in the US towards places with nicer weather. The reasons for this are introduction of air conditioning, shift in industrial composition in the US, increased elderly migration and rise in income.

The high growth in places with extreme summer heat and humidity suggests that air conditioning, though it did not start the migration to nicer weather, had a substantial positive effect on migration to places with higher temperatures. The shift in industrial composition in the US does account for a portion of the weather-related moves. Though the move to nice weather has been large for the elderly population in the US, it is, compared to other demographics, only moderate.

The three above explanations do account for the migration towards nicer weather; however, as the migration started in the 1920s, they cannot account for the initial movement. Therefore, Rappaport believes the most significant explanation for the increased migration to nicer weather is the broad-based rise in income. The rise in income in the US means a higher valuation in weather by the consumers, and thus movement towards nicer weather.

There were a couple aspects of the paper that could be improved to avoid limiting the results that were concluded. The first limitation is that the number of US geographic observations is relatively small, so data was only gathered for locations with populations greater than 100,000. The next limitation is that the compensating differential methodology is the difficulty controlling for individual-specific and house-specific characteristics (Gyourko et al. 1999; Combes et al. 2004; Lee 2010). There are an endless amount of variables that could play a role in this migration and limiting them at all could affect the results. Finally, another limitation is the identifying assumption that all locations evaluated were in their long run steady-state. Data tends to suggest that cities are always in a transitional state.

The present set of results suggests several lines of future research. One is the extent to which migration to nice weather has occurred or can be expected to occur in nations and regions other than the United States. A second line of research is the extent to which the U.S. migration to nice weather can be expected to continue. The introduction of air conditioning represents a discrete shock. A third line of research is the extent to which migration to places with high levels of other consumption amenities have occurred.

Rappaport (2007) relates to O'Sullivan's (2012) analysis of a shift of the labor supply curve to the right. As O'Sullivan explains, this shift can occur because of four different factors: improved amenities, declining disamenities, declining residential taxes, and improved residential public services. The intuition is the following. As income and wages rise across a country, the workers increasingly look for the above four factors to determine where to live and work (see also Luque (2013) and Luque (2014)). Better weather in one city compared to another is considered an improved amenity and therefore makes it more attractive for the worker. The introduction of air conditioning increases the attractiveness of cities with warmer weather and thus increases the amenities of that city which in return makes migration to the city rise.

17.4 Multiple Choice Questions

1. According to Rappaport's (2007) first initial research, which of the following (if any) is not one of the reasons that have influenced population shifts over the past century?

a) Decline in agricultural unemployment
b) Invention of air conditioning and heating
c) Rising per capita income
d) Affluent and mobile retirees
e) **All of the above are reasons for population shifts**

Explanation The explanation based on declining agricultural employment is straightforward. Agricultural productivity clearly depends on numerous weather

attributes, such as rainfall and the length of a growing season. The roles of air conditioning and improved heating technology require a bit more explanation.
As a matter of background, the first known air-conditioning units were installed around 1900. Over the subsequent 40 years, AC was slowly adopted by manufacturers and a few service businesses. However, it was not until after World War II that the mass adoption of residential air conditioning began. As late as 1960, only 13 % of U.S. households had any sort of AC and only 2 % had central AC. The final hypothesized way in which the contribution from weather to quality of life and productivity has changed is similar to rising per capita income, except that it applies only to the elderly. Social Security and better retirement planning have increased the wealth of retirees. Medical advances have increased their longevity.

2. According to Rappaport (2007), what one below is not a reason of migration to nicer weather?

a) Introduction to Air conditioning
b) Shift in the industrial composition of U.S. employment
c) Increased elderly migration
d) Broad-based rise in incomes
e) **Decline in agricultural employment**

Explanation Regressions of 1970-to-2000-population growth on weather suggests that each of these explanations played a role, expect for a decline in agricultural employment. The positive partial correlations of population growth with summer heat and humidity establish that air conditioning cannot alone account for the migration. But the high expected growth attributable to weather in places with extreme summer heat and humidity almost certainly would not have occurred in the absence of air conditioning. An extensive set of controls for initial industrial structure accounts for a portion of the weather-related moves.

3. According to Rappaport (2007), which of the following factors were not considered when determining "nice weather"?

a) Cooler summers
b) **Hurricanes**
c) Lower humidity
d) Warmer winter

Explanation Based on Rappaport's empirical evidence, the factors that were taken into account when determining "nice weather" are cooler summers, warmer winters, and lower humidity.

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School Choice

18

Joint Work with Benjamin Lavaque, Nicholas Maupin and Connor Murphy

A motivating question to consider while reading "School Desegregation, School Choice, and Changes in Residential Locational Patterns by Race" by Baum-Snow and Lutz (2011) is "How does desegregation of urban public school districts affect residential location and school choice responses?" The main goal of the paper is to study the unintended consequences of desegregation in large urban public school districts. In addition, the paper will help to identify public and private school attendance following the abolishment of segregation in schools, which is the elimination of racial preferences in school attendance. The study was done between the 1960s and 1990s following the decision of Brown v. Board (1954). We will be looking at 92 schools in the Metropolitan Statistical Area (MSA) in order to better recognize the shifts in the rates of private versus public school attendance.

The building blocks used to construct the relevant datasets used for this empirical analysis were four cross-sections of tract-level data from the decennial Census of Population 1960–1990 assigned to school districts using Geographic Information Systems (GIS) software. The dataset includes information on school enrollment by school type, such as private or public, and additional demographic information by race for those living in central school districts and the surrounding MSA region. The sample is comprised of 48 MSAs in the South Census Region and 44 MSAs in other regions with central school districts identified by Welch and Light (1987) as having experienced a major court-ordered desegregation plan between 1960 and 1990. Central districts are defined by the paper as those school districts that included the central business districts of the largest census defined central city as of 1960 in each MSA throughout the country. The sample includes all 56 central districts of over 50,000 students with a 1968 minority enrollment between 20 and 80 %; the only central district not included was New York City, which did not have a major desegregation order at that time. The remaining 36 districts had an enrollment of over 15,000 people. These districts consisted of a 1968 minority enrollment from 10 to 90 %.

The paper utilized 1970 school district geographies in order to limit the possibility that the boundaries were drawn in response to pressure for desegregation. In order to build census tract, central district, and 1999-definition MSA demographic

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data over time, the paper used census tract and county tabulations from 1960 to 1990. Finally, each MSA's central business district is defined as the centroid of the set of CBD census tracts reported in the 1982 Economic Census.

The first regression estimates the effects of school desegregation on the outcomes of interest. It examines the effects of desegregation on public school enrollment by race, private school enrollment by race, and population by race in the central school districts. The model uses the heterogeneity across school district in the judicial process of desegregation in order to examine the effects of desegregation on residential location patterns and private school choice.

Using the data from the paper we can see that the effects of desegregation on the white public enrollment in the central district have decreased on average by 12 %. White private enrollment in the central district increases by 3 %. The white population in the central district, as a whole, decreases by 6 %. Also, this paper estimates that outside of the South, there is evidence to support that there is an 8 % overall reduction in central city public enrollment. Moving forward through the paper we can see the effects of desegregation on the black population. There are estimations that black public enrollment increases by 13–20 % for areas outside of the South. In addition, black private enrollment declines by 20–28 %, but note that there were very few black private school students to provide a stable base.

In the data, the population increase during the 30 year span from 1960 to 1990 shows the white population grew by 26 % while the black population grew by 59 %. According to the MSAs, the white population grew 29 % while the black population was significantly higher with 78 % growth. This illustrates that school desegregation didn't play a clear factor in housing patterns from 1960 to present.

In conclusion, the analysis of this paper indicates that while desegregation was a reason for many whites to exit the outer regions of central districts, and the subsequent in-migration of blacks, school desegregation was not one of the main forces driving urban population decentralization because these two effects offset each other. The number of white residents and public school students estimated to be lost from central districts due to desegregation was almost equal to the estimated number of blacks that moved to central districts because of desegregation. The observed changes over the past 50 years in overall urban residential location patterns also cannot be directly attributed to school desegregation. It should be noted that from 1960 to 1990, there was much higher black population growth compared to white population growth. Even so, the paper states, "school desegregation was important in generating changes in the racial composition of central districts and also influenced patterns of private school attendance."

One factor not accounted for in this study is income level of the white and black families being observed. Due to metropolitan amenities, some lower income families may not be able to leave the central district because of higher costs of living outside the central district. This could also affect the amount of families leaving private schools after desegregation was implemented. It also does not factor in the quality of education at public versus private schools and the impact that quality has on enrollment statistics. Locational preferences could play into this where some areas may have better private school education than public school education or vice versa.

Future research should use income levels when determining housing because this may show other relationships to living in the central district versus decentralization. Also, we believe that this is a large variable in choosing a house. In addition, the data could have included results from after the millennium instead of ending in the 1990s. Desegregation is an ongoing issue and seeing current data is relevant in making policy changes.

Urban Economics (2012), by Arthur O'Sullivan, touches on the causes and effects of decentralization of population. It lists education as one of the factors that contributes to the suburbanization of population, mentioning how suburban schools are often considered superior to central-city schools, encouraging households to relocate to the suburbs. O'Sullivan states, "households are segregated with respect to income and educational attainment. . . since households tend to sort with respect to the demand for local public goods and the demand for housing." Later on, O'Sullivan explains how a family's choice of a neighborhood affects the educational level of its children. There is no mention or discussion of the desegregation of urban public school districts, however, the work of Baum-Snow and Lutz (2011) fills this gap.

18.1 Multiple-Choice Questions

1. According to Baum-Snow and Lutz (2011), black enrollment in public school systems increased by what percentage immediately after the implementation of desegregation?

a) 12 %
b) **14 %**
c) 23 %
d) 42 %

Explanation The correct answer is (b)—14 %. Though white enrollment in the public school districts decreased by 12 % after the implementation of desegregation, black enrollment increased by 14 % over the long-run period of 5 years after desegregation. This result coincides with the dramatic reduction of black enrollment at private schools in the central districts within the study.

2. According to Baum-Snow and Lutz (2011), what is the cause for the *significant reduction* in private school enrollment of blacks in the central school districts?

a) **The small base of black private school students**
b) The cost of attending private school increases
c) Private schools shut down
d) Desegregation in schools

Explanation The correct answer is (a)—the small base of black private school students. Baum-Snow and Lutz do not bring up private schools shutting down, or the cost of private schools increasing as a cause for the significant reduction in private school attendance of blacks in the central school districts. Desegregation may have led to the reduction in private school enrollment of black but it was not the cause for the significant reduction. The small base of black private school students did lead to a significant reduction because a smaller base allows the change in private school for blacks to have more statistical power.

3. According to Baum-Snow and Lutz (2011), school desegregation was important in generating changes in:

a) racial composition of central districts
b) patterns of private school attendance
c) patterns of public school attendance
d) **all of the above**

Explanation The correct answer is (d)—all of the above. Baum-Snow and Lutz note that school desegregation was important in generating changes in the racial composition of central districts and also influenced patterns of public and private school attendance. School desegregation led to public enrollment declines for whites and increases for blacks; the exact opposite occurred for private schools. White central district public school enrollment declines primarily produced an outflow into suburban public schools. However, the analysis of this paper indicates that while desegregation was a reason for many whites to exit the outer regions of central districts, and the subsequent in-migration of blacks, school desegregation was not one of the main forces driving urban population decentralization because these two effects offset each other.

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Neighborhood Effects

19

Joint Work with Kelsey O'Connor, Peter Nelson, and John Lerdahl

Poverty and homelessness have been major issues in the United States. From this, the government has tried to intervene by creating programs to assist low-income families and combat poverty. It is debated how federal tax revenue should be used to help house low-income families. Federal housing assistance was created during the Great Depression and up until the late 1970s the main focus has been on public housing projects. The government has focused on two policies to help house low-income families: public housing and vouchers for private housing. Housing vouchers have become more and more popular since the late 1970s. In the research paper *Experimental Analysis of Neighborhood Effects,* Kling et al. (2007) wanted to find out if neighborhood effects exist for those in public housing and, if so, does switching neighborhoods and out of public housing assistance have a positive effect?

The goals of this research were to analyze the existence and magnitude that neighborhood effects have on socioeconomic and health outcomes for adult and youth populations. Kling et al. (2007) wanted to know if the neighborhood that a person lived in had a direct effect on five key domains. These domains were economic self-sufficiency, mental health, physical health, risky behavior, and education. The authors conducted an experiment to find out if neighborhood effects existed for adults and male and female youth. The experiment that the authors conducted was called Moving to Opportunity for Fair Housing Program (MTO). This experiment was conducted to find out if moving out of public housing would have a positive or negative effect on the five indices of success described above. The description of the experiment will be described below.

The authors created three groups to analyze. The first is the control group, which did not receive a section 8 housing voucher, but was still eligible for public housing. The second group is the section 8 group that received a section 8 housing voucher with no further stipulations. The third group is the experimental group which received a section housing voucher along with the requirements to move to a neighborhood with less than a 10 % poverty rate and they had to move there within a year of receiving the voucher.

There was a voucher lottery between 1994 and 1997 in Boston, Baltimore, Chicago, New York City, and Los Angeles. This lottery decided whether or not the families would

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be in the control group, section 8 group, or experimental group. These locations were specifically chosen because of their extreme poverty and use of public housing assistance. After the participants were chosen, the data for this study was based on a baseline survey, administrative data and an impact evaluation survey conducted in 2002. The baseline survey was conducted before the experiment began, and asked participants questions about their mental health, economic stability, physical health, education, and risky behavior. In 2002, an impact evaluation survey was done (approximately 5–8 years after assignment) to see if their overall well-being had been increased by the move.

To summarize the experiment, families, primarily female-headed minority households with children, were targeted in this study. Families were offered vouchers to live in safer neighborhoods that had lower poverty rates with the exception to those in the control group who were not offered vouchers. For adults, the results showed positive effects for both the experimental and section 8 groups relative to the control group for the three domains: economic self-sufficiency, physical health, and mental health. The effect on mental health had the greatest magnitude for the experimental group and the only adult estimate that is statistically significant at the 5 % level. For the youth, there was found to be a positive direction of effects for mental health and education, but negative for physical health and risky behavior. However, the averages for all youth are positive, but most of them are not considered statically significant, having failed to reject the null hypothesis at the 95 % confidence level. Thus to conclude, for adults and for the youth, the effects from relocation to lower poverty neighborhoods have the greatest effect on mental health. The overall results for the youth showed significant differences between males and females. The data reveals large positive effects on mental health and reduction in risky behavior for female youth, but negative effects for male youth subjects. This gender pattern was the opposite of their expectations.

Kling et al. (2007) offered some explanations for the different results seen for male and female youth. The first is that females tend to suffer more from abuse and would benefit more from relocation. Second is that females spend more time in 'supervised' environments and less time on streets being exposed to negative behavior. Finally, the families were mainly female-headed households, so the male youth did not have a father figure to help them adjust to the move.

In conclusion, no significant overall effects of this intervention on adult economic self-sufficiency or physical health were found. Mental health assistance was the only major benefit that the vouchers provided for adults and female youth. For the outcomes that included significant treatment effects, the relationship between neighborhood poverty rate and outcomes is linear.

There were several weaknesses in this study. The first is that the study was only done on a volunteer basis. This suggests that most of the families that volunteered were already looking to relocate to try and create a better life for themselves. The second is that the post survey was done 4–7 years after the move. This is not a sufficient amount of time to see the full effects that the move could have had on the families. A third weakness is that majority of the families that volunteered for this program were female-headed households. This does not give a very good variety in the data sample and could have an effect on the results.

There are a few things that future researchers could do to improve this experiment. The first thing is that the experiment should not be solely performed on a volunteer basis. The authors could randomly select 5,000 families to undertake in this new experiment. By randomly selecting the families, this would also give the authors a more diverse set of families, rather than a situation where majority are female-headed households. Also, the post survey could be done 5 years, 10 years, and 15 years after to see the progress of the moved families. This would give more insight into the long-term effects of the move.

In relationship to O'Sullivan's (2012) book, this research coincides with the research done on Portland public schools. In the research on public high schools in Portland, a negative correlation is found between school performance and poverty, and school performance and minority. The data found in the research done by Kling et al. (2007) does not conclude any statistically significant evidence on improved school performance after the families moved. However, a slight increase in education was found among female youth, and a slight decrease in education was found among male youth.

19.1 Multiple-Choice Questions

1. In the "Moving To Opportunity" (MTO) experiment done by Kling et al. (2007), which of these is not an indicator of success measured by the authors?

a) Economic self sufficiency
b) Absence of mental health problems
c) Absence of risky behavior
d) Absence of physical health problems
e) **All of these are considered an indicator of success**

Explanation The correct answer is (e) all of the above. Kling et al. (2007) measure all of these indicators in their experiment. In addition to these four they also measure education. The authors used these five indicators to be able to most accurately determine the possible benefits of moving to a less impoverished neighborhood. These indicators are measured against each other comparing the averages from the experimental group to the control group, and the section 8 group to the controlled group. The goal was to find some sort of causality in the benefit or cost of neighborhood effects. The most important indicator they were measuring was economic self-sufficiency, which was determined to have no discernable effect.

2. According to Kling et al. (2007), which group was adversely affected by the MTO experiment?

a) Teenage females
b) **Teenage males**
c) Adult females
d) Adult males

Explanation The correct answer is (b) teenage males. In the data produced by the authors, the teenage males received negative outcomes in the areas of mental health problems, physical health problems, risky behavior, and education. What's most interesting is that, overall, the results for teenage males in the experimental group are the worst, when that environment was supposed to be the best. The only explanation given by the authors was that these males in the section 8 group and the experimental group already had problems with the measured indicators before the experiment began. The teenage males in those two groups had disproportionate rates of poor education attainment, risky behavior, physical health problems, and mental health problems. This may be a reason why these behaviors intensified in comparison to those in the control group after the move.

3. According to Kling et al. (2007), what were the effects on adult economic self-sufficiency from the MTO experiment?

a) Very positive effects
b) Slightly positive effects
c) Negative effects
d) **No discernible effects**

Explanation The correct answer is (d) No discernable effects. When looking at the data for the adult males and females, it can be seen that there was a .017 improvement for the experimental group and a .037 improvement for the section 8 group. These improvements are not considered strong enough by the authors to elicit a discernible effect. Economic self-sufficiency has three factors of determination: if the head of the household is employed, if they receive Temporary Assistance for Needy Families, and their level of income. Theories and non-experimental empirical results suggested that there would be large economic gains (economic self-sufficiency) from moving to lower poverty neighborhoods, but the results from the experiment revealed no significant increase in the families self-sufficiency level. This might be due to the fact that 75 % of households in the study were unemployed to begin with, revealing that the families were already struggling before the experiment began. Moving into a neighborhood with a reduced poverty had little effect on the families because relocation will do little for families that are already struggling immensely. Alternative government aid and subsidies are needed to improve the household's economic self-sufficiency other than housing vouchers.

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Part VI

Transportation

Urban Rail Transit Expansions

20

Joint Work with Daniel Mandel, Driton Ramadani and Jack Rabenn

Between 1970 and 2000, governments have spent more than $25 billion to establish or expand rail transit infrastructure in 16 major MSAs in the United States. Massive funds have also been invested to maintain and improve existing rail lines. In their paper "Effects of Urban Rail Transit Expansions: Evidence from Sixteen Cities, 1970–2000", published in 2005 in the *Brookings-Wharton Papers on Urban Affairs*, Baum-Snow and Kahn evaluate the effectiveness of this spending. With all of this money being spent, Baum-Snow and Kahn set out to answer the question: To what extent has rail transit investments triggered new ridership? Through the use of regression, the authors create a theoretical model to evaluate commuting mode choice adjustments as a result of new rail transit construction. Heterogeneous responses of the public in regards to public transit use of new rail infrastructure are then gathered after using explanatory variables such as the year the system was built, distance to the city center, and physical structure of the metropolitan area as a whole. These results are then used to quantify the welfare benefits and draw conclusions about how successful rail transit projects are across certain cities in the United States. By building off of prior studies and studying 16 U.S. cities throughout 1970–2000, this paper also sheds light on the importance of the variation in the decentralization of MSAs and how city structures impact commuting mode choice in response to new rail infrastructure.

To perform their analysis, the authors use digital maps of rail transit infrastructure in addition to demographic data at the census tract level. The authors say that they only included modern rapid transit lines, not vintage trolleys or commuter rail lines. The maps were from The Bureau of Transportation Statistics' National Transportation Atlas Database (NTAD). When maps were not available and/or not current, the authors constructed digital maps of rail lines and stations based on maps and construction histories from various sources. In order to make comparisons, these digital maps had different dates of January 1, 1970, 1980, 1990, 1994, 2000, and 2004. The census tract data are repeated cross sections from the 1970 to 2000 decennial censuses normalized to the 2000 census from the Urban Institute and Census Geolytics' Neighborhood Change Database.

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Holding geographic area constant, these data are used to analyze the change of demographic characteristics and transit ridership. The authors use geodata from the Neighborhood Change Database to map the locations of census tract centroids with Central Business District (CBD) definitions from the 1982 Economic Censuses Geographic Reference Manual. Their sample includes only "census tracts with centroids that fall within twenty-five miles of the nearest CBD of a metropolitan area that had rail transit expansions between 1970 and 2000" (Baum-Snow and Kahn 2005, p. 4).

Baum-Snow and Kahn use many theoretical models in this paper. The main theoretical model assumes that all work takes place in the CBD and people live over the available space so that in equilibrium every individual has the same utility level. Every individual is endowed with one unit of time that can be used only for working to earn wage or commuting. There is a fixed cost for owning a car but no fixed cost for using public transit. Driving does not have a fixed time cost but transit has a fixed time cost. Everyone has four commuting options: taking a bus to the rail line, driving to the rail line, taking a bus directly downtown, or driving directly downtown. Transit users only incur their fixed cost once, even if they transfer between bus and rail. The authors setup an equation to minimize commuting cost and then they analyze mode choice by evaluating bid-rent curves for land as a function of distance from the CBD. Then they use two different models that compare the speed of the rail line to driving in order to display where mode switching occurs. The first model looks at the effects of switching commuting options when driving is faster than rail line. The second model assumes the rail line is faster than driving.

There were a few crucial findings, both directly and indirectly associated with the main model. The first was that the model suggests most ridership on new rails is from former bus-riders, with very few coming from former drivers. Baum-Snow and Kahn found that the main driving force to get people to switch commuting modes is time saving because the marginal cost of lost work time is greater when you use a slower commuting option. In order to get people to switch from driving cars, it is important that the commuting time for rail is as fast as driving during rush and that the commuting rail expands far enough into the suburbs to reach a significant amount of people.

The researchers confirmed that rail systems were most likely to thrive in cities with high employment concentration in the city center and where the rail has a speed that makes it a competitive alternative to the automobile. With higher concentration, rails are able to reach a larger number of people. The fact that real world ridership of public rail transit has declined in the face of rail expansion fits this explanation. The decentralization of cities, and the subsequent suburbanization of both employment and residences have led to populations in metropolitan areas to be widely spread out, making it less likely for rail transit to be a feasible commuting option. The great lengths that these rail lines would have to extend to create enough access points and the speed the rails would have to travel at to compete with cars at that distance is unrealistic with cost constraints.

The researchers still found that huge costs associated with rail expansion can still be beneficial even if ridership decreases. Rail expansion can create large welfare

gains from decreased commuting times. Many new rail users are former bus riders because the rail commuting time is much more time efficient than bus commuting time, which come less frequently and are subject to traffic congestion.

In 10 out of the 16 cities studied, the greatest increase in public transit use after the introduction of new rail commuting occurs further from the CBD where people were previously commuting to the city by car. Due to the higher population density, new rail lines bring more riders closer to the CBD; however, this does not necessarily increase public ridership because most of the "new" riders switch over from bus commuting. The switch from bus commuters to new rail commuters does not increase ridership in general, but it does represent welfare gains from shorter commute times.

This paper presents a lot of great insight regarding the benefits of rail transportation but the paper also possesses some areas of weakness. The paper only focused on data of people that use rail to commute for work but children, elderly, and tourists also represent a large portion of rail riders. The paper also does not clearly distinguish between bus and rail transit and it was not clear if the limited expansion of ridership resulted from people choosing not to ride the rail or people choosing other modes of public transportation like bus.

It is important to note that this paper looked at rail data before 2004. Many new rail systems have been recently constructed so there is opportunity and a need for more current research. Rail is heavily subsidized by governments and with many governments struggling to balance budgets, there may be pressure to rethink these subsidies. This prompts a need for further research on cost-benefit analysis for rail systems. Further research should also consider gains to non-rail commuters from less congested streets. The authors also limited their scope of research to only American rail systems but many other countries have invested in rail infrastructure so it would be interesting to do a cost-benefit analysis for other countries to get a more inclusive picture.

This paper forms an interesting complement with Arthur O'Sullivan's textbook *Urban Economics* (2012). The paper emphasizes that rails have not been effectively increasing ridership due to decentralization. O'Sullivan (2012) and other research support the notion of decentralization across the United States. Both the paper and O'Sullivan (2012) note that rail transportation is very expensive to build and maintain. The government heavily subsidizes rail funding in order to help eliminate the negative commuting externalities of congestion, pollution, and accidents. However, O'Sullivan (2012) goes one step further to explain the government's rationale. He notes that subsidies are justified based on an efficiency argument because the average cost curve for the rail system is negatively sloped due to scale economies, which spread fixed cost over more riders and Mohring economies because more ridership increases the frequency of service.

In conclusion, decentralization of cities in the United States has diminished the effectiveness of expanded rail transit. Nevertheless, billions of dollars have been spent to expand, maintain, and improve rail transit infrastructure in the United States. With the help of theoretical models, Baum-Snow and Kahn find that the main benefit from rail expansion is welfare gains from commuting time savings. Their model suggests most ridership on new rails is from former bus-riders, with

very few coming from former drivers. The researchers confirmed that rail systems were most likely to thrive in cities with high employment concentration in the city center and where the rail has a speed that makes it a competitive alternative to the automobile. Since governments heavily subsidize rail costs, this paper provides insight that can help governments in the future allocate resources more efficiently.

20.1 Multiple Choice Questions

1. According to Baum-Snow and Kahn (2005), what is the main reason that the great increase in spending on rail improvements have not resulted in increased ridership?

a) People see rail transit as beneath them
b) People are too concentrated around the access points
c) **There has been a wide trend of decentralization across US cities**
d) People prefer to take the bus

Explanation Decentralization is the main issue when is comes to the lack of increased ridership on rails. In order for public transit, including rails, to thrive, there must be high concentration of employment and population concentration in the city center. This was very apparent throughout the report. The suburbanization trend of American cities, with regards to both employment and residences, has decentralized the city centers and moved people further away from rail access points. Option (b) is incorrect because if it were the case, then rail transit would be a large success because the paper found that rails are more successful in concentrated areas. Option (d) is incorrect because, as previously mentioned, there are large welfare gains from commuting times as a result of people switching from bus to rail public transit. Additionally, the research showed that the majority of new rail riders are former bus riders. Option (a) is not correct because governments subsidize rail and governments strive to do what is best for the community. If governments knew that people did not want to ride rail transit, then governments would not subsidize them.

2. According to Baum-Snow and Kahn (2005), what is the real benefit of expanded rail transit, as found by this research?

a) Less Pollution
b) **Welfare gains from commuting Time saving for commuters**
c) Centralization of the Population
d) Welfare Gains to non-commuters

Explanation The welfare gain of large commuting time savings is the result of a couple factors. The first is that the data in the report showed that most new rail users

were actually former bus riders. This is one of the main reasons why we do not see a large increase in the usage of public transit, as most of the new rail users were already public transit users. The rails are much more time efficient for these commuters in relations to buses, which come less frequently and are subject to traffic congestion. The report found no statistically significant evidence of reduced pollution and reduced car ownership after running regressions for car ownership. There was data that showed a possible decrease in car ownership, which would signify a decrease in pollution and congestion, but the regression analysis conducted deemed this data as statistically insignificant. Centralization of the population is not a benefit of expanded rail transit, but rather a condition for the success of investment in rail expansion and increased usage. Although the researchers hinted that there might be welfare gains from non-commuters, such as elderly and tourists, the focus of this report was on commuters, so any mention of gains to non-commuters is just opinion.

3. According to Baum-Snow and Kahn (2005), why do cities keep investing in rail transit if ridership is not even expected to increase?

a) Politicians like wasting money their city's money
b) Each city involved found a natural resource to exploit and are now flush with cash
c) Trains are cool, so why not
d) **Most of these projects are largely federally subsidized**

Explanation The answer is (d). According to the paper, federal funding typically covers between 50 and 75 % of the cost of new rail construction. The Federal Transit Administration reviews proposals and accepts based on cost and need. All else equal, they are more likely to fund lower cost projects. It is very common for planners to underestimate cost and overestimate ridership, which adds the problem of unneeded/unwarranted overspending on rail expansion. One could make an argument for option (a), but for the purposes of this paper, it is incorrect and logically people elect politicians so politicians wasting too much money will not be re-elected. Points (b) and (c) are clearly incorrect, as the paper did not mention anything about the discovery of natural resources in cities like Boston, Chicago, New York City, etc. Even though trains are cool, the paper did not give this as a reason for rail investment.

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Highways

21

Joint Work with Joshua Roth, Kyle McCoy and Keith Schuman

The author of this paper, Nathaniel Baum-Snow, conducted research to determine the effects the constructed interstate highway system of 1950 had on central city population. Using the 1947 interstate highway plan as a base, he aimed to figure out the causes of suburbanization from the highways constructed in 1950 through 1990. Baum-Snow also further explained Alonso's (1964) land use theory by analyzing the prediction that faster commuting times increase the demand for space in the suburbs. Baum-Snow's main goal of this paper was to determine how all of these factors contributed to the rise of suburbanization and the effects they had on decentralization of the central city population.

Baum-Snow used data from the 1947 Interstate Highway Plan when conducting his research. The Interstate Highway Plan was a federally funded program designed to connect metropolitan areas, cities and industrial centers to serve national defense and allow for better trade routes. The program was not designed with the demand for shorter commute in mind, meaning any effect highways had on commute and suburbanization were unintended. The Highway Plan spanned from 1950 to 1990, so Baum-Snow used that timespan in his research. In all, the Plan proposed 37,324 miles of Highway, 16,716 of which were built in the 136 metropolitan areas used in Baum-Snow's research. Baum-Snow then separated these highways into "rays", which are segments of road that connect to the central business district. Finally, Baum-Snow used the "PR-511" data, where beginning in 1956, each county reported the amount of highway completion for each year. This was used to determine the amount of "rays" connected to city centers for each given year.

In order to analyze the effects of highways in the city center on decentralization, Baum-Snow uses a regression model referred to as the long-difference estimates. This model measures the regression of the following variables: city center radius, the MSA population, mean log annual income and change in rays on the population density of 1950 city centers. The purpose of the test is to find the correlation between change in rays, MSA population, and city center radius on the population density of 1950-definition city centers, with the other remaining variables acting as controls to test the exogeneity of the plan.

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In addition to the regression model, Baum-Snow took a sample of 139 MSA's and examined the results of suburbanization across the US. More specifically, he used Austin, Texas as a case study to determine whether Alonso's land-use theory was accurate. Austin is a convenient case study due to the fact it is one of the largest cities to only have two rays, essentially one major highway running through the city. This makes it easier to evaluate if spatial patterns in population decentralization follow highways, and if the city is unimpeded by natural and political boundaries. From here, Baum-Snow used a population density map to explain how the spread of people from Austin is extremely decentralized. This implicitly supports the validity of Alonso's land use theory.

Baum-Snow found that the average population of the city decreased by 28 % from 1950 to 1990. This corresponds to the construction of highways from the 1947 IHS Plan. Using his regression model, long-difference estimates, Baum-Snow concluded that each new highway causes constant geography central city population to decline by 18 %. If the Interstate Highway System had not been built, instead of declining by 18 %, the city center would have seen an increase of population of 8 %. Additionally, he concludes that each new ray, conditional on control variables, would result in a 6 % decrease in central city population. Overall, Baum-Snow came to the conclusion that his model, using radial commuting highways, implies that central city population is a function of the number of rays, the radius of the central city, the MSA population, and the distribution of income; and concludes that highways are responsible for a third of suburbanization.

Baum-Snow (2007) only used Austin, Texas, as a city example because of its lack of physical restraints and because there is only one main interstate highway that runs through the city. Although this gives a good representation of how an interstate can lead to the decentralization of a city, an additional example of a coastal city or one with multiple rays in the city center could illustrate the point even better. Another issue left for future research is how highways and other modern transportation systems have impacted the formation of cities and suburbs in foreign countries as opposed to the United States. Jeff Speck (2013) compares urban land patterns within the United States to other countries by characterizing cities in the United States as being less walkable. He outlines some of the problems associated with cities that have more sprawl, including health, environmental and economic effects. Therefore, there are many socioeconomic consequences of suburbanization that should be explored in future research.

Despite the research Baum-Snow conducted in regards to the effects highways had on suburbanization there is still further research that can be done to further support this idea. For example, Baum-Snow did not account for the other positive externalities there are from living in the suburbs and the negative externalities there are from living in the city. Common negative externalities in urban areas include congestion and cleanliness. Also, Baum-Snow's study only focuses on residential housing, leaving out the effects highways had on commercial firms from moving out of the city. Overall, the study supports the result that the highway system did decentralize the population density in central cities. However, it did not include the possibility of other factors contributing to this fact as well.

In relation to O'Sullivan (2012), the book examines several cities that have experienced a reduction in density gradient in more recent years. For example, between 1801 and 1961, London's density gradient decreased from 1.26 to 0.34, meaning a more expansive and less dense city. This relates to how highways have caused a massive increase in suburbanization and a reduction in city density gradients in the U.S. from 1950 to 1990. Commuting costs, which include time lost from commuting, are a large factor in density gradient and the decentralization of population as investigated in this paper. The book and Baum-Snow also reference Tiebout models as an incentive for people moving away from the city center to form new communities. Baum-Snow focuses on the spatial mechanisms through which urban population decentralization is realized, but also acknowledges that Tiebout's model may explain some of this decentralization.

21.1 Multiple Choice Questions

1. According to Baum-Snow (2007), the interstate highway plan was created to:

a) Create suburbanization
b) Make commuting between cities and farmland faster
c) **Create direct interstate and national routes to connect large cities, industrial centers and serve national defense**
d) Create an economic disparity between people living in cities and people outside of cities

Explanation According to Baum-Snow (2007), the interstate highway plan was intended for easier transportation between large trade centers and for possible military use. An unintended consequence was an increase in highway systems from city centers to these interstate highways. These led to easier commuting times for residential land users.

2. What is the observed relationship between central city population and the creation of highways?

a) **As highways increase, central city population decreases**
b) As highways increase, central city population increases
c) As highways increase, central city density increases
d) There is no relationship between central city population and the creation of highways

Explanation As seen from the regression model and empirical evidence, the increase of highways led to a decrease in city center population holding a constant geography over time. This relationship is to be expected, since a decrease in

commuting time will increase a resident's willingness to locate farther from the city center.

3. Which of the following was not a consequence of the highway system?

a) Less densely populated city centers
b) Residential land use near highways
c) New municipalities (suburbs) outside the city center
d) **All of the above are consequences of the highway system**

Explanation All of the above were implications of the new highway systems in the United States. The average city experienced a reduction in its density gradient, and people became willing to locate farther from the city. Also, residential landowners located near highway systems to reduce commuting time.

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Part VII

Housing Financing and Government Programs

Financial and Housing Wealth

22

Joint Work with Leah Nizzari and Lucas W. Rytel

Financial wealth and housing wealth are the two largest and most important assets held by a household in many countries, including the United States and the Netherlands. In the article published in 2001, "*The Relationship between Financial and Housing Wealth: Evidence from Dutch Households*," Stefan Hochguertel and Arthur van Soest analyze financial and housing wealth in the Netherlands and attempt to determine how these two types of investment decisions are interrelated. In the past, studies similar to this one had focused only on the implications of housing decisions on financial wealth decisions and not vice versa. Hochguertel and van Soest develop an empirical model that explains how housing investment demand and financial wealth holdings impact one another. The authors' goals were to determine if homeowners have different demand for financial wealth than renters, how house prices affect the probability of homeownership, and whether or not housing wealth is affected by the level of financial wealth held.

In order to clearly explain their research and findings, the authors introduced some important facts and statistics regarding the Dutch housing market and some key differences between it and other countries. First of all, in 1990, only about 45 % of Dutch households were homeowners, compared to between 62 and 64 % of households in the United States. As for rentals, 77 % of available housing for rent is supplied and managed by municipal housing associations. These are usually low income households that are also eligible for rent subsidies based on their modal income levels. When it comes to mortgages, the Dutch government is involved by offering to have municipalities bear the risk of default on mortgages for inexpensive housing. It is also not uncommon to obtain a mortgage for 100 % or more of the value of the home. The lack of down payment constraints in the Netherlands also means that prospective homeowners do not need to save money in advance of seeking a mortgage. Finally, they conclude that in the Dutch market there is a greater incentive to invest in housing wealth because only 60 % of it is taxed, as opposed to a greater tax on financial wealth.

The microdata used to construct the model is taken from a survey conducted by several Dutch banks in 1988. The data from the survey is comprised of responses

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from over 10,000 individuals and 3,700 households. However, due to missing information and outliers, nearly 1,000 observations had to be discarded from the study. This data also seemed to have problems caused by self-reporting, because many households were under-reporting asset amounts. Although there were flaws in the data, the results appeared to resemble Dutch households' financial wealth much more closely than other available sources. The questions in the survey were targeted at determining the financial structure of the household. Hochguertel and van Soest (2001) were able to use this data to build an empirical model.

All things considered, the authors were able to conclude that low income households are incentivized to rent because of the large regulated rent market and its subsidies, while high income households are encouraged to buy homes based on the availability of mortgages and the favorable tax laws. Although favorable tax laws are advantageous for both low and high income households, those in the high income households will find this to be a greater benefit since they are in a higher tax bracket.

The model developed by Hochguertel and van Soest (2001) explains housing and financial assets and equity based on the thresholds associated with them. Housing equity is the self-reported value of the property less the outstanding mortgage. By assuming financial assets and housing assets are substitutes for one another, the model uses parameters to bind demand for one asset based on the demand for the other asset.

Hochguertel and van Soest (2001) conclude that although both housing assets and financial assets are dependent variables, housing asset thresholds are extremely important to financial investment decisions because of the high fixed cost associated with housing assets. Housing wealth is usually one of the largest assets a household possesses which is why the amount of it impacts the ability to hold financial assets. Homeowners consistently have different levels of demand for financial wealth than renters do. The authors also determined that housing wealth is not affected by the amount of financial wealth held. Although previous studies have shown financial wealth is affected by housing wealth, this study shows that the reverse is not true. Finally, the authors observed that an increase in housing prices in a particular region decreases the probability of both homeownership and ability to hold financial wealth.

While this study draws several interesting conclusions, it is important to note its limitations because of the data used. Since the survey conducted allowed its participants to self-report it's assets, some values were understated or missing entirely, resulting in approximately 1,000 responses having to be thrown out of the study. The data from the survey also does not distinguish between landlords and tenants. Therefore, we are not able to analyze housing consumption and investment independently from one another. Another limitation of this study is that the data is somewhat outdated. "*The Relationship between Financial and Housing Wealth: Evidence from Dutch Households*" was written in 2001, but the data used was from a survey conducted in 1988, over a decade earlier. This may result in a model that does not reflect the changes that occurred between the time of the survey and the time this article was written. One such change over the decade is subsidies for rental

properties owned and operated by municipalities have been cut back. It would be interesting to see in further research if policy changes such as this one have affected the housing and financial wealth decisions of Dutch households.

In the eighth edition of Urban Economics by O'Sullivan (2012), the relationship between housing wealth and financial wealth is not really explicitly mentioned. The authors discuss the opportunity cost of housing in Chap. 6, but this focuses mainly on the commuting cost and consumption of "other goods." However, this is still pretty similar to the model created by Hochguertel and van Soest because we can assume housing assets and the opportunity to consume other goods are substitutes for each other. Also, in Chap. 14, the authors discuss what makes housing different from other products. They concluded that housing is a rather durable asset that can deteriorate slowly over time and that the cost of moving is usually high, so households change their housing consumption infrequently relative to other goods.

Hochguertel and van Soest began their study by asking how the financial and housing wealth decisions of Dutch households are interrelated. The most significant conclusion found through the empirical model they developed is that housing wealth is not affected by the amount of financial wealth held. However, it is important to remember that this model is only relevant to the Dutch market. Another study would have to be done using data from other countries such as the United States to determine if this is true in other places. It is likely that we find different results. This is because the housing and renting policies of the areas are much different. In the United States there are down-payment requirements for purchasing a home. Therefore prospective homeowners must save and invest in financial assets before purchasing a home. The financial assets of this household would decline with the purchase of the home and then rise again. This saving for a down-payment is not present in Dutch households' financial structure. Therefore the results from this study are only applicable to the Dutch region. It would be interesting to see how households in the United States are structured in future research and compare the two.

22.1 Multiple Choice Questions

1. According to Hochguertel and van Soest (2001), which of the following is true about the Dutch housing market?

a) A greater percentage of the population are homeowners than in the U.S.
b) They have unusually high down payment requirements when purchasing a home
c) ***There are typically no down payment requirements when purchasing a home***
d) There is a great surplus of housing

Explanation In the United States, the percentage of homeowners is actually higher than in the Netherlands. About 63 % of American households own their home while only about 45 % of Dutch households are homeowners. That is why (a) is incorrect.

For (b), The Dutch housing market does not have high down payment requirements when prospective homeowners apply for a mortgage. In fact, there are typically no down payment requirements. That is the correct option, (c). It is not uncommon for Dutch people to obtain mortgages easily and for them to be worth more than 100 % of the home value. As for (d), the article did not talk about any surpluses in housing.

2. According to Hochguertel and van Soest (2001), why are low income Dutch households incentivized to rent rather than be homeowners?

a) ***The rent market is largely regulated and the government provides subsidies***
b) The availability of mortgages and the favorable tax laws
c) Buildings for rent are closer to the city center
d) They prefer the shorter commitment provided by rent leases

Explanation The correct answer is (a) 77 % of available housing is owned and operated by municipal housing associations. They provide a significant amount of subsidies which makes this attractive to households with an income level below a specified amount. (b) mentions the availability of mortgages and the favorable tax laws associated with them. This is actually why high income households are encouraged to own their homes. Tax advantages are much more attractive to the high income households in higher tax brackets. (c) and (d) are both incorrect answers because we did not mention anything about proximity to the city center or commitments to leases in our presentation.

3. Which of these was not a finding of Hochguertel and van Soest?

a) Homeowners consistently have different levels of demand for financial wealth than renters
b) Housing wealth is not affected by the amount of financial wealth held
c) Increase in housing prices decreases the probability of both homeownership and ability to hold financial wealth
d) ***The decision to rent or own a home is completely based on personal preference***

Explanation (a), (b), and (c) were all main findings by the authors. First of all, they found that homeowners are likely to hold significantly more financial wealth than renters. This means that they have consistently higher levels of demand for financial wealth. Next, housing wealth is not affected by the amount of financial wealth held, because there is no down payment requirement. Whereas in the United States, prospective homeowners will often save for this down payment, those in the Netherlands do not need to do this. (c) is also correct because if an area is more expensive it will obviously limit who can live there. If one can afford to live in the more expensive area, they will have more of their assets in housing wealth and will not be able to hold as much financial wealth. Therefore, the option that is false is

D. Hochguertel and van Soest found that Dutch households make the decision to rent based on income and existing wealth and savings. There are many different factors that play into a household's decision to own or rent other than personal preference.

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Real Options

23

Joint Work with Sam Teper, Maurice Law, and Aaron Sandock

The research study conducted by Christopher R. Cunningham (2006) titled "*House Price Uncertainty, Timing of Development, and Vacant Land Prices: Evidence for Real Options in Seattle*", seeks to explain value created by real estate options and how those affect both timing of development as well as vacant land prices. In his work, Cunningham (2006) aimed to seek out the effect of these options on the factors listed above. Through his findings, Cunningham (2006) concluded that the uncertainty of house-prices leads to a delay in development construction, as well as an increase in vacant land prices.

Classic financial theory states that any investment that produces a non-negative NPV can add value to a firm. Therefore, when a positive NPV project is presented, that firm will choose to invest. Although there has been prior research done on the topic, that research lacks in empirically testing for real estate options in these investment decisions. Cunningham's (2006) paper was the first research at the time where both predictions were tested within the same study: house-price uncertainty should delay home construction and house-price uncertainty should raise the value of vacant land.

In his research, Cunningham collected data from King County, which is located in Seattle, Washington. He assembled raw data using three sources which included the King County Assessor's parcel and description files, the assessor's real property transaction files, and the county GIS files of various parcel zoning and jurisdictional boundaries. Compiled together, this raw data represented over 500,000 home sales, 163,000 land parcels at risk of development, and 81,000 arms-length vacant land transactions. He limited the years of the study from the first quarter of 1984 through the second quarters of 2002.

When making predictions concerning future land prices, Cunningham (2006) uses the term "real option", a term defined as an investment opportunity that is both stable and illiquid. The real option is also an investment that can be pursued in the future once new information is taken into account. Since the real option allows the holder to wait to make a decision until new information is revealed, it enables a holder to make a more informed decision. Therefore, the premium associated with

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holding this option must be accounted for when determining current prices and firms must have other investment opportunities with somewhat higher expected returns in order to justify deviation from the real option.

In order to check his predictions, Cunningham (2006) compiled this raw data to create three separate data sets, which he used in his research study. The first data set matched home sales to the corresponding lot's identification number. Then, he used the home characteristics, lot characteristics and home sales prices to construct measures of quality-adjusted home prices. This model was used to then determine house price uncertainty. In this data set, Cunningham (2006) showed graphs supporting price appreciation over time with some variations between different school districts. The second data set looked at parcels at risk of being developed to see how house-price uncertainty can affect the timing of development. Cunningham (2006) used year built to determine when a site "dies." The site "dies" when construction begins because the site is no longer a target for development. Cunningham (2006) decided to use the 1-year preceding date of when the building is listed as built in order to account for time of construction. The potential problem here is to think about buildings that may take longer or shorter than 1-year to build. It would be extremely difficult to track the construction timeline for each individual building; therefore 1 year is probably a fair estimate. The third data set used was comprised of vacant land sales in order to measure contribution of price uncertainty to high land value. This data set used arms-length transactions to determine prices based upon uncertainty.

Using these data sets, Cunningham (2006) came up with his model of land development, where he used the variable π to represent profit per acre of new development. This was determined by a function of price per unit of housing, housing output per acre, capital per acre, and land rent. Using π (profit per acre) he was then able to determine equilibrium price, which he called R (U). This equilibrium price was a function of profit per acre, housing output per acre, and capital per acre.

Traditional models state that if equilibrium price, R (U), is greater than or equal to the discounted rents of the alternative use of the land, R (Alt), then the developer would choose to build on the property. Therefore, it makes sense that if the equilibrium price the developer can obtain in the market is greater than the alternative use then it will be chosen to build and obtain that equilibrium price rather than leave the land as is.

With the introduction of this real option, there exists an opportunity that is valuable, which Cunningham (2006) calls the real-option premium or OP in the model. Therefore, in this study he modified the model to be that if R (U) is greater than or equal to R (Alt) + OP, only then would a developer choose to build. Since this opportunity cost has real value, it must be included along with the alternative price in order for a developer/land owner to make the best decision for their site. From an investor/developer standpoint, this logic makes sense because an investor is looking to maximize value, so they will choose the decision that leads to the most value creation. From this model, it is clear that an increase in the value of the option premium (OP) will reduce the amount of new construction. This will delay building

since it will make the decision to not build more valuable to investors and vice versa if the value of the option decreases.

Cunningham (2006) ran a regression of vacant land price against the uncertainty calculated from the quality-adjusted home price. He found that a 1 standard deviation increase in uncertainty would lead to a modest increase of $1,446 dollars in 2004, or about 1.6 % increase in price. Although this isn't as strong of a correlation as one would like to see, it does agree with the basic concepts of finance that a high volatility (uncertainty) will yield higher potential returns (land prices). Cunningham (2006) also broke the distance from downtown into several groups. He found that from 0 to 12 miles away from the downtown there was a negative correlation between land uncertainty and vacant land prices. However, from 12 to 20 miles from the downtown, there was strong evidence for positive correlation. Therefore, he concluded the real options only have a real effect in the urban-rural setting located 12–20 miles from the downtown in this sample. The other finding was related to how price uncertainty affects risk of development. Through his research, Cunningham (2006) was able to conclude a 1 standard deviation increase in price uncertainty leads to a 10.7 % lower risk of development. This is a very strong piece of evidence for how more uncertainty will lead to lower likelihood of development, which agrees with Cunningham's (2006) expectations. As the uncertainty increases, people are less likely to develop land because they feel they will be better off by waiting until more information is revealed.

A more recent publication titled "*Commercial Real Estate Analysis and Investments*" by Geltner et al. (2014) cites some of Cunningham's (2006) work. In the book, the authors explore what they refer to as the call option model of land value. They explain that one who owns land essentially has an option to either build or not build, which is consistent with what Cunningham (2006) explained in his research. This enables the owner of the land option to either leave the property as is and collect the rents of the current standing asset, or pursue a development opportunity. In the event that the present value of the development opportunity are greater than the value of the option premium and the present value of the current asset rents, then the owner of the land will choose to build. The value of the option premium as explained by Cunningham (2006) as well as the text, depends on the amount of uncertainty. More uncertainty about the future leads to a higher option premium, which will delay construction as discovered by Cunningham (2006). Geltner, Miller, Clayton and Eichholtz (2014) explain it is important not to overbuild a property, which they define as building more space than the usage demand. This idea is important since if a developer overbuilds, they will not meet their returns for the project. The option enables developers to wait until they can better determine the needs of the market going forward and diminishes the risk of overbuilding. For this reason, one can see how an option premium exists in the ability to wait to see what the future holds.

Although Cunningham (2006) provides evidence for his claims, some questions still remain. How does the option premium play a role in development decisions and land prices in different types of assets? For example, would the value of the option premium differ in a space being used as a multifamily complex versus an industrial

facility? Additionally, one could wonder how prevalent the effects are in cities other than Seattle with varying density. In the paper the urban/rural frontier (12–20 miles from downtown) showed the greatest effects of delayed construction with increasing uncertainty, but how would other cities react? Would we see the same results in all cities or would different cities display other results? Lastly, one could wonder how the interest rates affect the real option premium. How would times of high or low interest rates have an effect on the magnitude of the option premium? This paper was able to provide very interesting results, and has really opened the door for others to further explore a variety of topics associated with the option premium.

Cunningham's (2006) findings are consistent with the past research: Uncertainty about the future prices decreases risk of development and raises vacant land price. These results suggest that real estate developers do account for real options when making decisions. Thus, developers will only build when the equilibrium price is greater or equal to the discounted rent of the alternate use of land plus the real-option premium.

23.1 Multiple Choice Questions

1. According to Cunningham (2006), what is the difference between the classic model in a developer's decision and the model proposed by him?

a) The new model considers the surrounding landscape as a factor
b) **The new model considers a premium based on land price uncertainty, factoring in whether or not the developer should build in the current period**
c) The new model considers the hazards of development as factors
d) All of the above

Explanation Both the classical model and the new model consider surrounding landscape as a factor of pricing the rents that can be achieved, therefore this cannot be a difference. Also, both model consider the hazard of development in determining whether or not to build since there are always basic development risks associated with taking on a project so this cannot be the answer. The new model however accounts for an additional value of the option premium (OP) while the traditional model fails to acknowledge the value, therefore the answer must be B.

2. According to Cunningham (2006), how does price uncertainty affect the likelihood of development?

a) More price uncertainty leads to a higher likelihood of development
b) Less price uncertainty leads to a lower likelihood of development
c) **More price uncertainty leads to a lower likelihood of development**
d) A change in price uncertainty has no effect on likelihood of development

Explanation According to Cunningham's model, a 1 standard deviation increase in price uncertainty leads to an 11.3 % lower likelihood of development. This is because as there is more uncertainty, developers will likely hold off on new projects to see what the future environment holds in order to make the favorable decision. Therefore, the answer is C.

3. According to Cunningham (2006), how does price uncertainty affect the value of vacant land from 12 to 20+ miles from the downtown?

a) Price uncertainty lowers the value of vacant land
b) **Price uncertainty raises the value of vacant land**
c) Price uncertainty has no effect on the value of vacant land
d) It is uncertain how price uncertainty affects the value of vacant land

Explanation As the chart shows, between 12 and 20 miles from the downtown area, an increase in price uncertainty raises the value of vacant land. This makes sense because as the uncertainty about the future is unknown, developers are willing to pay more for the land because of the value of the option premium. This higher level of uncertainty can potentially lead to higher rewards, which increase the price. Therefore the answer is B.

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Low-Income Housing Subsidies

24

Joint Work with Kirsten Voss and Nicole Wilsey

In Sinai and Waldfogel's (2005) paper, "Do low-income housing subsidies increase the occupied housing stock?", the effect of housing subsidies on the supply of housing stock is dissected. The purpose of the authors' research was to determine if the quantity of occupied housing per capita increases due to subsidized housing. Are more people finding housing or are they just being housed less densely? However, if subsidized housing is crowding out low-income housing of similar quality instead, then the housing policies have little effect on housing consumption. Of two different types of housing subsidy programs, which is most effective? Sinai and Waldfogel delve into the different types of subsidies, propose a simple framework for analyzing their effect, define and analyze the data, and provide evidence of the impact that subsidized housing policies have on housing consumption as a whole.

The data used was sourced from the Department of Housing and Urban Development and the U.S. Census. Sinai and Waldfogel (2005) used cross-sectional data in 22,872 Census designated places and 252 Metropolitan Statistical Areas on total housing, subsidized housing, and population. An MSA is defined as a county or group of counties with a minimum population of 50,000 people. A census designated place is an area of concentrated population identified for statistical purposes. The authors then ran various regressions on this data with controls for age, race, income, and marital status weighted by population and split out by state. Regression analysis is a statistical method for measuring relationships between various variables. Sinai and Waldfogel were able to create clear relationships between the amount of total housing, total subsidized housing, and population. By using the controls the authors were able to eliminate correlations due to other factors than the ones they were interested in. This allows for an accurate analysis of the data.

Sinai and Waldfogel (2005) made a clear distinction between two different types of housing subsidies: project-based and tenant-based. Project-based housing subsidies use government funding to supply housing units. Examples of project-based subsidies are Section 236 housing and public housing projects. The market is predominantly project-based subsidies although tenant-based subsidies are

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becoming increasingly more used. Tenant-based subsidies give recipients a form of rent assistance. Programs like Section 8 and other voucher programs are tenant-based. A family meeting the eligibility criteria pays 30 % of their income in rent. The remaining 70 % of rent is given in the form of a voucher. Over $25 billion a year is allocated towards low-income housing subsidies by various levels of government. Despite this substantial expenditure, it is unclear whether there is any effect on whether families are homeless, share a unit with another family, or occupy their own unit.

One main finding from this paper was that there is less of a crowd-out effect in more populated areas, such as MSAs. In this paper, crowd-out refers to the decrease in private housing being built due to the large amount of government spending on housing subsidies. The authors first looked at the effect population size has on crowd out by comparing occupied subsidized units per capita in MSAs and census designated places. Sinai and Waldfogel (2005) found that in MSAs, one additional unit of subsidized housing increases the total occupied housing units by 0.52 units, while in census places an additional unit only increases total occupied units by 0.35 units. The crowd out effect occurs more in small populations because government spending on subsidized housing does not increase the total number of occupied of housing units as much as it does in the MSAs. Public spending seems to discourage private developers from building new housing units in smaller populated areas.

To further prove that population size effects crowd-out, Sinai and Waldfogel (2005) sorted the census designated places based on population size and looked at the effect that adding one additional subsidized unit had on raising the total number of occupied housing units. The authors found that the larger the population, the more an additional subsidized unit raised the total number of occupied housing units. In a place with an above-the-median population, a subsidized unit will increase the total number of occupied units between 0.2 and 0.4 units. In the census designated places with the smallest populations, an extra unit only increases total number of occupied units by 0.06 units.

Another key finding is that the crowd out effect is lower when the demand of subsidized housing is greater than the supply currently in the area. The ability of subsidized housing to generate new housing units increases when less subsidized housing is available compared to the population in need. Sinai and Waldfogel (2005) researched how the addition of a subsidized unit raises total housing in areas of high, median, and low pressure for subsidized housing. A high pressure area is one with very few subsidized houses compared to a relatively large population in need. A low pressure area is one with a high supply of subsidized housing compared to a relatively low demand from eligible participants. In a high pressure area, adding one additional subsidized unit will increase the total housing by 0.49 units. In comparison, adding one additional subsidized unit in a low pressure area will increase total housing by 0.44 units. The authors conclude that these results show that in high pressure areas, subsidized housing will have a greater effect on increasing the total number of housing units than in a low pressure area.

Last, Sinai and Waldfogel (2005) looked at whether project-based or tenant-based assistance was more effective at providing housing units for those who would

otherwise not have their own. The authors initially conjectured that there would be no difference in the effectiveness between the two assistance programs. The authors then learned that vouchers are often given to those most needy instead of project-based housing, to help avoid concentration in housing projects. This caused Sinai and Waldfogel (2005) to begin to believe that tenant based programs may be the more effective choice. To prove this hypothesis, the authors tested the effect that project-based and tenant-based housing had on the total occupied housing stock. They found that tenant-based assistance added 0.7 occupied units for every additional unit, while crowding out less than one third of a private housing unit. Program-based only added 0.2–0.3 units and crowded out 0.7–0.8 of a private housing unit. This evidence shows that tenant-based assistance is more effective at adding more units to the occupied housing stock as well as crowding-out less privately developed housing units.

In conclusion, Sinai and Waldfogel (2005) found that overall units financed by the government do in fact raise the total number of occupied units, although on average three units of subsidized housing displaces two units of private housing that would have otherwise been occupied. There is less crowd out in more populated areas, such as MSAs, and less crowd out in areas that have a higher demand from eligible participants of low-income subsidies compared to the supply of subsidized housing. Finally, the authors conclude that tenant-based housing programs are more effective than other subsidy housing programs at providing housing to those who would otherwise not have their own.

Some suggestions for future research would be to perform a similar analysis that includes recent data. The research for the paper was done in 2001, which leads us to question whether trends and conclusions would change with new data. In the paper, the researchers state that at the time of the research there had been rapid growth of tenant based subsidies. With new research from the last decade, it could be determined whether this trend continued on or if project based housing subsidies grew instead. Another area to research would be on what the actions the recipients of low income housing subsidies would actually take if given a low income subsidy. This could be done by interviewing people who are eligible for this type of program. In the paper some assumptions of the actions of these participants were made. For example, the authors say that by giving a family who currently lives with another family a subsidy the family will move out and occupy a new housing unit, which adds to the total number of occupied units. It may be difficult to determine what actions the family would actually take based on other factors that may influence their decision. With a subsidy, a family may have to start paying 30 % of their rent on a new unit when previously they were living rent free in a different unit. This may not be affordable to all families.

As mentioned above, we would recommend further research on this topic with new data from 2001 to the present to see if the authors' findings are still relevant today. Looking specifically at the effect the recession in the 2000s had on this topic would also be something to further look at. Research would show if during the recession the demand for low-income housing increased, which in turn may have affected some of the findings discussed in this paper. The researchers could also

look into whether or not low-income housing subsidies are the best way to provide people in need with housing. Further research could explore any alternatives to housing subsidies as well as the opinions of those recipients of the subsidies on what could be improved upon.

As discussed in Urban Economics by Arthur O'Sullivan (2012), this paper explores the displacement effect subsidies have on the private market, the efficiency of the subsidized new private housing, as well as which housing policy is best. The textbook states that the best housing policy depends on the individual area and it would be best to give direct grants to local governments so that they could decide the best mix of housing subsidies and vouchers. The textbook and this paper both conclude that the ideal subsidy program would be a mix of program-based and tenant-based housing.

24.1 Multiple Choice Questions

1. According to Sinai and Waldfogel (2005), the crowd out effect is lower in what type of area?

a) A Low Pressure Area
b) A Medium Pressure Area
c) ***A High Pressure Area***
d) None of the above

Explanation One key finding of the paper was that the crowd out is lower in high pressure areas. A high pressure area is one with very few subsidized houses compared to a relatively large population in need. A low pressure area is one with a high supply of subsidized housing compared to a relatively low demand from eligible participants. In a high pressure area, adding one additional subsidized unit will increase the total housing by 0.49 units. In comparison, adding one additional subsidized unit in a low pressure area will only increase total housing by 0.44 units. The authors conclude that these results show that in high pressure areas, subsidized housing will have a greater effect on increasing the total number of housing units than in a low pressure area.

2. According to Sinai and Waldfogel (2005), what percentage of income are recipients of tenant-based housing subsidies required to pay in rent?

a) 25 %
b) 50 %
c) 10 %
d) ***30 %***

Explanation Programs like Section 8 and other voucher programs are tenant-based. Eligible participants typically receive a voucher for the difference between the fair market value of the housing and their contribution. A family meeting the eligibility criteria typically pays 30 % of their income in rent. The remaining 70 % of rent is given in the form of a voucher. Depending on the authority that the participant gets the voucher from the rules may vary.

3. According to Sinai and Waldfogel (2005), which of these were controls used in the regressions?

a) Age
b) Race
c) Income
d) Marital Status
e) ***All of the above***

Explanation The authors ran various regressions on the cross-sectional data with controls for age, race, income, and marital status weighted by population and split out by state. These controls allowed Sinai and Waldfogel to effectively analyze the data and find the true relationships involved between total population, total subsidized housing, and total housing units.

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Mortgage Credit Expansion

25

Joint Work with Justin Shor and Jordan Teschendorf

Written in 2009 in the midst of the greatest economic recession since the Great Depression, "The Consequences of Mortgage Credit Expansion: Evidence From the U.S. Mortgage Default Crisis", by Atif Mian and Amir Sufi, analyzes the primary reasons for the increase in sub-prime mortgage lending leading up the housing bubble burst of 2007 and the subsequent drastic rise in mortgage defaults. The goal of the paper is to empirically examine three competing explanations for the subprime mortgage expansion and the resulting default crisis.

The first popular explanation asserts that the income prospects of subprime borrowers may have improved in the early 2000s, leading to better creditworthiness and justifying the high relative growth of mortgage credit to subprime borrowers over this time period. The second explanation maintains that the expansion of credit to subprime borrowers may have been caused by an outward shift in the supply of mortgage credit by lenders due to many potential explanations (risk diversification, moral hazard, etc.). The third and final explanation evaluated argues that the credit expansion to subprime borrowers was largely the result of increased expectations of future house price growth resulting in lower perceived loss given default and a greater inclination to extend credit to riskier clients.

With assistance from data provided by Equifax, a company that provides and maintains consumer credit history and related data on households in the United States, the authors conducted a comparison between subprime and prime zip codes, defined as the highest and lowest quartile zip codes in the national distribution based on a cross section of 1996 credit scores. This illustrated that default rates since 2006 were over three times as high for subprime borrowers within the same metropolitan area. In their analysis, the authors work with a sample of 18,408 ZIP codes obtained from Equifax or HMDA data between 1996 and 2007. These ZIP codes represent 92 % of the entire U.S. population. The authors also note that the fraction of subprime borrowers living in a given ZIP code is critical to their analysis. Their main measure of subprime borrowers is consumers with a FICO credit score below 660 as of 1996.

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To test their assumptions, the authors use a simple model of mortgage lending where default probability is determined exclusively by income. The model uses a series of equations that take a variety of factors into account, including income profile, credit supply factor, expected house price appreciation, and default probability, among others.

The authors break up their findings into three areas, each corresponding to the three competing explanations detailed previously. The first potential explanation, the income-based hypothesis, finds that income growth from 2002 to 2005 is concentrated among prime segments of the population that did not experience disproportionately high credit growth, a direct contradiction to the income-based hypothesis discussed earlier by the authors. They show that there is a statistically significant negative relationship between income growth in subprime ZIP codes and relative growth in mortgage credit, and this is the only period in the past 18 years in which this relationship holds. The authors show that the period in which credit growth becomes negatively correlated with income growth directly overlaps with the expansion of subprime mortgage securitization. The sharp increase from 2002 to 2005 in the fraction of mortgages sold by originators to non-GSE (Government sponsored entities) reflects a dislocation of those who originate the loan and those who confer the risks and rewards of loan performance.

The second potential explanation, the supply-based hypothesis, supported the fact that mortgage credit to subprime zip codes grew faster in subprime zip codes despite the lower relative income growth compared to prime zip codes. This fact is seen in an outward shift in the supply of credit to subprime zip codes. Another notable finding is that the denial rate for subprime ZIP codes falls disproportionately from 2002 to 2005. In addition, the fraction of mortgages sold to non-GSE investors increased disproportionately during this period as well. This was accompanied by an increase in subprime mortgage securitization.

The third and final potential explanation, the house price expectations-based hypothesis, used differing housing supply elasticities to test whether expectations of future housing price growth contributed to the extension of credit to riskier borrowers. From 2002 to 2005, subprime ZIP codes experience negative relative income growth, a relative increase in the fraction of securitized mortgages, and positive relative mortgage origination growth. In addition, from 2005 to 2007, subprime ZIP codes with high supply elasticity experience a sharp relative increase in mortgage default rates. The data shows that mortgage origination growth remained positive in high housing supply elasticity MSAs, despite a lack of expectation for housing price growth in the same areas.

The authors admit shortcomings in both the income-based and house price expectations-based hypotheses and find more empirical support for the supply-based hypothesis. To reiterate some of the findings in testing the three hypotheses, subprime ZIP codes experience strong relative growth in mortgage credit from 2002 to 2005. This result is surprising given the negative relative and in some cases absolute income growth for subprime borrowers. The authors acknowledge that economically similar times, such as 1990–1994, saw no corresponding shift in non-mortgage consumer credit from 2001 to 2005 and there was no relative growth

in mortgage credit to subprime borrowers during this period either. The rapid rise in securitization of subprime mortgages led to a decline in denial rates for subprime ZIP codes, a drop in subprime interest rates, and a dissociation between the mortgage lenders and the people responsible for the ultimate loan performance. While the authors admit several shortcomings of their research and findings, the question of why mortgage lenders lent so much money to borrowers that were not creditworthy remains unanswered. In addition, the authors use ZIP code data as of 1996 to determine the percentage of subprime borrowers in an MSA. Gathering more recent data, after 2002, might eliminate some of the variation that has occurred since 1996 in the form demographic changes. A final area of potential future research involves examining the relationship between mortgage credit growth and income growth over a period of time greater than the 18-year period the authors analyzed.

While void of strict causality claims, the paper outlines a number of alarming facts and pieces of data that prompt the reader to critically evaluate both the borrowers' and lenders' roles in the mortgage market and how a future housing crisis can be prevented or averted. As demonstrated by the recent recession and housing market collapse, subprime borrowers were given unfettered access to cheap money despite their inability to cover the full cost of the mortgage they had taken on. This raises the question of where the fault lies in subprime lending, namely, a moral hazard problem that arose as a result of the spike in subprime mortgage origination and securitization. While it may be easy to point to the finger, perhaps both the borrower and lender are to blame for engaging in the risky and gratuitous behavior that resulted in the worst recession since the Great Depression.

25.1 Multiple Choice Questions

1. According to Mian and Sufi (2009), which of the following correctly describes the relationship observed between mortgage credit growth and income from 2002 to 2005?

a) **Mortgage credit growth to subprime borrowers was disproportionately higher than prime and negatively correlated with income growth.**
b) Mortgage credit growth to subprime borrowers was disproportionately higher than prime and positively correlated with income growth.
c) Mortgage credit growth to subprime borrowers was the same as to prime borrowers and positively correlated with income growth.
d) Mortgage credit growth to subprime borrowers was the same as to prime borrowers despite a negative correlation with income growth.

Explanation The authors show that mortgage origination growth is almost 40 percentage points higher in subprime than in prime ZIP codes from 2002 to 2005. In addition, as the fraction of subprime borrowers within a given county increases,

we observe that income growth slows by a statistically significant margin. Because credit growth is larger in subprime ZIP codes that experience a decline in relative income, we observe a negative correlation between credit growth and income growth during the 2002 to 2005 period. Given this observation, choice (a) is the correct answer. Choices (b) and (c) are incorrect because mortgage credit growth to subprime borrowers was negatively correlated with income growth during this period. Choice (d) is incorrect because mortgage credit growth to subprime borrowers was higher than mortgage credit growth to prime borrowers during the 2002–2005 time period.

2. According to Mian and Sufi (2009), what was the primary determinant of defining what constituted a subprime borrower in the authors' model?

a) The Borrower's ZIP Code
b) The Borrower's Race
c) **The Borrower's FICO Credit Score**
d) The Borrower's Age

Explanation Choice (c) is correct because the authors explicitly state that the borrower's FICO credit score was the main measure used in determining if a borrower was a subprime borrower and, in turn, if they live in a subprime ZIP code. Choices (a), (b), and (d) have nothing to do with determining whether a borrower is a subprime borrower as an individual.

3. According to Mian and Sufi (2009), which of their hypotheses was the most plausible hypothesis to explain the credit expansion to subprime borrowers?

a) Income-based Hypothesis
b) **Supply-based Hypothesis**
c) Housing Price Expectations-based Hypothesis
d) All three hypotheses were accurate

Explanation The supply-based hypothesis is supported by the fact that mortgage credit to subprime zip codes grew faster in subprime zip codes despite the lower relative income growth compared to prime zip codes. This fact is seen in an outward shift in the supply of credit to subprime zip codes. Because of this fact, choice (b) is correct and (a) is incorrect. Subprime lending increased during a period with lower relative income growth. Choice (c) is incorrect because data showed that mortgage origination growth remained positive in high-housing supply elasticity MSAs, despite a lack of expectation for housing price growth in the same areas. Choice (d) is incorrect for obvious reasons.

Reference

Mian, A. and A. Sufi (2009), "The Consequences of Mortgage Credit Expansion: Evidence from the U.S. Mortgage Default Crisis", *The Quarterly Journal of Economics* 124, 1449-1496.

Government Programs and Labor Markets 26

Joint Work with Charles York, Jess Yang, Brian Zinoviev, Peter Hui Zhang

Since the 1980s, federal and state governments have created multiple programs to improve employment in disadvantaged neighborhoods. In their research, Ham et al. (2011) focused on measuring the impact on the labor market of three such programs: State Enterprise Zones (ENTZ), Federal Empowerment (EMPZ) and Federal Enterprise Community (ENTC); see Green and Malpezzi (2003) for an excellent review of housing policies and programs in the U.S. It is important to assess the outcomes of these programs for three reasons. First, these are expensive programs that cost a substantial amount of tax money from governments. Second, these programs provide alternatives to other programs aiding low-income labors such as Job Corps, which only has a modest effect. Third, the evaluations conducted previously on these programs were not sufficient. Thus, Ham et al. (2011) calculated the impact of ENTZ, EMPZ and ENTC by analyzing the 1980, 1990 and 2000 Census Data, and found that all the three programs have significant benefits for employment of disadvantaged labors.

Contrary to previous research, Ham et al. (2011) used census tracts data instead, which has a much lower aggregation level than the Zip code or county level. By using census tract data, the effect of ENTZ can be better captured. The census data from 1970 was not included because matching census tracts between 1970 and 1980 are very difficult. Moreover, the definition of "labor force" changed between 1970 and 1980. Thus only census data from 1980, 1990, and 2000 were used for the research.

In their research, Ham et al. (2011) utilized three estimators to assess the effect: a conservative difference in difference in difference (DDD) estimator, a more restrictive DDD estimator, and the Heckman-Hotz random growth model, where the most restrictive assumptions were made. In the conservative DDD, they assumed that the quadratic trends of an ENTZ are the same as the nearest Non-ENTZ's. In the more restrictive DDD, they assumed that the ENTZ shares the same quadratic trends on average with the contiguous Non-ENTZs. In the Heckman and Hotz (1989) random growth model, all ENTZs and Non-ENTZs in the same state share the same trends.

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In their research, Ham, Swenson, Imrohoroglu, and Song found that all three programs had positive, statistically significant, impacts on local labor markets. The outcome measures that were analyzed and found to be impacted positively included the unemployment rate, the poverty rate, the fraction with wage and salary income, and employment.

With ENTZ programs, tax benefits vary by state and can come in the form of income tax, property tax, and/or sales tax benefits. The magnitude of expenditure also varies by state and local areas. The overall effect of the ENTZ at a national level is as follows: unemployment falls 1.6 %, poverty drops 6.1 %, average wage and salary increase by $700 (in 2000 $), employment rises by 61 people. Due to imprecise estimation, the ENTZ impact at a state level was statistically insignificant.

For both EMPZ and ENTC designation, the annual cost to the government is $3,000 per resident, provided as a tax credit to employers. In 2006 the combined annual cost for these two programs was $1.21 billion.

The national weighted average overall effect of EMPZ designation on the five measured categories is as follows: (i) unemployment drops 8.7 %, while poverty drops 8.8 %; (ii) wage and salary income increase significantly by $6,000, and employment increases by 238 people. All of these statistics are significantly higher than ENTZ.

The national weighted average overall effect of ENTC on the five measured categories is as follows: (i) unemployment decreases 2.6 %, while poverty rate decreases 20 %; (ii) salary and wage increase by $3,209, and employment increases by 154 jobs; and the fraction with positive employee earnings increases by 1.36 %.

To summarize, all three programs significantly improve labor markets. ENTZ designation significantly affects all outcome measures but the fraction of households with wage and salary income. EMPZ designation improves the labor market in terms of every category except the fraction with wage and salary income, while ENTC improves all five measured categories of unemployment, poverty rate, salary and wage, employment, and fraction with positive employee earnings. The effects of EMPZ and ENTC designations on all five of these categories are considerably larger than the impact of ENTZ designation. This may be due to the fact that EMPZ and ENTC are usually implemented in much more disadvantaged labor markets. Also, very little evidence was found of spillover to the nearest non-treatment tract.

These results are noteworthy because this is the first study to compare all of these three programs simultaneously, allowing for policy makers to compare relative impacts. This is the first study to find that, on average, ENTZ designation actually has a significantly beneficial effect on local labor markets. While ENTC and EMPZ designations pose a significantly higher impact on unemployment, poverty rate, salary and wage, employment, and fraction with positive employee earnings, all three programs significantly improve local labor markets.

Some suggestions for future research would be to perform the same, or similar analysis with data from the 1990, 2000, and 2010 census as well as looking at how the ENTC, EMPZ and ENTZ programs have worked within industries that have received subsidies or other benefits from the government. The analysis including the 2010 census data would provide updated information and also allow the

possibility of including more tracts. In looking at how these programs have worked in industries with other federal assistance, one could see how the additional government programs have been benefited or hindered by other government assistance. One weakness that was seen in the research was the fact that their choice of using census tracts limited them to a smaller of amount of overall data.

In connection with O'Sullivan's (2012) discussion of how the implementation of a tax can decrease the demand for labor due to increased overall costs for the firm, Ham et al. (2011) found that tax breaks (exemptions/credits) can increase the demand for labor and reduce the overall costs to the firm. Additionally, drawing from O'Sullivan (2012), a higher crime rate can be seen as a factor that decreases the housing prices in that area. Since high unemployment and poverty rates are often correlated to higher crime rates, the decrease in unemployment and poverty within the coverage of these government programs can be seen as indirectly reducing crime rates. Thus, the implementation of these government programs studied by Ham et al. (2011) could indirectly increase housing prices within the areas positively affected.

26.1 Multiple Choice Questions

1. According to Ham et al. (2011), what does ENTZ stands for?

a) Empowerment Zones
b) State Networking Zones
c) Enterprise Community
d) **State Enterprise Zones**

Explanation ENTZ stands for State Enterprise Zones. Two of the other options, Empowerment Zones and Enterprise Communities refer to federal programs, while the other option, State Networking Zones, is not one of the programs that is addressed in the paper. The State Enterprise Zones vary from state to state but for the most part involve substantial governmental costs in the form of tax credits available to firms within these Enterprise Zones.

2. According to Ham et al. (2011), why is using census tract data more effective than using Zip code level data?

a) Because census tract data is easier to access
b) **Because census tract data is less aggregated and can better capture the effect of ENTZ**
c) Because census tract data is more aggregated and can better capture the effect of ENTZ
d) Because census tract data is more precise

Explanation According to Ham et al. (2011), census tract data is used to assess the effect of ENTZ because it is less aggregated than Zip code data. A census tract is a geographic area that is defined as the smallest territorial unit for the purpose of a census. An area that shares a same Zip code is relatively larger compared to a census tract. Given that ENTZ is usually applied to relatively smaller geographic areas, census tract data is more effective for capturing the effect of ENTZ.

3. According to Ham et al. (2011), the designation all three programs had a positive, significant impact on

a) Unemployment Rate
b) Poverty Rate
c) Employment
d) **All of the Above**

Explanation According to Ham et al. (2011), from their analysis of ENTZ, EMPZ, and ENTC programs, the designation of any one of these programs was shown to significantly and positively impact the labor market in a given area, including the measured outcomes of unemployment rate, poverty rate, and overall employment.

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