The Park Place Economist

Volume 29 | Issue 1 Article 6

2022

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## Abstract

Widespread urbanization in the United States over the years has changed the economic landscape of the country dramatically. This study explores the effect of working in a rural versus an urban area on wages in Illinois. General research suggests that there may be wage premium for working in urban areas, but this study takes a slightly different approach by focusing on county-by-county data as opposed to regional data. Labor market wages are considered in the context of efficient market theory. Linear regression models are run using data from the American Community Survey in order to explore whether there is a wage premium for those working in an urban county in Illinois.

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Widespread urbanization in the United States over the years has changed the economic landscape of the country dramatically. This study explores the effect of working in a rural versus an urban area on wages in Illinois. General research suggests that there may be wage premium for working in urban areas, but this study takes a slightly different approach by focusing on county-by-county data as opposed to regional data. Labor market wages are considered in the context of efficient market theory. Linear regression models are run using data from the American Community Survey in order to explore whether there is a wage premium for those working in an urban county in Illinois. Empirical results reveal that there is indeed a wage premium that exists for working in an urban county in Illinois and thus that labor markets are not adjusting efficiently to changes in demand. This finding has implications for those deciding on where to bring their knowledge and skills and provides even greater incentive to work in an urban area.

## I. Introduction

The industrial revolution significantly changed the ways in which workers did their jobs and life as people knew it back in the 18$^{th}$-19$^{th}$ century. It is widely agreed upon that this revolution touched almost every aspect of everyday life. For example, Clark (2008) found that there were three primary factors that all coincided to allow for society to progress rapidly: productivity growth (in part due to technological growth), a decline in both fertility rates and infant mortality rates, and increases in human capital by way of increased literacy. These events led to effects such as improved standard of living,

rising average income, and a skyrocketing population. Fundamental changes in the way tasks were carried out in the workplace coupled with the massive increase in the population led to the process of urbanization. As time passed, more and more people began moving from rural to urban areas in search of opportunity. This led to a large clustering of economic activity in urban areas and shifted it away from rural areas. A significant contributor to the migration of many rural workers away from their homes was the mechanization of agriculture. As farming equipment became cheaper and more efficient, less manpower was needed to produce the same output as years prior. The demand for labor in rural areas thus began to fall, as these new labor-saving technologies offered a cheaper replacement for the same amount of work. On the other hand, demand for labor increased in urban areas, as there was a newfound need for an excess of workers because of the extreme amount of growth and sheer number of new companies entering the market. Millions of people flocked to urban centers as this opportunity arose since this work provided better incentive (for various reasons) than staying rural. However, is there truly a premium to this day for working in an urban center? Expanding upon that, the question I wish to explore in this paper is does living in an urban versus a rural area affect wages/salary, holding all else equal? In modern times, this question is possibly the most important it has ever been. The answer to this question can have important and significant implications for people who may be deciding on where to enter the labor force and where to take their knowledge and skills, such as those who have recently graduated college. If there truly is a wage disparity between urban and rural areas and a "penalty" for staying rural, then this will offer even more incentive for rural workers to take their labor elsewhere and move to urban centers.

In order to answer this question of whether urban and rural wage disparities exist, I will be taking a few different factors into consideration. Most importantly, I will be focusing my research on the counties in the state of Illinois exclusively as opposed to conducting a country-wide analysis to attain more location-specific results. Illinois has a healthy mix of both heavily urbanized and isolated rural

counties, which will work well for the purpose of this study. I will use the ACS database to collect data and run multiple linear regression models to predict the wage differentials between urban and rural areas after controlling for different variables, such as demographic and human capital differences.

## II. Literature Review

Although there is not as much research on how location impacts wage levels compared to how other variables may impact wages, there is still relevant literature that must be addressed in order to obtain some background knowledge related to my research question. We will start by exploring what the literature has to offer on the wage determinants. Based on intuition, one can assume a few determinants of wages: education level, field of study, cognitive ability, etc., but does the literature agree? One study of German college graduates done by Kopecny and Hillmert (2021) found strong supporting evidence of wage variation based on field of study and regional labor market differences. These are significant findings because typically those who are successful in the higher-paying fields must have the accompanying human capital traits to be able to perform well, and this aligns with the theoretical framework discussed later in this paper. It is also important that regional labor market differences were found to influence wages, as this provides evidence for the notion that location can have an impact on wage levels.

A crucial assumption in my research is derived directly from human capital theory. Human capital theory, which I will go into more in-depth in the next section, allows for there to be measurable productivity-related factors that can provide valuable insight into what an individual's wage levels may be. Previous literature seems to support the notion that human capital variables are relevant to wage levels, and I am particularly interested in human capital variables such as educational attainment. One noteworthy piece of literature explored this relationship between educational attainment and wages. Serneels (2008) collected firm-worker data was collected from the Ghana Manufacturing Enterprise

Survey 2000 to discover the relationships between performance, education, cognitive ability, and wages. The findings indicated that education is correlated with wages in two different ways. First, education is correlated with the allocation of job level; if you have a higher education, you are more likely to attain a higher job level, and thus a higher wage. Second, education serves (at least partially) as a signaling device for cognitive ability, and cognitive ability is related to performance. It seems that much of the literature comes to the same conclusion that human capital variables such as educational attainment are, in some way, related to wages. Thus, it will be important to control for differences in educational attainment between urban and rural counties in order to keep results consistent and accurate.

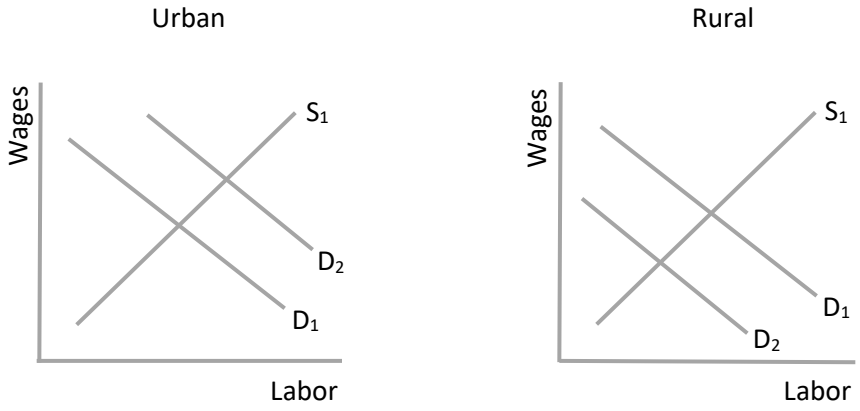
On the topic of urban versus rural wages specifically, one of the most noteworthy findings from the literature came from Zhi Wang (2016). Wang used a sample of college graduates from 2000 U.S. Census data to look at the relationship between wage growth and the location of labor-force entry. Data points are split into large city and small city/rural area categories with city data being utilized from all over the United States. This is one area in which my research differs from this study; this is a nationwide study, while I will only be analyzing the state of Illinois. The results from Wang's research supported the notion that people earn higher wages in urban areas; for an average-ability worker who entered the labor force in a large city, the "urban wage premium" five years after labor-force entry was 22.9%. This is a significant finding and applies directly to my research question, as this is one of the very questions I am seeking to answer myself. It is worth noting that these findings came on a nationwide scale compared to the statewide scale I will be using, along with data that is 19 years older than the data I will be using. Nonetheless, I still believe it is applicable and expect to arrive at similar results.

## III. Theoretical Framework

There are two relevant theories to my research question: the theory of supply and demand and human capital theory. The theory of supply and demand is a staple of economic thought and is based on

the law of demand and the law of supply. These two laws interact, in our case, to determine the levels of wages and quantity of labor. The willingness of workers to supply labor to an industry is represented by the labor supply curve, and the willingness of an industry to hire workers is represented by the labor demand curve. These two curves meet at an equilibrium point where the amount supplied is equal to the amount demanded, and in our case, this point decides the equilibrium wage level and labor level. In the case of urban and rural labor markets, we need to look back to the mechanization of agriculture to get a complete picture. Seen in Figure 1, the demand for labor in the rural labor market falls since less manpower is needed, and so workers begin leaving these areas in favor of urban areas. On the other hand, demand for labor increases in urban labor markets as the size and number of businesses continues to increase as a result of industrialization in urban centers. This creates a wage differential that favors urban areas, and this should trigger supply shifts. According to an efficient market, we would expect supply to shift away (to the left) from rural areas and toward (to the right) urban areas, and thus the wage differential to be eliminated. However, if supply does not shift rapidly and there is a prevailing gap in the wage level between urban and rural areas, we will know that there are frictions that are preventing the market from being efficient.

Figure 1



The other theory that is relevant to this paper is human capital theory. Human capital theory states that as an individual raises their human capital, i.e., educational attainment, skills, experience, etc., their wages should increase accordingly since they offer higher productivity. For example, in 1997, Goldsmith et al. (1997) drew a sample of 12,686 people from the National Longitudinal Survey of Youth (NLSY) who had been surveyed in 1980 and again in 1987. The goal of this study was to see if physical human capital traits, among other things, have an impact on wages. The results showed that human capital variables such as formal schooling and work experience do indeed relate to wages (Goldsmith et al., 1997). Human capital theory is used in the context of my paper because I will be using educational attainment as a primary variable in order to see if it can explain the difference in wages between urban and rural areas. For example, if there is simply a higher concentration of college-educated workers in urban areas, this could explain the difference in wages and thus the labor market would still be efficient. This would make sense as it is widely accepted throughout the literature that education and wages are positively correlated. For example, in a study done in 2014, it was found that the college earnings premium has risen from 43% ($15,750) in 1980 to 61% ($20,050) in 2011 (Daly, M., Bengali, L., 2014). Data for the study was pulled from the Panel Study of Income Dynamics (PSID) and is a longitudinal study that includes more than 40 years of data on educational attainment and wage information, among other things. These findings are significant because it provides further proof that having a college education gives you an automatic advantage over those without one, and this is a crucial assumption in my research. This theory of human capital also ties into the efficient market theory discussed in the previous section because if it is found that human capital variables fail to explain the difference in wages between urban and rural labor markets, it would mean that there are frictions and thus that the labor markets are not efficient. Human capital theory is a very popular and widely cited theory, and I believe it ties in very well to the core of my research.

## IV. Data and Empirical Model

My hypothesis is that urban and rural labor markets will not adjust efficiently to maintain equal equilibrium wage levels in urban and rural labor markets. I expect there to be disparities in wage between rural and urban areas and thus for there to be frictions preventing the markets from adjusting efficiently, holding all else equal. In order to discover if labor markets are not adjusting efficiently, I will be collecting data related to the most important aspects of this question: wage levels amongst populations, wage data by location (urban versus rural), and educational attainment amongst this population. These variables will make this hypothesis testable in that we will be able to see just what kind of wage disparity exists between urban and rural areas, and we will be able to test the location variables to see if they play a significant role in these disparities, holding all else equal. If other variables cannot account for this difference, then we will know that there are frictions that are causing wage disparities between urban and rural areas.

The database used for this research is the IPUMS 2019 American Community Survey (ACS) database. The sample used for this analysis only consists of data from the state of Illinois and consists of 76,395 observations. The age range I have decided to use for this research is from ages 18-65, in order to account for most people who are able to work. The ages 18-21 are included in consideration of those who decide not to pursue a college degree in favor of working in trades or a similar line of work. Also, in order to be included in the regression, individuals must be classified as employed, which is classified as working at least 36 hours a week.

Annual ages will be the dependent variable for the regression equation. Of the independent variables, most important in the regression is the location variable; it is denoted as “Urban” and assigned a value of 1 if the individual works in an urban area. The coefficient to this dummy variable will indicate whether there is a wage premium for those who work in urban areas versus rural areas.

Education, human capital, and other miscellaneous but important control variables will also be included as independent variables. The following educational attainment dummy variables are included: high school graduate, some college, Bachelor's, Master's, Professional degree, and Doctorate. If one's educational attainment fulfills one of these categories, it will be assigned a value of 1. As discussed earlier, I expect there to be an increasingly high wage premium the more education one has achieved. Race variables are also split into dummies; I created dummies for the variables Black, Asian, and OtherRace. The other race variable consists of those who have indicated "other" and those who indicated that they identify as multiracial. I will also control for other independent variables such as age, gender, language, and marital status. The gender variable is denoted as Male and is assigned a value of 1 if the individual is male; EnglishLang is the language variable and is assigned a value of 1 if the individual speaks English; and marital status is assigned a value of 1 if the individual is married.

Focus will be placed only on the state of Illinois, which is an important aspect that sets this research apart from other similar studies done in the past. Each county's population will be measured, and each will be put into a category depending on whether it is considered rural or urban. The following counties are categorized as urban: Champaign, Cook, DuPage, Kane, Lake, McHenry, McLean, Madison, Peoria, Rock Island, St. Clair, Sangamon, Will, and Winnebago. The largest county by population included in the urban category is Cook County, with a population of 5,275,541; on the other hand, the smallest county by population included in the urban category is Rock Island County, with a population of 144,672. As is expected, the majority of these urban counties are a part of or border large metropolitan areas such as Chicago and St. Louis. All remaining counties in Illinois are categorized as rural for the purposes of this study. Although there are counties in which both urban centers and expanses of farmland coexist, there will be no middle-ground, and they will be placed into one of the two categories based on population.

The first regression I will use to test my hypothesis is as follows:

$Wages = B_0 + B_1(Urban) + B_2(Male) + B_3(Married) + B_4(Black) + B_5(Asian) + B_6(OtherRace) + B_7(Age) + B_8(EnglishLang) + B_9(HSGrad) + B_{10}(SomeCollege) + B_{11}(Bachelor's) + B_{12}(Master's) + B_{13}(ProfDegree) + B_{14}(Doctoral) + B_{15}(AgeSquared)$

I will test to see which coefficients to the independent variables are statistically significant in order to see which variables, if any, are affecting wages. In the regression above, we expect the educational attainment variables to be significant since we know that education is correlated with wages. Markets can still be efficient if these variables are statistically significant. On the other hand, though, if the Urban variable is significant, this will signify that the location in which one works has an impact on wages, holding all else equal.

I will also run an additional regression that includes interaction variables for each level of educational attainment and the Urban variable. I am running this regression in order to see if the effect of any of the educational attainment variables on Wages changes depending on the value of the Urban variable. This interaction will test whether the effect of having a certain education on wages will change depending on if they work in a rural versus a rural area. Interactions are run for each level of education in the model. The regression is as follows:

$Wages = B_0 + B_1(Urban) + B_2(Male) + B_3(Married) + B_4(Black) + B_5(Asian) + B_6(OtherRace) + B_7(Age) + B_8(EnglishLang) + B_9(HSGrad) + B_{10}(SomeCollege) + B_{11}(Bachelor's) + B_{12}(Master's) + B_{13}(ProfDegree) + B_{14}(Doctoral) + B_{15}(AgeSquared) + B_{16}(IntHSGrad) + B_{17}(IntSomeCollege) + B_{18}(IntBachelor's) + B_{19}(IntMaster's) + B_{20}(IntProfDegree) + B_{21}(IntDoctoral)$

This regression is run with the purpose of getting a better understanding of the relationships between each variable in the regression. In this case, it offers valuable insight into the relationship

between education and job location; from this we can determine, for example, whether a bachelor's degree has a higher return in an urban area versus a rural area.

## V. Results

A linear regression model was run in order to test the effect of different variables on Wages and to test my research hypothesis. Before analyzing those results, though, it would be useful to analyze a descriptive statistics table, presented in Table 1, in order to acquire a better overall understanding of each variable in the regression.

**Table 1**

**Descriptive Statistics for 2019 ACS Data Set: Rural vs. Urban**

| 2019 Sample | Rural | Urban |
|---|---|---|
| Male | 51.2% | 49.1% |
| Married | 54% | 50.4% |
| White | 92.7% | 72.4% |
| Black | 4.3% | 12.5% |
| Asian | 0.8% | 7.5% |
| Other Race | 2.2% | 7.6% |
| Fluent in English | 95.2% | 74.3% |
| HS Dropout | 8.6% | 8.2% |
| HS Grad | 33.2% | 20.7% |
| Some College | 38.3% | 28.2% |
| Bachelor's | 13.8% | 26.5% |

| | | |
|---|---|---|
| Master's | 4.9% | 12.1% |
| Professional Degree | 0.7% | 2.8% |
| Doctoral | 0.6% | 1.6% |
| Employed | 70.8% | 75.0% |

There are a few noteworthy takeaways from this table. First, there are noticeable differences in the demographic variables between rural and urban areas; there is a significantly higher percentage of White individuals in rural areas as opposed to other races. There is a relatively small percentage of other races present in rural areas. The biggest and most noteworthy differences, though, are in the educational attainment variables. A significant majority of individuals in the rural category have not earned a bachelor's degree: 71.5% of rural individuals have only completed either high school or some college. On the other hand, only 48.9% of the urban population stopped at these levels of education. 26.5% of the urban population has achieved a bachelor's degree, while only 13.8% of the rural population has done so. The numbers are equally polar for higher levels of educational attainment. This higher percentage of highly-educated individuals in urban areas would suggest that we should see higher levels of wages in these urban areas — the real question is whether this premium will still exist when holding these variables constant. The regression results are shown in Table 2 and certainly answer this question.

**Table 2**

**Regression Results for 2019 ACS Data Set (Standard Errors in Parentheses)**

| **Model 1** | **Unstandardized Coefficients** |
|---|---|
| Constant | -108130***<br>(2336.234) |

| | |
|---|---|
| Urban | 13176***<br>(492.222) |
| Male | 23372***<br>(423.490) |
| Married | 13064***<br>(479.913) |
| Black | -12429***<br>(744.113) |
| Asian | -4008***<br>(1031.830) |
| OtherRace | -2661***<br>(964.394) |
| Age | 4695***<br>(110.646) |
| EnglishLang | 9032***<br>(635.552) |
| HSGrad | 8567***<br>(855.921) |
| SomeCollege | 15882***<br>(838.511) |
| Bachelor's | 40035***<br>(890.836) |
| Master's | 55612***<br>(1031.669) |
| ProfDegree | 116034**<br>(1649.592) |
| Doctoral | 78661***<br>(2046.966) |
| AgeSquared | -52***<br>(1.286) |
| Sample Size | 76395 |
| Adjusted R-Squared | .232 |

Significance at the .10, .05, and .01 levels is denoted by *, **, and ***, respectively.

Each of the unstandardized coefficients represent the way in which the dependent variable (wages) moves when there is a one-unit change in the value of the independent variable. They are rounded to the nearest whole number (nearest dollar, in this instance). In this case, every independent variable is a dummy variable except for Age and AgeSquared, and thus each unstandardized coefficient value represents the change in wages that occurs when the value of the given dummy variable is 1. Each coefficient's significance is marked by three stars; it is interesting to note that every independent variable is significant to the .01 level. Focusing on our educational attainment dummies, we see that there is a positive relationship between wages and education: the higher your educational attainment, the higher the wage premium. The wage premium for someone with some college education over those who did not complete high school jumps from $15,882 to $40,035 when attaining a bachelor's degree. This is a huge jump and was expected based on the previous literature outlining the relationship between education and wages. As we can see, the largest wage premium exists for those with a professional degree; there is a massive $116,034 premium. The other human capital variables such as age and English language also show a positive correlation with wages. It is noteworthy that each of the race variables showed a negative correlation with wages; there are multiple reasons why this could be the case and would be an interesting topic to explore in future research.

The most important result is the urban wage premium: the regression results show that simply working in an urban area, ceteris paribus, offers a $13,176 wage premium. This result was statistically significant to the .01 level. This means that those working in urban counties in Illinois are earning this wage premium over those working in rural counties simply because of their location. This is a striking result, and it confirms the hypothesis that there is an urban wage premium and thus that labor markets do not adjust efficiently. This indicates the presence of frictions in the markets that are preventing this efficient adjustment. This result aligns with other research done on the topic and literature that was discussed earlier in this paper; for example, Zhi Wang's finding that there was a 22.9% urban wage

premium after being in the labor force for five years. The adjusted R-Squared value is about 23.2%, which indicates that 23.2% of the wage variation can be explained by the variables in the regression.

**Table 3**

**Regression Results for 2019 ACS Data Set (Standard Errors in Parentheses)**

| **Model 2** | **Unstandardized Coefficients** |
|---|---|
| Constant | -103715<br>(2535.303) |
| Urban | 8249<br>(1571.913) |
| Male | 23235<br>(422.852) |
| Married | 13080<br>(479.183) |
| Black | -11809<br>(743.527) |
| Asian | -5039<br>(1031.394) |
| OtherRace | -2104<br>(963.356) |
| Age | 4649<br>(110.462) |
| EnglishLang | 8449<br>(635.671) |
| HSGrad | 8469<br>(1432.029) |
| SomeCollege | 15417<br>(1415.292) |
| Bachelors | 28948<br>(1633.620) |
| Masters | 37690<br>(2121.400) |

| | |
|---|---|
| ProfDegree | 81208<br>(4703.106) |
| Doctoral | 51898<br>(5128.542) |
| AgeSquared | -51<br>(1.284) |
| IntHSGrad | -386<br>(1776.262) |
| IntSomeCollege | 606<br>(1739.928) |
| IntBachelors | 14971***<br>(1923.554) |
| IntMasters | 22690***<br>(2410.272) |
| IntProfDegree | 40433***<br>(5024.896) |
| IntDoctoral | 32771***<br>(5590.523) |
| Adjusted R-Squared | .236 |

Significance at the .10, .05, and .01 levels is denoted by *, **, and ***, respectively.

In addition to the first linear regression, I wanted to add a second regression that included interaction variables in order to get a better idea of the relationship between the education variables and location. These results are shown in Table 3. In these interactions, each education variable is being interacted with the Urban variable in order to model the relationship. It is not all that surprising that having a high school diploma or some college education does not affect wages all that much when interacted with the location variable — it seems being urban does not have much effect on influencing wages with either of these attainment levels. On the other hand, we have the college-level attainment variables: there are huge premiums when interacting with the Urban variable. The professional degree variable alone sees a $40,433 premium when interacting with the Urban variable, which is a massive

premium. Looking at this jointly with the Urban coefficient in this model, the estimated effect of working in an urban area with a professional degree is around $48,000. Therefore, the decision for a worker to bring his education and knowledge to a rural area may not be in his or her best interest as a working individual if his goal is to maximize income. Conversely, since there is no interaction variable for high school dropouts, the effect of living in an urban area would only be around $8,000. These interactions have big implications and not only emphasize the importance of education, but they also further accentuate the difference between possible wage levels in urban and rural areas in Illinois.

## VI. Conclusion

This study aimed to answer the question of whether there is a wage premium for simply working in an urban county instead of a rural county in Illinois, holding all else equal. Data was collected on individuals using county-by-county survey information and partitioned accordingly. A regression model was then run in order to explore the effect that different independent variables had on the wages of those in the sample group. The results were striking: for simply working in an urban county rather than a rural one, there is a wage premium of $13,176.896, holding all else equal. My hypothesis earlier in the paper was that labor markets would not adjust efficiently and thus there would be a wage gap between urban and rural areas. This hypothesis seems to be confirmed by the findings; despite all factors such as educational attainment being held equal, there still exists a significant wage premium for working in urban areas.

This wage disparity does lead to some possible policy implications. We know that many people continue to move to urban areas in search of opportunity and based on the findings it makes sense given that there is also a premium for working in urban areas. It may serve those who do work in rural areas well if some sort of incentive is implemented in order to either keep people in rural areas or make it an attractive option to move there. At the same time, though, this could possibly lead to even more

friction and thus market inefficiency. Perhaps a monetary incentive could work to level the playing field for those who do not have the ability to pack up and leave everything behind to move to an urban area. This could also take some pressure off urban areas that may be seeing too large of an influx of people.

Numerous studies have been carried out on what exactly influences the wages an individual will experience throughout his life. A small subsection of these studies explores the relationship between wages and labor market region; this is the area that I focused on in this paper. Even less research has been done on county-by-county data. The goal of this paper was to add to the relatively small amount of existing literature in that area and to provide a different perspective by focusing only on counties in Illinois. The findings in this paper align with the findings in similar literature that wages are dependent, in some capacity, on location. There are still many ways that this fundamental question could be explored — future research could go a few different directions. For example, in future studies on county-specific differences, a different categorization technique could be used. The classification of rural versus urban counties in Illinois proved difficult when accounting for those counties which have both rural and urban characteristics. Future research could also address even more factors that could be affecting wages in different areas, such as degree type. Finally, an additional layer could be added to this research by utilizing a longitudinal study in order to analyze certain rural and urban groups' wage levels over a period of time and comparing wage growth.

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