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How do Cities Matter? A Review of Missouri and Its Recent Economic Growth

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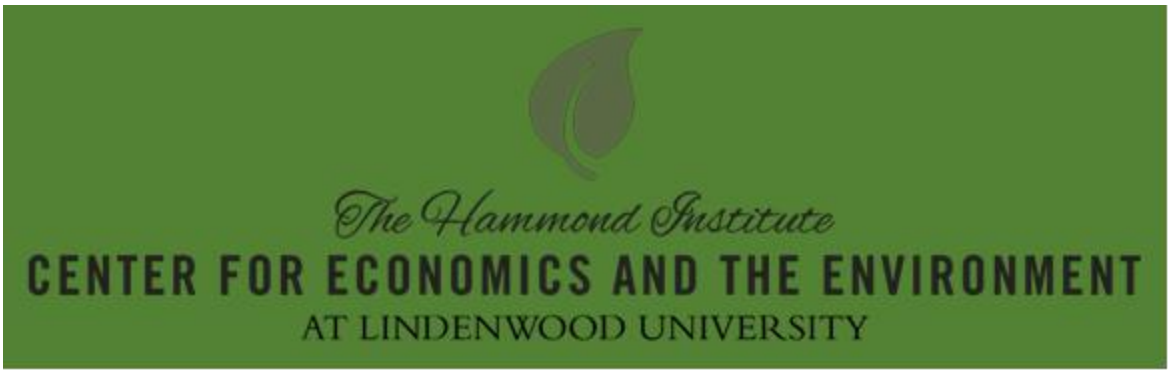

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by

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EXECUTIVE SUMMARY

The purpose of this paper to examine the data on economic growth across cities in the United States to see if the data supports the notion that cities are major contributors to their state's economic growth. We find that even though cities account for a disproportionate amount of economic growth in a majority of states, merely having a metropolitan area (or two) in your state does not guarantee economic success for the state. As we narrow the focus to Missouri, we find that over the past two decades not one metropolitan area in Missouri ranks higher in growth rates than 197th out of the 385 metro areas across the United States. In addition, we look at some policy decisions that might account for why some metropolitan areas grow at a lower rate than others do. We look into a specific policy, the imposition of an earnings tax. Since Kansas City and St. Louis city both levy such an earnings tax, such an analysis is not without immediate importance.

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1. INTRODUCTION

Based on population, number of payroll employees, and earnings per worker, the Missouri economy has not kept pace with the rest of the country.[1] The United States is a big country and there will be changes in the economic landscape over time as resources move to where they are most valued. But, the prolonged decay in Missouri's economy relative to the nation begs the question: Why? If resources can move about, wouldn't it seem like growth rates would eventually even out over long periods of time? [2]

Cities have been identified as engines of economic growth. Across the globe, we have witnessed a steady increase in the fraction of people living in urban areas over the last several decades. It is reasonable to presume that this migration owes something to the expected return to labor; people are willing to suffer the cost of moving in order to obtain the possibly higher returns—higher wages and amenities—to living in the city.[3] To help us understand why cities are important to overall economic activity and growth, Glaeser (2011) has documented the success and the decline in cities over time.[4] His central theme is that cities are economic successes, in large part, because they foment the exchange of ideas. Basically, technological progress is the end-product of someone implementing an idea. The most successful ideas breed spinoffs that are also valuable and cities are where idea exchange occurs at the lowest cost. In contrast, cities decline when policies lower the return to these ideas, inducing people to relocate.

The purpose of this paper to examine the data on economic growth across cities in the United States to see if the data supports the notion that cities are major contributors to their state's economic growth. Our analysis finds that first, cities account for a disproportionate amount of economic growth in a majority of states. Second, the evidence also shows that growth rates vary substantially across cities. This suggests that merely having a metropolitan area in your state does not guarantee economic success for the state. As we narrow the focus on Missouri metropolitan areas, we find that over the past two decades not one metropolitan area in Missouri ranks higher in growth rates than 197th out of the 385 metro areas across the United States.

In addition, we look at some policy decisions that might account for why some metropolitan areas grow at a lower rate than others do. In particular, we look for evidence of what is called "convergence." That is, do cities that had reported low real GDP in 2001 tend to grow faster than

cities with high levels of real GDP? In other words, do they converge toward a higher level of income? On the policy front, we also look into a specific policy, one in which some cities impose an earnings tax on those employed within the confines of their city boundary. This allows us to see whether the existence of an earnings tax tends to slow growth relative to cities with a lower or zero earnings tax rate. Since Kansas City and St. Louis city both levy such an earnings tax, such an analysis is not without immediate importance.[5]

The paper is organized as follows. A brief overview of the economic research that seeks to explain why cities serve as engines of economic growth is put forward in Section 2. In Section 3, we review the evidence on economic growth across states and the role of metropolitan areas. Section 4 presents the evidence on growth rates across metropolitan areas. The evidence on convergence and the tax rates is presented in Section 5. Section 6 analyzes how the evidence affects the state of Missouri. A brief summary is presented in Section 7.

2. THE ECONOMICS OF GROWTH AND CITIES

In this section, we emphasize the role that two specific factors play in terms of affecting economic growth. First, we explain the role that technological progress plays in explaining how economies grow over time. The basic argument is that technological progress arises from the implementation of ideas. Second, we talk about how cities can spur technological progress by lowering the transaction costs associated with transmitting ideas and discoveries associated with testing the new ideas.

The Role of Technological Progress

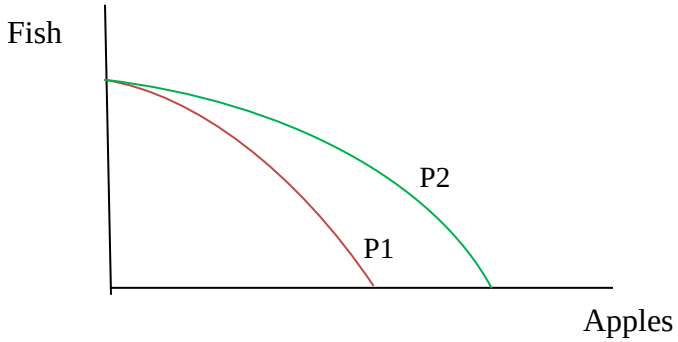
To understand economic growth, researchers are principally concerned with how real GDP increases over time. The production of final goods and services depends on the quantity of inputs, such as people, machines and land. Technology refers to the processes that combines these factors of production and other raw materials into the goods and services that people want. Over time, the number of workers increases as children grow up and as immigrants enter the country. Machines, more generally the stuff we call physical capital, is accumulated through purchases, also known as investment spending. Except for the Netherlands, the quantity of available land is regarded as fixed. The point is there are three primary ways to grow faster: number of workers increases, more physical capital is accumulated, or a new way is developed such that workers, machines, and land can be

transformed into a larger quantity of goods and services. The latter method is referred to as technological progress.

The notion of technological progress can be traced back to the work by Solow and Swan. Technology refers to the methods employed by companies to combine all the inputs they need to produce the salable item. Technological progress then is a change in technology that results in more of the salable item being produced with the same, or even fewer, inputs. Sometimes, technological progress comes in the form of a new machine. For example, the tractor replaced the previous technology used to prepare soil for planting. Because the farmer could prepare the soil in less time, other activities that would increase crop yield could be applied. Thus, the improved machine was a form of technological progress. At other times, the process is altered in a way that makes workers and machines operate so as to produce a larger quantity of the item. Here, the assembly line serves as good illustration of how organizing workers to specialize in a particular activity resulted in total car production increasing without adding any new workers.

Figure 1 gives a visual characterization to what technological progress means. In this graph, there are two goods in the economy: apples and fish. The red line depicts the combinations of apples and fish that can be produced with the people and machines, land, and lakes that exist within this country for a technology represented as P1. Note that the green line represents combinations of apples and fish that can be produced, given that a new technology (labeled P2) is developed that increases the yields of each apple tree. In this illustration, the technological progress only results in an increase in the production of apples for every level of fish that is produced.

Figure 1
A Graphical Illustration of Technological Progress



With this working explanation describing what technological progress is, the next step is to ask, how does technological progress occur? The short answer is ideas. In order for technological progress to occur, someone needs to come up with an idea of how to do things differently. Not every idea is a good one, as some fall into the circular drawer and never appear again. Even ideas that seem like good ones are ultimately subject to the market test. In other words, the idea is implemented and tested to see if indeed, it is worth it to permanently include it as a means of producing a good or service. Thus, technological progress is the outcome of idea generation and experimentation in order to assess the return to the idea.

On Dispersing Technological Progress, or the Role of the Metropolitan Area

Glaeser (1998) describes how urban size is comprised of both positives and negatives.[6] On the positive side, the agglomeration effects include valuable information spillovers. On the negative side, these agglomeration effects bring congestion, pollution, and crime. It may be useful to review the underlying principles that Glaeser argues are important positive attributes. In particular, it may be worthwhile to ask how a city can produce the information spillovers that are useful for fomenting economic growth.

Glaeser's key argument is that the density of population is important for the transmission of new discoveries. Going back to the ideas of Hotelling (1929), we see that economists saw the positive relationship between market size and transaction costs.[7] Part of the consumer's cost of buying a product depends on how far the buyer must travel. Together, the item's price combined with the transaction to get to the shop determines the total cost to the buyer. So, distance is positively related to the broad measure of total cost.[8]

To complete the role that agglomeration plays in terms of information spillovers *a la* Glaeser, note that a valuable discovery can lead to valuable extensions. Glaeser's key point can be summarized as follows: urban growth depends in part on the transmission of valuable ideas that correspond to technological progress. Most often, a city is home to some technology expertise or natural, physical advantage that is valuable. The technological/physical advantage gives rise to services and suppliers locating near the core city.[9] For example, every city needs bakers, electricians, and an assortment of other services to support the workers in the one or more core technologies that operate in the city.

In these settings, Glaeser's idea comes to full fruition as innovators of some technologies are extremely valuable with lots of spinoffs that could be developed. Thus entrepreneurs locate nearby, swelling the urban area, in order to exchange the ideas and draw from the innovator's expertise. Such agglomeration can lead to more rapid breakthroughs because the transaction cost of exchanging the ideas is low enough when the concentration of entrepreneurial activity follows a highly valued innovation. This is what Glaeser means when he speaks of the success of the city. Good ideas are the modern-day version of the gold rush. To sustain the rush, however, ideas are like veins that can arise endogenously through communication, conditional on finding and vetting good ideas over time.

Over time, cities rise and fall based on the investment in technological breakthroughs. Arguably, Missouri's two principal metropolitan areas are an illustration of how cities rise and fall viewed through a lens of the relevant technologies each possesses. Both St. Louis and Kansas City emerged because city fathers took hold of the physical advantages associated with being at key points on a valuable transportation technology: the river system. Over time, newer transportation technologies like railroads and the interstate highway system provided some continuation of economic growth for these two cities. Each city served a vital role in the nation's distribution system: as an important node for multi-modal transportation. St. Louis and Kansas City provided a return to industries relying on distribution to service their customers. However, based on the economic growth performance of these two cities, one can infer that the returns to the transportation infrastructure and other endeavors have been below the national average for the past several decades.

Thus far, we have identified the role that new ideas play in terms of affecting technological progress. The underlying process that goes from the idea itself to the implementation is usually associated with research and development (R&D) spending. Start with the premise that new ideas arrive in people's minds at some rate. The ideas have some expected commercial value. In many cases, the new idea is summarily rejected by a person after giving it a little bit of thought. For instance, the person recognizes the idea is not technically feasible, or the person does not have access to the financing needed to implement the idea, or perhaps the idea is deemed to be too risky for a risk-averse idea generator. Ultimately, ideas have to meet the simple economic criterion if they are worth implementing.

The basic intuition is easily summarized: the cost of R&D is weighed against the gains in future productivity. By lowering costs or creating new products, R&D can make a company more profitable. If the expected marginal profit gains exceed the marginal cost of R&D, then R&D is worth it. Researchers have tried to identify the marginal gain in productivity. In 20 studies using firm or industry level data, Hall, Mairesse and Monhen (2010) report that the rate of return on R&D spending is between 14 percent and 128 percent.[10] For this group of mostly manufacturing firms, R&D appears to be an activity that, on average, offers a return greater than that offered by investing in the S&P 500 stock index.

The central message is that people and ideas are ultimately the source of technological progress. Some forms of technological progress are more significant innovations than other forms; here, the idea of significance is that the innovation has multiple applications that can be implemented commercially.[11] So, when a significant innovation occurs, there can be spillovers in terms of additional technological progress. Here is where distance plays its role. The rate at which spillovers can be implemented depends on how quickly the new ideas are communicated. And, reducing the distance—such as living in the same urban area—lowers the transaction cost and speeds up the implementation rate for the spillovers.

3. METRO AREA CONTRIBUTION TO STATE GROWTH

The goal in this section is to provide evidence describing observed disparities in economic growth rates across urban and rural areas. In doing so, it will become evident why researchers consider cities as engines of economic growth.

Table 1 shows how the share of the United States' population has been increasingly moving in urban areas for decades. More specifically, the US population living in urban areas has increased from 64 percent in 1950 to 80.8 percent in 2010. Indeed, the data supports the idea that urban areas are becoming increasingly more important for economic growth in the United States. Unfortunately, the United States reports data on real GDP data at the metropolitan area only going back to 2001.[12] Throughout this analysis, the data will span the period 2001 through 2017 except where otherwise noted.

Table 1

Fraction of US Population Living in Urban and Rural Areas, 1950-2010

Census year	Pct. US Population in Urban Area	Pct. US Population in Rural Area
1950	64.0	36.0
1960	69.9	30.1
1970	73.6	26.4
1980	73.7	26.3
1990	75.2	24.8
2000	79.1	20.9
2010	80.8	19.2

Source: *US Census Bureau*

The first step is to examine how much growth in the United States is attributable to growth in the metropolitan portion of the country. Formally, we compute the contribution to the country's real GDP growth from the metropolitan areas. At the national level, the Bureau of Economic Analysis reports real GDP for the metropolitan portion of the country and for the non-metropolitan portion. Here, the metropolitan portion corresponds to the county-level aggregation that corresponds to the Metropolitan Statistical Areas (MSA) as defined by the United States Office of Management and Budget.[13]

The MSA generally consists of a primary city, the surrounding suburbs and other parts of the region that are deemed to be significantly economically tied to the primary city and its suburbs. For example, Kirkwood is part of the St. Louis MSA, as are less "urban" areas in Jefferson County. The upshot is that there is no clear definition of an MSA, but it includes some subjective identifications made by the Office of Management and Budget. Because the Bureau of Economic Analysis is applying its county-level breakdown, the data do not correspond exactly to the map presented in Hafer and Rogers. Most noticeable, the Hafer and Rogers map shows a contiguous MSA for Joplin-Fayetteville-Springdale, while the Bureau of Economic Analysis reports separate values of real GDP for a Joplin MSA and a Fayetteville-Springdale MSA. Overall, there are 382 MSAs in the Bureau of Economic Analysis report for each year.

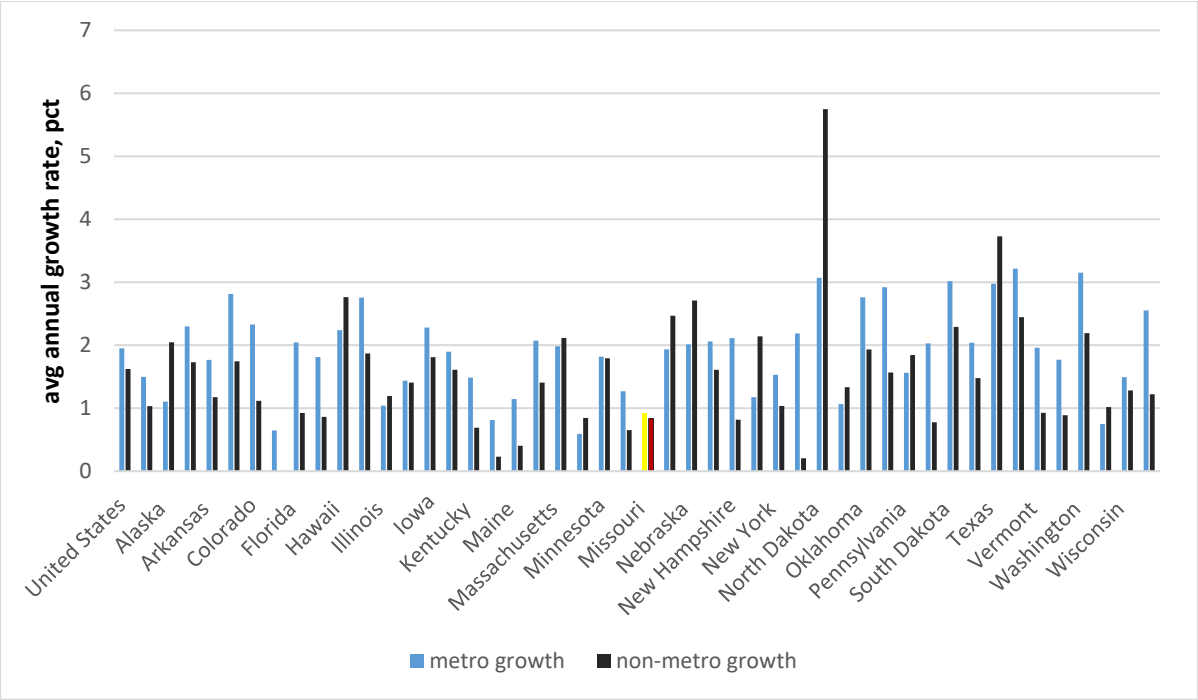
Figure 2 plots the annual growth rate of real GDP for the United States along with the contribution to annual real GDP growth coming from the metropolitan portion of real GDP for the entire United States.[14] The evidence indicates that increases in real GDP occurring in the MSAs have accounted for the lion's share of economic growth in the United States over the past two decades. Between 2001 and 2017, MSAs accounted for no less than two-thirds of the rate of national economic growth.

Figure 2
Contribution of MSA Real GDP Growth to National Real GDP Growth, 2001-17

Source: *Bureau of Economic Analysis*

We now tackle two questions. First, annual growth rates of GDP are subject to cyclical fluctuations: They are by no means constant and subject to variations in economic activity, policy changes, etc. Accordingly, it may be useful to look at measures of economic growth over longer horizons. To do this we can average economic growth across the entire 2001-2017 period, thus removing any cyclical features present in the data in Figure 2. Second, we want to begin looking at the contributions at the state level. In other words, is there a strong case that cities are the economic engines for states over time? We accomplish both goals in Figure 3 where we plot the average annual percentage change in real GDP at the metro level and at the non-metro area over the entire 2001-2017 period. Note that three states report real GDP for the state without allocating any to a non-metro portion. Delaware, New Jersey and Rhode Island consist only of metro areas.

Figure 3
National and State Average Annual Real GDP Growth for Metro and Non-Metro Portion, 2001-17



Source: *Bureau of Economic Analysis*

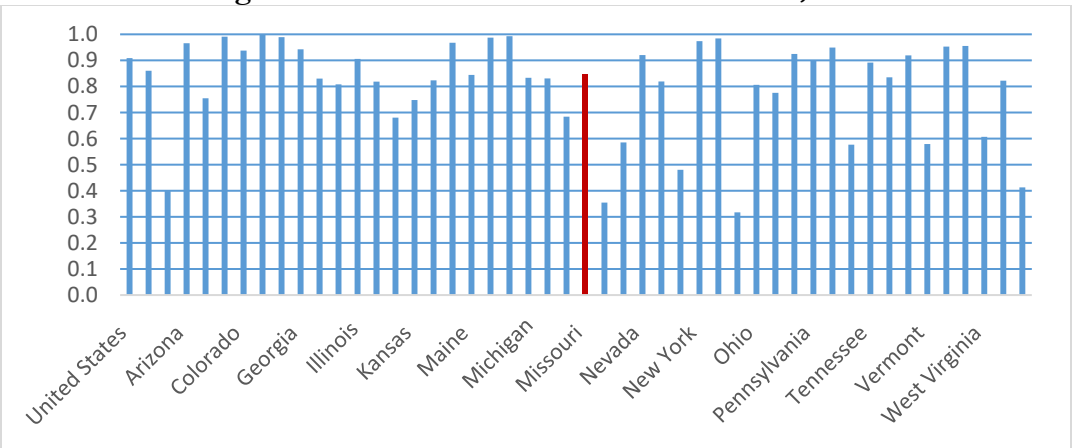
The comparative measures of economic growth are reported for the nation as a whole (see far right-hand-side of the figure) and for each state.[15] In this direct comparison, it is possible to see how fast the metro portion is growing in each state relative to the how fast the non-metro portion is growing. For the United States we see that the metro portion of real GDP increased at 1.95 average annual rate compared with the non-metro portion increase of 1.62 percent. The implication is for the United States, on average, real GDP increased in cities at a faster rate than it increased in rural areas. At the state level, the black bars are sometimes taller than the blue bars, indicating that for some states the non-metro portion increased at a faster rate than the metro portion. This occurs in thirteen states. In contrast, for most states—thirty-four out of the forty-seven states, to be exact—the metro portion of the state recorded faster growth than in the non-metro portion. Notice that for Missouri, the annual average rate of real GDP increased at a 0.92 rate in the metro portion and at a lower 0.83 rate in the non-metro portion. From Figure 3, once can infer that cities contribute a great deal to most states' economic growth. Even though the evidence for Missouri indicates that neither

cities nor rural areas increased at a very fast rate, it remains true that the metro portion of the state grew faster than the non-metro part.

The last comparison to consider is the ratio of the change in real GDP in the metro portion to the change in real GDP.[16] We compute this fraction for the United States and for each state for the period 2001 through 2017. Figure 4 plots the ratios. If this calculation shows that the proportion of real GDP growth attributed to urban areas is roughly the same as the percent of the urban population in that area, then real GDP growth for the period is roughly the same for both urban and rural areas. However, if this proportion is greater than the percent of the population living in urban areas, then real GDP growth is greater in urban areas than in rural areas.

For each state, we use the 2010 United States' Census Bureau measure of the ratio of urban population to total state population to assess whether the metro portion of the change in real GDP to the total state change in real GDP is disproportionate or not. In thirty-seven of the forty-seven states for which we have metro and non-metro portions, the change in real GDP in the metro portion to the total state change in real GDP is greater than the fraction of the population living in the state's urban areas. To illustrate this point, note that 70.4 percent of Missouri's population lived in urban areas when reported in the 2010 Census. The change in real GDP in the metro portions of Missouri accounts for 84.7 percent of the total change in real GDP between 2001 and 2017. Compared with the national data, roughly 80 percent of the United States' population lives in metropolitan areas. However, the metro portion accounts for 90.9 percent of the change in national real GDP between 2001 and 2017. On average, therefore, cities account for a disproportionate fraction of real GDP increase in the country.

Figure 4
Ratio of Change in Real GDP in Metro Portion to Change in Real GDP at National or State Level, 2001-17



Source: *Bureau of Economic Analysis*

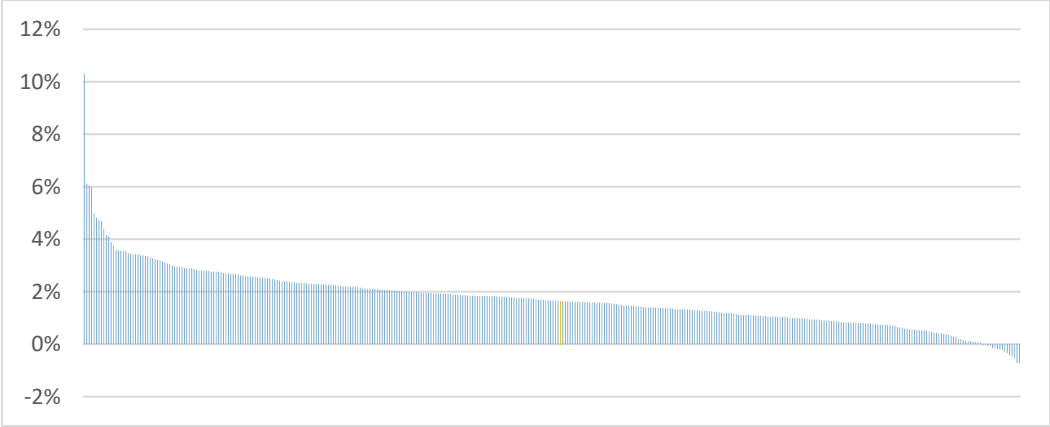
For Missouri and for the majority of states, the evidence tells us that metro areas account for a disproportionately large share of real GDP increases between 2001 and 2017. Combined, the evidence presented in this section tells a consistent story: For the United States, MSAs contribute a larger share of the gains in real GDP than their share of the population. In this sense, cities are the engines of economic growth.

4. GROWTH BY METROPOLITAN AREA IN THE UNITED STATES

In this section, we report the average annual growth rate in real GDP for each of the 385 MSAs in the United States. We pay particular attention to the rankings of real GDP growth for MSAs in Missouri.

Figure 5 plots the average annual growth rate for each MSA in the United States. Between 2001 and 2017, Midland, Texas, (the highest bar in figure 5) recorded the highest average annual percentage change in real GDP, increasing at a 10.3 percent rate. Of the 385 MSAs, sixteen (the bars on the far right in figure 5) recorded smaller real GDP levels in 2017 compared with the 2001 levels. The range spans eleven percentage points as the largest contraction occurred in Charleston, West Virginia, which declined at an average annual rate of 0.7 percent. The sample mean for the average annual growth rate across MSAs is 1.74 percent and the standard deviation is 1.1 percent. There are 290 MSAs within one standard deviation of the average annual real GDP growth rate.

Figure 5
Average Annual Growth Rate in Real GDP by MSA, 2001-17



Source: *Bureau of Economic Analysis*

How do the Missouri MSAs rank in this set? It is not good. Table 2 indicates where Missouri's eight MSAs ranked in terms of real GDP growth among the 382 MSAs in the United States. Specifically, the Bureau of Economic Analysis reports annual real GDP values for St. Louis, Kansas City, Springfield, Columbia, St. Joseph, Jefferson City, Cape Girardeau, and Joplin. It is striking that not one of Missouri's MSAs ranked higher than 197th. Indeed, Joplin, St. Louis, St. Joseph, and Jefferson City—half of the MSAs in the State of Missouri—increased an annual average rate in this century that was in the bottom tail of the distribution of MSAs in terms of economic growth.

Overall, the evidence provides a basis for saying that cities are the source of a significant portion of a state's economy. The evidence for Missouri is consistent with this observation. Indeed, Missouri's MSAs are growing below the median metro area, and the state economy is not faring well when one compares growth in its GDP to most other states.

Table 2
Ranking of Missouri MSAs, Average Annual Increase in Real GDP, 2001-17

MSA	Ranking among US MSAs
Columbia	197
Kansas City	213
Springfield	222
Cape Girardeau	275
Joplin	299

St. Louis	312
St. Joseph	315
Jefferson City	324

Source: *Bureau of Economic Analysis*

To deepen our understanding of the Missouri experience, it is useful to review our understanding of economic growth. Missouri's performance, particularly its urban economic performance, needs some context. This is especially true when one considers that every city and every state is trying to find best practices that can be applied to produce the next growth miracle. The bottom line is that growth miracles are rare and probably cannot be conjured by well-intentioned policymakers.

5. ECONOMIC POLICY AND URBAN GROWTH

State and local economic policies have primarily taken to two lines of attack in order to affect urban economic growth. Subsidies have been used to induce firms to relocate, especially for companies in "key" industries often associated with technology. In addition, favorable tax policies have been implemented to provide public resources and amenities that some policymakers believe are critical to attracting the kinds of entrepreneurs who will instigate technological progress.

City governments play important roles in determining the public goods acquired with tax collections. Combined with funding provided by state and federal government partners, city governments affect spending on K-12 education, mass transit, parks, museums, surface roads and highways, and other forms of infrastructure. Increasing infrastructure spending, for example, lowers transportation costs. Education spending increases the level of human capital that a city's population accumulates, making its workers more efficient. Many other public works provided by governments increase the quality of leisure time, and ultimately the well-being of its community. The point is that some kinds of city government expenditure result in more productive workers. Ultimately, worker productivity is positively related to economic growth.

It matters how cities acquire the funding needed to purchase these productivity-enhancing public goods. In particular, city tax policy affects the returns to labor and capital. In this section, we look into this issue, paying special attention to the use of earnings taxes as a source of revenue, and how it might affect economic activity in the city and, hence, the state. In other words, is there a

relationship between the earnings tax rates and economic growth rates for the US metropolitan areas?

The Impact of Earnings Taxes on Urban Growth

Looking across MSAs, the question to ask is: do cities with higher earnings tax rates report lower than average annual MSA growth rates for real GDP than cities with lower earnings tax rates? In those MSAs in which the central city has an earnings tax, it is typically the primary city in the metropolitan area that has an earnings tax while the surrounding suburban area is earnings-tax free. Using personal income data, there is evidence that the city-to-MSA ratio of income is lower for cities with an earnings tax. Hence, one possible outcome, therefore, is that the earnings tax affects the distribution of income within the MSA, but does not affect the MSA's trajectory of income over time.

A little background on the city earnings tax is useful here. With suburban population growth and an increase in commuters from the suburbs to the primary city, the tax on labor income served as a means of collecting revenues from city-service users. Commuting workers use city roads, police services and other city services. If the city relies extensively on property taxes, commuting workers would not be contributing taxes to pay for these services.

Income taxes are not frequently implemented by primary cities. Only about 10 percent of the MSAs have a city earnings tax present. There are forty-one MSAs out of 382 in which at least one city within the metropolitan area has an earnings tax. In both 2000 and 2010, the Philadelphia MSA had the highest earnings tax rate, though it fell from 4.564 percent in 2000 to 3.928 percent in 2010. More than half of the MSAs (twenty-six out of forty-one) have city earnings tax rates at or below 1 percent. In addition, nearly half of the MSAs reported a change in the earnings tax rate between 2000 and 2010. Of the nineteen that changed the city earnings tax rate between 2000 and 2010, seventeen raised the tax rate. Only Philadelphia and Detroit reported a lower city earnings tax rate in 2010 compared with the 2000 tax rate.

We then calculated simple correlation coefficients for average annual real GDP growth and the earnings tax rate for the primary city in each MSA. For example, in the case of St. Louis MSA, which covers many towns in both Missouri and Illinois, St. Louis city is the "primary" city. For these

calculations, we computed the average annual growth rate for real GDP for each MSA using data from 2001 through 2018. The earnings tax rate for the MSA's primary city is taken from both 2000 and 2010. Remarkably, the correlation coefficients are identical up to three decimal places, and were found to be -0.176.[17] More importantly, the evidence indicates that the correlation is negative, is statistically significant, and weak in the sense that it is less than 0.2 in absolute value. [18] Thus, the interpretation is that MSAs with a higher earnings tax rate in the primary city, on average, record lower real GDP growth than MSAs with a lower earnings tax rate in the primary city.

Based on this evidence, there is a link between the earnings tax rate in the primary city and the state. Recall that we presented evidence suggesting that urban areas account for a disproportionate part of a state's economic growth. Now, we present cross-section evidence consistent with the notion that a primary city with a higher income tax rate is negatively related to the urban area's economic growth rate. Thus, the indirect evidence suggests that an increase in the income tax rate in the primary city is negatively related to the state's economic growth rate.

Cautionary Notes on the Interpretation

It is important to use caution when interpreting the correlation coefficient. For instance, the average temperature of the MSA could be correlated with the city earnings tax rate since many of the cities that have earnings taxes are in the older industrial cities in the Midwest or Northeast parts of the United States. This warns us that correlation does not imply causation. Though outside the scope of this paper, it is natural to ask whether other factors—such as educational attainment in the MSA, the initial level of real person income, or even average temperature—could account for the weak correlation between real GDP growth and the earnings tax rate.

To the extent that state income growth is the weighted average of rural income growth and MSA income growth, in states where primary cities predominantly have earnings tax rates, then urban policies could have spillovers that account for why some states are growing at a lower rate than other states. Indeed, this is what Wall (2020) finds for the state of Missouri.

6. IMPLICATIONS FOR MISSOURI

The evidence paints a picture of a Missouri economy in which the metropolitan areas are recording slower than average economic growth. Hafer and Rogers (2019) document that Missouri's economic

performance has been one of slow economic growth relative to the nation for the last 50 years. As such, in the case of Missouri there is no metropolitan engine running fast enough to propel the state economy.

Why is Missouri underperforming relative to the nation? In general, our findings indicate that the earnings tax rate is weakly, negatively related to the metropolitan area's growth rate. However, Missouri's two largest cities are metropolitan areas that straddle state lines, and the MSAs for each of these also include suburbs that are outside of state lines. When speaking about state economic growth, our results may bear on economic growth. The logic is fairly straightforward. The earnings tax rate in St. Louis and Kansas City induces people to leave the central city in the MSA and depart for the suburbs. Insofar as some of the exits from the central city are into the neighboring state—St. Louis activity moves to Illinois and Kansas City activity moves to Kansas—then the earnings tax could be contributing to slower economic growth in Missouri. So even though the earnings tax rate redistributes income within an MSA, when the MSA includes suburbs outside of a state's lines, this may have an impact on the state growth rate. It is a challenging, though potentially important research question to identify how much the earnings tax rate contributes to Missouri's slow economic growth.

Trying to discern the factors that cause one state or MSA to grow faster than another is very difficult. We have dealt with some possible explanations. But what of others? Modern growth theory points to the importance of technological progress as a spur to economic growth. One way to measure this is by considering the level of expenditures (public and private) on research and development (R&D). As it turns out, Missouri's spending on R&D ranks it 8th in R&D spending by private businesses in 2017.[19] In terms of federally funded research, Missouri ranked 16th. Though one year is not necessarily an indicator of continued effort in R&D, the data show that Missouri consistently ranks in the top half of states on these two broad measures of R&D spending.

In our discussion on productivity and economic growth, we provided some intuition for why R&D spending could increase productivity gains. There are two questions to be answered. First, it is possible that the innovations spawned by Missouri's R&D are not yielding returns to metro areas in Missouri because the returns to R&D spending are not generating the kinds of agglomerations present in other cities. In other words, the gains from R&D spending are going outside the state.

Second, R&D spending in Missouri is not yielding innovations as R&D spending and innovations do in other states. It would be helpful if the returns to R&D were calculated at the state level. Somehow, Missouri researchers are just not discovering innovations at the same pace as researchers in other states. The evidence suggests that Missouri's slow economic growth cannot be tied to a lack of effort in basic R&D.

Another is to consider is the level of governmental intervention in the economy. Government policies can re-direct resources by subsidizing or taxing certain industries and leaving others untouched. If there is a misallocation in the state or local economy, such subsidies can be helpful perhaps in terms of accelerating the efficient equilibrium. In general, however, tax credits and other forms of subsidies, such as tax-increment financing, are used extensively by city governments to attract businesses to locate inside their city limits. For the cities, the emphasis on these subsidies is that they pass a "but-for" test; specifically, the investment would not occur but for a tax abatement or other subsidy program. Lester and El-Khattabi (2017) look specifically at tax-increment financing and report that there is no systematic relationship between the quantity of tax-increment financing and employment, business counts or sales.[20] Could it be possible that tax-increment financing is offered to businesses in Missouri that yield below-average returns and thus accounts for why Missouri cities are growing so slowly relative to most others?

If there is one prescription for Missouri, it is to focus on trying to put together the conditions that are most favorable to discovery and to implementation of the technological progress within the state's borders. There is no "one guaranteed way" to foment, discover and innovate. However, unnecessary city regulation and too much city central planning are almost assuredly going to curtail such activities from reaching their potential.

7. SUMMARY AND CONCLUSIONS

In this paper, the focus is on income growth across urban areas. Three questions are examined. First, what is the current thinking regarding urban areas and their contribution to income growth? Second, what is the evidence regarding a key economic policy variable—specifically, city earnings tax rates—and income growth across metropolitan areas in the United States? Third, what, if anything do the results from the policy analysis imply about income growth in the state of Missouri?

The economic literature stresses the role that technological progress plays in determining an economy's income growth rate. Technological progress is literally tied to the returns from ideas, which is why researchers have stressed that cities act like petri dishes for ideas; through geographical concentration, ideas are permitted to diffuse at a faster rate than they would if people were disbursed across large swaths of land. While modern inventions like the Internet may result in an economy in which geographic concentration is no longer important for technological progress, historically cities have been important engines driving income growth.

Local policies undoubtedly affect the return to the ideas that correspond to technological progress. We considered the effect of one such policy, the earnings tax. Across MSAs in the United States there is weak evidence that MSAs in which the primary city has a higher earnings tax rate, on average, report a lower average annual growth rate for real personal income. Based on previous research findings, we also know the earnings tax rate in the primary city is associated with a shift in the distribution of the MSA's income level as the fraction of income in the city declines relative to the suburbs.

Missouri is an interesting case study because its two largest cities have implemented the earnings tax. Moreover, Missouri has reported one of the lowest income growth rates among the states for many decades. If cities are really the engine driving income growth, then urban policies in St. Louis and Kansas City, for example, could have detrimental effects statewide. More generally, until more recently, why had Missouri's rate of technological progress been so low over the past several decades? New ideas that generate the kinds of valuable spillovers are not easy to discover. In the absence of faster growth, good-intentioned politicians may seek to guide the economy by offering tax credits and tax abatements. While such policy actions do affect the after-tax return to subsidized activities, the subsidies may spur misallocations as factors of production move to more highly valued activities in an after-tax sense only. If the pre-tax returns remain low, technological progress only follows by sheer luck.

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NOTES

[1] See Rik W. Hafer and William H. Rogers, "The Missing Million: Missouri's Economic Performance since the Moon Landing," Show-Me Institute, April 17, 2019, accessed at https://showmeinstitute.org/publication/employment-jobs/missing-million-missouris-economic-performance-moon-landing.

[2] Going back to the foundations of economic growth, researchers pointed to technological progress as the driving force that accounted for why economies grow. Moreover, new technologies flowed easily across political boundaries so that eventually living standards would converge across the globe. At the national level, this convergence seems like a reasonable presumption since technologies can flow across state lines quite easily. See the writings by Robert M. Solow, "A Contribution to the Theory of Economic Growth," *Quarterly Journal of Economics* 70, no. 1 (February 1956): 65-94. Trevor Swan, "Economic Growth and Capital Accumulation," *Economic Record* 32, no. 2 (1956): 334-61. More recently, work by Acemoglu (2009) and Jones and Vollrath (2016) have argued that institutions play a critical role in terms of accounting for differences in technological progress across regions. For excellent overviews on the institutions and factors that contribute to technological progress, see Daron Acemoglu, *Introduction to Modern Economic Growth* (Princeton, NJ: Princeton University Press, 2009); and Charles I. Jones and Dietrich Vollrath, *Introduction to Economic Growth, 3rd Ed* (New York: W.W. Norton and Company, Inc., 2016).

[3] Throughout this paper, we will use the term "city" as equivalent to Metropolitan Statistical Area. If we need to refer to the chief city, we will use the term "primary" city. To illustrate, Kansas City, Missouri, is the primary city in the Kansas City Metropolitan Statistical Area. But suburbs like Gladstone, Missouri, and Overland Park, Kansas, are part of the Kansas City Metropolitan Statistical Area.

[4] Edward Glaeser, *The Triumph of the City* (New York: Penguin Books, 2011).

[5] Howard Wall also considers the effect of earnings taxes on out-state economic activity. See Howard Wall, "The Missouri-Wide Effects of City Earnings Taxes," *Missouri Policy Journal* (2020), accessed at https://www.lindenwood.edu/academics/beyond-the-classroom/publications/missouri-policy-journal/number-9-spring-summer-2020/

[6] Edward L. Glaeser, "Are Cities Dying?" *Journal of Economic Perspectives* 12, no. 2 (1998): 139-60.

[7] Harold Hotelling, "Stability in Competition," *Economic Journal* 39, no. 153 (1929): 41-57. With two firms competing for buyers located uniformly along a fixed-length space, Hotelling was primarily interested in characterizing firm location decisions. For a given location, the distance between the buyer and the firm captured a transaction cost that dictated the buyer's purchase. Each firm selected its storefront in order to maximize market share. Price competition resulted in price equalization, but the transaction cost component served as the means of competing for market share. In terms of an east-west line, competitive firms would locate near one another in order to divide up the eastern portion of the segment for one producer while it would be less costly for the western portion of the segment to visit the other producer.

[8] For an alternative way to represent competition across distances see Steven Salop, "Monopolistic Competition with Outside Goods," *Bell Journal of Economics* 10, no. 1 (Spring 1979): 141-56. An elegant approach to explaining how location decisions on the city-suburban margin are affected by the costs of city congestion weighed against the transaction costs associated with locating near the central business district is offered in Andrew Haughwout and

Robert Inman, "Fiscal Policy in Open Cities with Firms and Households," *Regional Science and Urban Economics* 31, no. 203 (April 2001): 147-80.

[9] Northwest Arkansas is perhaps an excellent example of how a particular technological innovation gives rise to support services and expanding suppliers. Suppose Wal-Mart's chief innovation was its logistical structure. This allowed to the retail giant to expand its business to the point where suppliers sought to be near Wal-Mart's headquarters in an attempt to better serve such a large customer. Such evidence is consistent with the notion that there is a spillover—most likely, lower transaction costs in the form of efficient communication—that induces such an agglomeration.

[10] Bronwyn H. Hall, Jacques Mairesse, and Pierre Mohnen, "Measuring the Returns to R&D," Chapter 24 in *Handbook of the Economics of Innovation* vol. 2, eds. Bronwyn H. Hall and Nathan Rosenberg (Amsterdam: Elsevier, 2010): 1033-82. In this paper, the reader can find a complete description of the means by which R&D affects productivity. They refer to R&D that lowers production costs or widens the spectrum of final goods or intermediate inputs.

[11] Formal versions of economic spillovers are presented in the endogenous growth models of Romer (1986) and Lucas (1988). In Romer's economy, spillovers are present in the form of capital accumulation at the firm level. Because the investment is non-excludable, there are benefits to the aggregate production of consumption goods. In other words, Romer models spillovers as an externality in the aggregate production function that exhibits increasing returns to scale. As a technical point, the First Fundamental Welfare Theorem fails in Romer's model because of this spillover/externality. Individual firms did not internalize the returns from capital investment, and thus would underinvest relative to the efficient level. Why did researchers like Lucas, Romer and others believe that economic growth theory needed greater attention? The chief motive was to account for the cross-country observation that living standards across countries were not converging as would have been predicted by the exogenous growth models. However, as data collection increased for states and metropolitan areas, there were inequalities in the distribution of economic activity across cities within a country that were similar to those observed in the data across countries. Consequently, the model economies developed by Lucas and Romer have possible applications to city economies. The New Growth theories provide a framework that potentially can account for why some cities exhibit persistently high rates of real GDP growth while other cities remain stagnant in terms of economic growth. More specifically, externalities may help to explain why people congregate in cities. The link between cities and economic growth can be traced back to ideas presented in Hoselitz (1953). See Robert E. Lucas, Jr., "On the Mechanics of Economic Development," *Journal of Monetary Economics* 22, no. 1 (July 1988): 3-42; See Pal M. Romer, "Increasing Returns and Long-Run Growth," *Journal of Political Economy* 94, no. 5 (October 1986): 1002-37; See Bert F. Hoselitz, "The Role of Cities in the Economic Growth of Underdeveloped Countries," *Journal of Political Economy* 61, no. 3 (June 1953): 195-208.

[12] Real GDP also measures the total factor payments received by workers and people who own capital. So, choosing real GDP as a measure of aggregate income is quite common.

[13] An MSA is defined by a central urban area of at least a population of 50,000 people.

[14] Formally, the orange bar is calculated from the equation $\frac{GDP_t - GDP_{t-1}}{GDP_{t-1}}$ while the contribution from the MSAs is calculated from the equation $\frac{GDP_t^M - GDP_{t-1}^M}{GDP_{t-1}}$ where GDP_t represents the real GDP for the United States at date t and GDP_t^M is real GDP for the MSAs in the United States. Note that there is an identity at play; namely, real GDP produced in the MSAs plus GDP produced in the rural areas (non-MSAs) sum to total real GDP produced in the United States.

[15] After the United States, the forty-seven states are presented alphabetically. Wyoming, for example, is the last pair of bars on the right-hand-side of the graph.

[16] Formally, the percent change of GDP growth in the MSA can be calculated as $\frac{real\ GDP_{2017}^{MSA} - real\ GDP_{2001}^{MSA}}{real\ GDP_{2001}^{MSA}}$ and similarly the percent change in GDP growth for the state can be calculated as $\frac{real\ GDP_{2017}^{State} - real\ GDP_{2001}^{State}}{real\ GDP_{2001}^{State}}$. This calculation takes the ratio of the two to compute the proportion of GDP growth in a state that is attributed to the growth in MSAs.

[17] Author's calculation

[18] We compute the standard error of the correlation coefficient using the methods described in Ashley, Granger and Schmalensee (1980). With the standard error equal to 0.0513, one would reject the null hypothesis that the correlation coefficient is equal to zero. See Richard Ashley, Clive W. J. Granger and Richard Schmalensee, "Advertising and Aggregate Consumption: An Analysis of Causality," *Econometrica* 48, no. 5 (July 1980): 1149-67.

[19] See Table 4 in InfoBrief, National Center for Science and Engineering Statistics, September 2019, at https://www.nsf.gov/statistics/2019/nsf19326/nsf19326.pdf.

[20] See T. William Lester and Rachid El-Khattabi, "Does Tax-Increment Financing Pass the 'But-For' Test in Missouri?" Show-Me Institute Policy Study no. 41, November 14, 2017, accessed at https://showmeinstitute.org/publication/subsidies/does-tax-increment-financing-pass-test-missouri.