DOES PARTICIPATION IN GLOBAL FLOWS INCREASE PROSPERITY IN U.S. METROPOLITAN ECONOMIES?

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By

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ABSTRACT

This study examines how participation in global flows of goods, services, people, and capital affects economic growth and prosperity in U.S. metropolitan areas. Like many large urbanized nations, the United States is not a monolith; the national economy is perhaps better understood as a differentiated network of city and metropolitan economies that concentrate and cluster market activity. My hypothesis, which I will test through multivariate regression analysis, is that U.S. metropolitan areas that are more engaged in global flows of goods, services, people, and capital will exhibit higher levels of growth and prosperity. I find that the share of foreign-born population and the share of jobs in foreign-owned enterprises are positively associated with GDP per capita at the metropolitan scale, while the share of metropolitan GDP generated by exports has no significant impact on GDP per capita growth. Measures of other determinants of economic growth—education, technological innovation (as measured by advanced industries share), and capital investment—are also positively associated with GDP per capita. However, the share of the regional economy generated by exports does not have a statistically significant association with GDP per capita. Metropolitan leaders should note that participation in global flows—specifically flows of investment and people—can achieve small increases in GDP per capita, but not lose sight of the fact that investments in public goods like education yield the largest gains in average incomes.
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I. INTRODUCTION

This study examines how participation in global flows of goods, services, people, and capital affects economic growth and prosperity in U.S. metropolitan areas. Like many large urbanized nations, the United States is not a monolith; the national economy is perhaps better understood as a differentiated network of city and metropolitan economies that concentrate and cluster market activity. The 100 largest U.S. metropolitan areas—defined as central cities and their surrounding commuter sheds—sit on approximately 12 percent of the country’s land mass, house two-thirds of national population, and generate three-quarters of U.S. GDP (Berube, 2007). My hypothesis, which I will test through multivariate regression analysis, is that U.S. metropolitan areas that are more engaged in global flows of goods, services, people, and capital will exhibit higher levels of growth and prosperity.

As the country’s major hubs of economic activity, understanding how metropolitan areas grow and prosper is particularly vital in a national era of sluggish post-recession growth, stagnant median incomes, and rising poverty. Recovery in the wake of the Great Recession remains slow and uneven—much more so than previous recessions in 1990 and 2001 (Liu et al. 2015). Median household income has grown minimally in real terms since the 1970s, and the housing and financial crises brought an end to the debt-fueled growth model that households adopted to compensate for their stagnating earnings (Stiglitz, 2012). When the bubble burst, poverty sky-rocketed: Between 2000 and 2011, the number of poor and near-poor in the United States increased from 81 million to 107 million (Kneebone and Berube, 2013).
In the post-recession period, a growing chorus of business and political leaders has used these troubling statistics as validation for a new, more sustainable growth model. One strand of thought, as exemplified by President Obama’s call to double national exports within five years during his 2010 State of the Union address, embraces global economic engagement as a means to generate economic growth and raise living standards by tapping rising demand in the rest of the world. Indeed, globalization has intensified. Revolutions in information technology and transportation, the rapid rise of emerging markets, the globalization of finance, and the advent of global value chains have intensified international exchange. Global flows of goods, services, and capital have expanded rapidly over the last two decades, increasing from $5 trillion in 1990 to $26 trillion in 2012 (Manyika et al., 2014).

These expanding global flows ostensibly create opportunities for U.S. cities and metropolitan areas, and thus the nation. Recent international evidence suggests that participation in global flows increases GDP growth at the national level. Conversely, countries that remain on the periphery of international exchange are rapidly being left behind (Manyika et al., 2014). Previous studies have examined the impact of individual global flows—whether immigration, trade, or foreign direct investment—on local economies. But to my knowledge, no study exists that examines the effect of these flows, in concert, on economic growth and prosperity.

This work aims to fill that gap in the knowledge base through a multivariate analysis that examines how exports, foreign direct investment, and immigration are associated with GDP per capita in U.S. metropolitan areas. The paper proceeds in the next section with a review of the relevant literature on cities, economic growth, and global flows. In Section III, I outline a theoretical model for metropolitan growth. In Section IV, I outline my empirical approach.
Section V reviews the relevant data needed to test my hypothesis and section VI details my findings. Finally, I conclude with a summary of the implications of these findings.
II. Literature Review

Metropolitan areas (sometimes referred to as cities, regions, metropolitan regions, urban areas, etc.) consist of a densely populated urban core and less populated surrounding areas such as suburbs and exurbs that share common industries, housing and labor markets, and infrastructure (Squires 2002). This section summarizes three strands of literature related to cities and growth. First, it reviews the forces of agglomeration that help explain why metropolitan economies exist. Second, it delves into how cities relate to the broader theoretical literature on how economies grow, and the role of trade in helping further that process. And third, this section examines the empirical work measuring the impact of trade, foreign direct investment, and immigration on economic outcomes in cities and nations.

Metropolitan areas exist because clustering economic activity in place creates advantages due to economies of scale (Cortright, 2009). The economist Alfred Marshall in the 1800s—and later the economists Paul Romer and Kenneth Arrow—described the benefits that accrue to firms, workers, and local economies from three “agglomeration externalities”: input externalities, labor market externalities, and knowledge externalities (Marshall, 1890). Greater Seattle’s information technology cluster provides an illustrative example of all three externalities. Both large technology companies like Amazon and Microsoft and small start-ups benefit from shared input externalities they all tend to demand: specialized services like data storage, web design, and information management; high-quality broadband infrastructure; and research coming out of the University of Washington’s computer science department. These firms also benefit from labor market externalities. Deep pools of specialized tech workers allow for the better matching of firms and workers, raising productivity. Finally, the geographic concentration of tech firms
creates *knowledge externalities*—or a process Marshall observed as “The mysteries of the trade become no mystery, but are, as it were, in the air.” A very small geographic area in Seattle’s South Lake Union neighborhood is attracting technology companies that demand the knowledge exchange that comes with proximity and face-to-face meetings (Katz and Wagner, 2014).

Marshall’s work on agglomeration was prescient in that it foreshadowed how the theoretical underpinnings of what causes economic growth would change. Neoclassical growth theory previously argued that the long-run growth rate was determined by the rate of technical progress (Solow, 1956), which was treated as exogenous in most models. Beginning in the 1960’s (Arrow, 1962) and continuing in the 1980’s (Romer, 1986 and Lucas, 1988), economists theorized endogenous factors such as human capital, research and development, and knowledge exchange drive economic growth. Endogenous growth theory rarely mentioned cities explicitly, but rather affirmed the economies of scale, positive spillovers, and knowledge exchange that come from clustering key inputs in metropolitan areas (Aghion and Howitt, 1999).

The advent of endogenous growth theory coincided with major structural changes in the global economy. The further opening of the global trading system (most notably through regional trade agreements and China’s entry into the World Trade Organization in 2001); the effective doubling of the globally connected labor pool; ¹ and sustained advancements in information, communication, and transportation technologies have ushered in profound changes how economies grow and interact through exchange (Glaeser and Kohlhase, 2004; OECD, 2013;

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¹ See this excerpt from Freeman (2006): “In the 1990s, China, India, and the ex-Soviet bloc joined the global economy and the entire world came together into a single economic world based on capitalism and markets. This change greatly increased the size of the global labor pool from approximately 1.46 billion workers to 2.93 billion workers (exhibit 8.1). Since twice 1.46 billion is 2.92 billion, I have called this ‘The Great Doubling.’”
Freeman, 2006). These dynamics have allowed companies to unbundle their production processes and disperse them across the world to locations where production can be conducted most efficiently and effectively, either through outsourcing or by expanding the company’s own operations abroad (Gereffi et al., 2005; Spence and Hlatshwayo, 2011). As a result, the McKinsey Global Institute recently found that global flows of goods, services, and capital have expanded rapidly over the last two decades, increasing from $5 trillion in 1990 to $26 trillion in 2012 (Manyika et al., 2014). People movement has grown more slowly; since 1980, a consistent 2.7 percent share of global population resides outside its country of origin (Manyika et al., 2014).

In response to the changing nature of global exchange, economists such as Dixit and Stiglitz (1977) built on a similar foundation as endogenous growth theory to examine how economies grow when models allow for increasing returns to scale and labor mobility. Called the “new trade theory”, this work treated the movement of people and capital as variables that drove trade, as opposed to keeping them on the exterior of economic models. This meant that trade did not occur randomly because of natural endowments, but because certain places were producing goods and services more cheaply and efficiently than others because they were able to attract people and capital.

In 1991, the economist Paul Krugman combined elements of both the new trade theory and agglomeration into a core-periphery model that became the foundation of modern economic geography (Krugman, 1991). Shown in Figure 1, Krugman theorized that the interaction between economies of scale, transport costs, and market size could produce a circular causation in which production concentrated itself in the “core” over time. Essentially it explained that the reason cities and countries with similar economic endowments still traded with one another was because
they were divvying up and then specializing in different types of economic activity. This practice has caused economists to conclude that trade in products has been joined by a “trade in tasks” (Grossman and Rossi-Hansberg, 2008). The emphasis on agglomeration grounded this trade at the regional scale (Fujita et al., 1999, Fujita and Thisse, 2013). The upshot of this theoretical research: if regional or national economies are allowed to exploit increasing returns to scale, economic integration—trade in goods and services, exchange of people, or flows of ideas—can raise long-run economic growth because the size of the market increases (Lewis-Batiz and Romer, 1991).

**Figure 1. Krugman's 'core-periphery' model**


A wide-ranging literature has attempted to resolve debates about the effects on growth and prosperity from the global integration of trade, investment, and labor markets. At a global scale, the literature suggests that the economic gains from exchange are substantial. Bradford,
Grieco, and Hufbauer (2005) estimate that the liberalization of the U.S. economy in the 50 years following World War II increased income per capita by $2,800 to $5,000 in 2003. Clemens (2011) estimates that free movement of labor worldwide would result in gains between 50 percent and 150 percent of global output.

While welfare enhancing at a global scale, globalization can have different impacts on individual workers, industries, and regions. In the case of an advanced economy like the United States, global trade has created both costs and benefits for metropolitan areas. Metropolitan exports can help generate local income and wealth, supporting the purchase of other goods and services (Jacobs, 1969). Participating successfully in global markets requires that firms be highly productive (Melitz, 2012). As Berube and Parilla (2012) write: “Trade thus acts as a ‘natural selection’ mechanism that allows high-productivity firms to thrive, and forces low-productivity firms to withdraw from the market. The benefits of higher firm-level productivity in turn accrue to the entire metro area, raising average incomes.” On the flip side, however, in some regions the losses may outweigh the gains. A study of regional labor markets found that regions with manufacturers more exposed to competition from Chinese imports saw higher overall unemployment, lower labor force participation, and reduced wages (Autor et al., 2013). Indeed, other research has found that opening regions up to import competition can worsen income inequality locally (Feser, 2007).

Analyses of foreign direct investment (FDI) yields similar mixed results. In a review of the literature, Saha et al. (2014) find that foreign direct investment can be growth-enhancing not only in its ability to inject new jobs and capital investment, but also as a mechanism for high-productivity firms to boost local wages, induce knowledge spillovers to other firms, and generate
exports. Those authors write that, “FDI accomplishes all of this not by simple virtue of its foreignness, but rather because it is conducted by multinational enterprises that, regardless of country of origin, enjoy a number of competitive advantages” (Saha et al., 2014). However, other evidence suggests that FDI that occurs through mergers and acquisitions (e.g., a transfer of ownership of existing productive assets to a foreign company) may have ambiguous effects on employment generation (Chari et al., 2009).

The impact of immigration on receiving economies has been another hotly contested debate in the globalization literature. In a review of immigration studies in the United States, Saiz (2003) finds a mixed picture. He notes that, in the long run, immigration has resulted in higher national economic growth. However, since most immigrants have been on the lower end of the skills spectrum, their entry into the labor market has been associated with small slowdowns in wage growth among low-skilled domestic workers (Borjas, Katz, and Freeman, 1996). These findings are somewhat contradicted, however, by an examination of wage trends in Miami following the arrival of 125,000 Cubans in 1980, which found that the wages of low-skilled workers in Miami were unaffected by the sudden labor market shock (Card, 2001). In a more recent study of U.S. cities, Card (2007) found increases in immigration are associated with “a modest widening of the wage gap between more- and less-skilled natives, coupled with a positive effect on average native wages.”

Indeed, there is a rich literature examining how economies interact with international flows and the outcomes of those interactions. But to my knowledge, no study exists that examines the effect of global flows, in concert, on economic growth and prosperity for U.S. cities and metropolitan areas. This work aims to fill that gap in the knowledge base through a
multivariate analysis that examines how exports, foreign direct investment, and immigration are associated with growth and living standards in U.S. metropolitan areas. I next turn to my theoretical framework.
III. THEORETICAL FRAMEWORK

To estimate the association between global flows and metropolitan economic growth, I deploy the following theoretical model:

\[ \text{GDP Per Capita} = f (\text{Physical Capital, Labor/Human Capital, Technology, Global Flows, } \mu) \] (1)

This framework draws on preceding theoretical and empirical research outlining what matters for economic growth. As the previous section summarizes, economies require some basic inputs to fuel their expansion—physical capital, labor and human capital, and technology.

This analysis hypothesizes that the positive externalities that arise from global connectivity matter as well. Openness to trade, investment, and people can help bring in new resources and ideas from outside the borders of a metropolitan area. It can also inject the proceeds of international sales back into the local economy, spurring growth. It is for these reasons that global flows of goods, services, people, and investment are included as variables that would affect GDP per capita growth positively. Next, I operationalize this model in an estimable equation using available data.
IV. **Empirical Model**

To test the theoretical outlined above, I will deploy the following empirical model:

\[
GDPPC = \beta_0 + \beta_1 \text{CAPEXP\_IND} + \beta_2 \text{TERT\_SHARE} + \beta_3 \text{AISHARE\_OUTPUT} + \beta_4 \text{EXPORT\_SHAREGD} + \beta_5 \text{SHARE\_FOES} + \beta_6 \text{SHR\_FOREIGN\_BORN\_METRO} + \mu
\]  

GDPPC is a proxy for the average standard of living in a metropolitan area, and thus serves as an important economic outcome for local leaders. This variable is the total amount of goods and services produced in the metropolitan divided by total population, so the amount of income residents would receive if the gains of growth were distributed evenly, which of course they are not.²

CAPEXP\_IND, EM, TERT\_SHARE, and AISHARE\_OUTPUT represent proxies for the fundamental drivers of economic growth. CAPEX\_IND is the total capital expenditure in a metro area and is used to control for the amount of physical capital invested. Firms must invest in capital to complement labor, and I’d expect that greater investments would be positively associated with GDP per capita. TERT\_SHARE is the share of the population with a college degree, indicating the level of human capital in the region. A wide body of literature has revealed the relationship between education and rising living standards, therefore I predict a positive relationship between this variable and GDP per capita. AISHARE\_OUTPUT is the share of metropolitan GDP generated by advanced industries, a proxy for the level of technological sophistication in the economy. Technology has become increasingly important to economic growth, and I expect GDPPC to be positively associated with this variables.

² Data availability issues prevented an analysis of median income at the metropolitan scale.
The final three variables—EXPORT\_SHAREGDP, SHARE\_FOES, and SHR\_FOREIGN\_BORN\_METRO—measure global flows of goods, services, people, and investment. Trade has been linked to economic growth in several country-level studies, and I predict that the export share will be positively associated with GDP per capita. Similarly, foreign direct investment induces local spillovers that improve local productivity, which I expect will result in a positive relationship with GDP per capita. Finally, I estimate that the share of foreign-born population will also be growth-enhancing, due to the benefits of greater matching between the global labor pool and the local labor market.

Four of the six models will include year and geography fixed effects. For two of the models, I will deploy state fixed effects and for two of the models I will deploy metro area fixed effects. I next describe the data used to estimate these regressions.
V. DATA

Metropolitan areas provide a distinct view of the nation’s economic performance. Map 1 shows economic growth in 2014 for 381 U.S. metropolitan areas, and there is a significant variation in the data. Economic performance is highly differentiated based on industrial structure, competitiveness factors and, perhaps, connections within global flows.

Figure 2. Real GDP growth, by metro area, 2014

This analysis relies upon a dataset of 381 metropolitan areas defined by the U.S. Office of Management and Budget (OMB). To create that dataset, I merged data from a variety of different sources for the years 2005 to 2011. This time frame represents the only years in which all of my variables of interest are available. Table 1 provides the summary statistics for the sample for 2011.
First, metropolitan-level data on gross domestic product (GDP) and employment come from Moody’s Analytics county-level estimates. These county-level estimates were summed to create metro-level GDP and employment based on OMB’s 2013 metropolitan area definitions. Second, the U.S. Census Bureau provides this study’s population estimates. GDP per capita for each metropolitan area was created by dividing metro-level GDP by population. GDP per capita is the main dependent variable used in this analysis. GDP per capita varies significantly across the United States. The sample mean is just under $45,000; GDP per capita levels in places like Nashville, TN and Dayton, OH approach these levels. Among large metropolitan areas (those ranked in the top 100 by population), McAllen, TX has the lowest GDP per capita at around $24,500 and San Jose, CA (Silicon Valley) has the highest at around $87,150. The highest GDP per capita among all 381 metro areas is Midland, TX, a prominent site in the post-recession oil boom.

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3 Interested readers can see a full set of descriptive statistics in the Appendix in Table A-1.
I include independent control variables from three additional datasets. First, to proxy for the level of human capital in a given metropolitan area, I use the U.S. Census Bureau’s American Community Survey (ACS) five-year estimates of the share of a county’s population with a college degree (Abel and Gabe, 2010). These county-level estimates were summed to create metro-level educational attainment based on OMB’s 2013 definitions. The sample average is just under 29 percent but the sample ranges between 14 percent and 50 percent. Once again McAllen, TX has the lowest share of its population with a bachelor’s degree (16 percent) among large metro areas. The Washington, DC metro area has the highest share (47 percent).

Second, to control for the amount of physical capital invested, I estimate annual metro-level capital investment using the U.S. Bureau of Economic Analysis’s Annual Capital Expenditures Survey (ACES). The ACES provides national industry-level estimates of investments in capital equipment, software, and capital structures. Using employment data from Moody’s Analytics at the two-digit North American Industry Classification System (NAICS) code level, I estimate the amount physical capital invested per worker for each industry at the national level, and then allocate these measures to each metropolitan area based on the annual composition of industry employment (Abel and Gabe 2010). Moody’s bases employment forecasts for U.S. metro areas on two U.S. Bureau of Labor Statistics series: the monthly Current Employment Statistics (CES) and the Quarterly Census of Employment and Wages (QCEW). This approach is not ideal. Capital intensity within industries likely varies by metropolitan area. Therefore, localized figures would be ideal, but this procedure is the best approximation given available data. The summary statistics reveal significant variation between places. Firms in the average metro area invested about $19,200 in capital per worker in 2011, according to my
estimates, a total seen in metro economies like Oklahoma City, OK and Portland, OR. Service-intensive metros like Las Vegas, NV and Washington, DC tend to have the lowest capital expenditures per worker while capital-intensive economies like Stockton, CA and Oxnard, CA that specialize in energy, agriculture, and manufacturing tend to have the highest.

Third, to estimate for the capacity for technological innovation at a metropolitan level, I include the share of metropolitan output in advanced industries provided by the Brookings Institution’s Metropolitan Policy Program. Brookings defines advanced industries as those industries—at the four-digit NAICS code level—in which, 1) R&D spending exceeds $450 per worker, as measured by the National Science Foundation’s 2009 Business R&D and Innovation Survey (BRDIS), and 2) over 21 percent—above the U.S. average—of an industry’s workforce can be found in occupations requiring a high-degree of STEM knowledge as defined by the Occupational Information Network (O*NET) database (Muro et al. 2015). The sample average for the share of GDP in advanced industries is just over 15 percent, which masks significant differences within the sample. With a maximum value of 51 percent in 2011 and a standard deviation of 7.8 percent, the distribution of this variable contains a long right tail. Among large metro areas, technology hubs like San Jose, CA and Portland, OR tend to have the highest shares while leisure destinations like Las Vegas, NV and Lakeland, FL have the lowest shares.

Finally, I deploy data on global flows of goods, services, people, and investment from three data sources. First, annual goods and services exports come from the Brookings Metropolitan Policy Program database. Brookings’ estimation technique allocates U.S. exports

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4 Stata offers to measures of a variable’s distribution: skewness and kurtosis. Skewness for this variable=1.76 and Kurtosis=7.46.
for a given industry to counties based on their share of national production in that particular industry. The data are aggregated afterwards at metropolitan, state, region, and national level. Brookings utilizes this technique to allocate goods exports reported by the Census Bureau and most services exports reported by the BEA (Brookings 2015). This methodology includes inherent imprecision, due to the fact that these are allocated exports based on value-added shares, rather than documented exports. The U.S. Census Bureau provides exports at the metropolitan area scale but they are calculated by origin-of-movement of the good, not the origin of production. The point where the good’s movement is initially tracked is not always the original production location, especially when the exported goods get consolidated along the shipment route. As such, origin-of-movement data provide an inaccurate view for regional economic analysis, upon which this paper focuses. The metro average for export shares of GDP is just over 12 percent, about the level at which places like Cleveland, OH or Milwaukee, WI export. Manufacturing and energy-focused metro economies, like Baton Rouge, LA and Wichita, KS have high export shares while government hubs like Birmingham, AL, Sacramento, CA and, of course, Washington, DC tend to have very low shares of their economy devoted to exports.

Second, to measure international people flows, I utilize American Community Survey (ACS) five-year estimates of the share of a county’s foreign-born population. These county-level estimates were summed to create metro-level foreign-born shares based on OMB’s 2013 metropolitan definitions. In the average metro area, just under 8 percent of the population was born outside the United States in 2011. Places like Baltimore, MD and Jacksonville, FL exhibit

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5 For more on why these data are preferable to the U.S. Census Bureau’s exports data, see Brookings Institution, “Brookings export database methodology,” May 2015.
this level of immigrant share. The highest shares of foreign-born workers tend to concentrate in metro areas in Florida (Miami) and California (San Jose, Los Angeles, and San Francisco) whereas the lowest shares are seen in metros like Youngstown, OH and Jackson, MS.

Third, I obtain foreign direct investment data from the Brookings Metropolitan Policy Program database. Brookings uses establishment-level data to provide estimates of employment in the majority-owned U.S. affiliates of foreign companies across all 381 U.S. metropolitan areas between 1991 and 2011. These estimates are based on 2009 OMB metropolitan definitions. Brookings’ database is compiled from two different sources: The National Establishment Time Series (NETS), which stitches the records from Dun & Bradstreet’s (D&B) annual survey of business establishments in the United States into a time series; and the BEA’s Financial and Operating Data of Majority-owned U.S. Affiliates of Foreign Companies, which provide national, state, and industry benchmark data on total employment in the majority-owned affiliates of foreign companies in the United States (Marchio 2014). These data do not capture other investment flows such as foreign equity or debt investments, which may have their own influence on regional economic growth. On average, foreign-owned enterprises account for just over 4 percent of employment in U.S. metro areas. FDI shares are greatest in Bridgeport, CT, Worcester, MA, and El Paso, TX, increasing to as high as 25 percent in some regions. But most metro areas do not have a significant share of foreign-owned employment, especially regions like Provo, UT and Fresno, CA, which both have shares under 2 percent.
VI. Findings and Analysis

These results reveal several new insights on the relationship between global flows and metropolitan GDP per capita growth. The six models generally have good explanatory power. The two linear regressions explain between 40 and 55 percent of the variation in GDP per capita and the fixed effects regressions explain between 45 and 61 percent of variation in GDP per capita. Several findings are consistent across most models. First, the control variables—education, advanced industries output, and capital expenditures—are all growth-enhancing across a majority of models, which is to be expected. Second, of the global flows variables, the share of jobs in foreign-owned firms and the share of the population born outside the United States are positively associated with GDP per capita in a majority of the models. Finally, exports do not seem to have any relationship with GDP per capita growth, at least within my models.

I estimated six models to study the relationship between three global flows variables and GDP per capita growth. The first two models do not employ any fixed effects, Models 3 and 4 employ state and year fixed effects, and Models 5 and 6 employ metro area and year fixed effects. Models 1, 3, and 5 include all metropolitan areas in the United States for which data is available. Modes 2, 4, and 6 include only the top 100 metropolitan areas. All of the variables of interest can be interpreted as elasticities: a one percent change in the independent variable is associated with an X percent change in GDP per capita. The following interpretations arise from the results shown in Table 2.
Table 2. Results for regional GDP per capita growth in U.S. metro areas, 2005-2011
Dependent variable: natural log of GDP per capita

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
<th>Model 5</th>
<th>Model 6</th>
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<tr>
<td>Constant</td>
<td>7.821</td>
<td>7.731</td>
<td>8.500</td>
<td>7.70</td>
<td>10.044</td>
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<td></td>
<td>(0.167)**</td>
<td>(0.163)**</td>
<td>(0.207)**</td>
<td>(0.433)**</td>
<td>(0.157)**</td>
<td>(0.382)**</td>
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<tr>
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<td>0.849</td>
<td>-0.010</td>
<td>0.194</td>
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<tr>
<td></td>
<td>(0.019)**</td>
<td>(0.019)**</td>
<td>(0.049)**</td>
<td>(0.110)**</td>
<td>(0.019)</td>
<td>(0.055)**</td>
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<td>LnAllShare</td>
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<td>0.063</td>
<td>0.164</td>
<td>0.038</td>
<td>0.055</td>
<td>0.082</td>
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<td></td>
<td>(0.015)**</td>
<td>(0.023)**</td>
<td>(0.063)**</td>
<td>(0.079)</td>
<td>(0.023)**</td>
<td>(0.052)</td>
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<td>0.141</td>
<td>0.197</td>
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<td></td>
<td>(0.0096)</td>
<td>(0.022)**</td>
<td>(0.031)</td>
<td>(0.035)**</td>
<td>(0.052)**</td>
<td>(0.117)*</td>
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<td>(0.042)</td>
<td>(0.076)</td>
<td>(0.023)</td>
<td>(0.034)</td>
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<td>LnFDIShare_Emp</td>
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<td>-0.0003</td>
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<tr>
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<td>(0.007)**</td>
<td>(0.021)**</td>
<td>(0.012)</td>
<td>(0.068)*</td>
<td>(0.006)</td>
<td>(0.021)</td>
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<td>LnForBornSharePop</td>
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<td>0.035</td>
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<td>0.055</td>
<td>0.011</td>
<td>0.091</td>
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<tr>
<td></td>
<td>(0.005)**</td>
<td>(0.007)**</td>
<td>(0.017)</td>
<td>(0.028)*</td>
<td>(0.013)</td>
<td>(0.036)**</td>
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<td></td>
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<tr>
<td>R-sq between</td>
<td>0.3185</td>
<td>0.3880</td>
<td>0.0014</td>
<td>0.1158</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R-sq overall</td>
<td>0.3976</td>
<td>0.5491</td>
<td>0.4026</td>
<td>0.5455</td>
<td>0.0006</td>
<td>0.1288</td>
</tr>
<tr>
<td>Prob &gt; F</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Number of observations</td>
<td>2619</td>
<td>700</td>
<td>2619</td>
<td>700</td>
<td>2619</td>
<td>700</td>
</tr>
</tbody>
</table>

Fixed Effects? No No Yes – state/year Yes – state/year Yes – metro/year Yes – metro/year
Metros All Top 100 All Top 100 All Top 100
OVTEST Prob > F 0.000 0.0124

*p<0.10, **p<0.05
All six models include metrics of human capital as measured by the share of the population with a college education (LnTertShare), technological innovation as measured by the share of gross metropolitan product generated by advanced industries (LnAIShare), and physical capital as measured by capital expenditures per worker (LnCapex_perworker).

Five of the six models find that the share of the population with a college education is associated with higher GDP per capita growth at the 95 percent significance level. Depending on the model, a one percent increase in the share of the population with a college education is associated with a 0.19 percent to 0.67 percent increase in regional GDP per capita. In other words, if a metropolitan area were able to increase the share of its population with tertiary education by 10 percent, from the metro average of 28.6 percent to 31.5 percent, it could increase its GDP per capita between $800 and $2900, depending on the model. However, the magnitude declines as fixed effects are added. The models also reveal that the association is higher in the top 100 metro areas than when all metro areas are included, suggesting that the returns to education on growth may be greater in large metro areas.

Four of the six models suggest that the share of a region’s GDP generated by advanced industries is positively associated with GDP per capita growth at the 95 percent significance level. Depending on the model, a one percent increase in the share of regional GDP generated by advanced industries is associated with a 0.055 percent to 0.164 percent increase in regional GDP per capita. To get a sense for this magnitude, let’s examine a 10 percent change in the share of a region’s economy in advanced industries on GDP per capita. If the average metro economy, which generates about 15 percent of its GDP in advanced industries, were able to increase that to
16.5 percent, the associated gain in GDP per capita would be between $240 and $700. Again, the magnitude declines as fixed effects are added.

Four of the six models suggest that the amount of capital expenditures per worker is positively associated with GDP per capita growth at the 90 percent significance level. Depending on the model, a one percent increase in capital expenditures per worker is associated with a 0.084 percent to 0.197 percent increase in regional GDP per capita (or GDP per capita gains of $360 and $850 for a 10 percent change in capital expenditures per worker). The findings generally confirm my hypothesis that human capital, physical capital, and technological innovation are associated with greater GDP per capita growth.

The results from the global flows variables indicate that the share of the regional economy generated by exports (LnExportShareGDP) does not have a statistically significant association with GDP per capita, although the sign of the coefficient is positive in five of the six models, which was the hypothesized relationship between exports and GDP per capita growth.

The share of regional employment housed in foreign-owned enterprises (FOEs) also exhibits a positive relationship with GDP per capita in five of the six models, which was expected given the wealth-spurring productivity spillovers that these firms create in the local economy. However, once state and metro fixed effects were added, the coefficient on LnFDIShare_Emp became statistically insignificant, except for in Model 4. For the significant results, a one percent change in the share of regional employment in foreign-owned enterprises is associated with a 0.03 percent to 0.136 percent change in GDP per capita (or GDP per capita gains of $130 and $585 for a 10 percent change in the share of jobs in FOEs).
Finally, international flows of people and workers, as measured by the share of foreign-born population, appear to have positive associations with GDP per capita growth. Four of the six models exhibit a positive, statistically significant relationship between these two variables. Depending on the model, a one percent increase in the share of the population born in the foreign country is associated with a 0.028 percent to 0.09 percent increase in regional GDP per capita. Raising the share of the population born outside the United States by 10 percent (e.g. from the sample mean of 7.8 percent of metro population to 8.7 percent), would be associated with GDP per capita increases of $120 and $385).

These results suffer from two possible sources of bias: omitted variable bias and multicollinearity. These models should not be interpreted as comprehensive predictors of GDP per capita growth. Indeed, tests for omitted variable bias (OVTEST) on both OLS models revealed F-statistics greater than 3.6, suggesting that there are variables that matter for GDP per capita growth that are outside the scope of this analysis (e.g. industrial structure of the metro economy, etc.). Future research should explore the impact of including additional variables. Multicollinearity occurs when two or more independent variables are highly correlated. A VIF test for multicollinearity revealed a mean VIF of 1.5, well below the threshold that would imply multicollinearity.

The overarching conclusion from these results is that global flows, at least foreign direct investment and immigration, seem to matter for GDP per capita growth, but have a relatively small impact relative to things like the education and skills of the workforce, the presence of technological innovation in the economy, and capital investment.
VII. CONCLUSIONS AND POLICY IMPLICATIONS

This study attempted to estimate the relationship between global flows—trade, foreign direct investment, and immigration—and metropolitan economic growth, as measured by GDP per capita. Recent evidence suggests that participation in global flows increases GDP growth at the national level. Previous studies have examined the impact of individual global flows—whether immigration, trade, or foreign direct investment—on local economies. But to my knowledge, no study exists that examines the effect of these flows, in concert, on economic growth and prosperity.

This analysis aimed to fill that knowledge gap. I find that the share of foreign-born population and the share of jobs in foreign-owned enterprises are positively associated with GDP per capita at the metropolitan scale, while the share of metropolitan GDP generated by exports has no significant impact on GDP per capita growth. Measures of other determinants of economic growth—education, technological innovation (as measured by advanced industries share), and capital investment—are also positively associated with GDP per capita.

Several policy recommendations arise from these findings. First, a higher share of foreign-born residents seems to have a positive impact on GDP per capita. How can local economies become attractive environments for foreign-born workers? For starters, policymakers, business leaders, and civic institutions should not construct barriers around their regional economies, either by enacting anti-immigrant policies or fostering a culture that promotes anti-immigrant sentiment. Further, metropolitan areas can enable open and attractive environments for people of different backgrounds by promoting immigrant integration programs
and valuing cultural diversity. Foreign students represent tomorrow’s workforce, and colleges and universities with foreign students can be important assets for local economic development. At the national level, any immigration reform should make it easier, not harder, for young, well-educated foreign students to stay in the United States if they have obtained gainful employment.

This analysis also found that foreign direct investment is positively associated with GDP per capita growth. How can cities and metropolitan areas further foreign direct investment? Foreign companies tend to demand environments that have the necessary inputs—educated workers, innovation ecosystems, supportive infrastructure, and good governance—that support their growth. Many cities and states have sought to attract FDI through tax incentives or public subsidies. If taking this approach, local leaders should offer these incentives through investments in broader public goods that will benefit not only the potential investor but also a wider cluster of firms in the region. For instance, this means instead of offering a one-time tax break, it would be better to create a new worker training program at a local community college that will be a resource for other companies as well. Foreign direct investment attraction requires global interaction, which means that local entities typically travel abroad to close deals. While a necessary aspect of FDI policy, if possible these trips should be a shared public and private expense, given the spillover benefits that new foreign entrants provide to existing firms in the region. Those spillovers should be internalized through a shared funding mechanism through which local firms can contribute to region-wide public-private FDI efforts. In its effort to attract and retain BMW, Upstate South Carolina invested in the Clemson University International Center for Automotive Research (CU-ICAR), an advanced research campus that brings together educational training and research and development for the automotive sector. This approach
satisfies BMW’s needs, but also can benefit the broader cluster of automotive and advanced materials in the region (Muro, 2015).

The variable that had the greatest influence on GDP per capita was the share of the population with tertiary education. Therefore, local policymakers should remember that raising the level of education within their local population or attracting highly educated workers can be a path to higher average regional incomes. While beyond the scope of this report to provide a broad-based review of what local policies boost educational attainment, local policymakers tend to have the flexibility to enact reforms that strengthen the K-12 education system. Similarly, urban leaders can make their local environments more livable, and thus attractive to talented workers, through investments in infrastructure, parks, crime prevention, and other amenities.

Finally, it is not entirely clear why exports seem to have no effect on GDP per capita growth. One hypothesis is that the time period coincided with a decline in U.S. manufacturing, which accounts for a large share of exports, and therefore metro areas with a higher share of their economies devoted to exports may also be struggling with the manufacturing downturn. Therefore, future analysis should attempt to analyze the impact of industrial structure of the export sector on growth.

Mayors, county officials, regional business leaders, university presidents, and other civic stakeholders are hungry for new information that can help them steward and structure economic development investments. Boosting local exports and attracting foreign direct investment have increasingly been used as means to enable metropolitan growth. Yet, there remains significant uncertainty among the economic development community about the importance of global flows to growth (McDearman and Donahue 2015).
The empirical results from this study can help inform these debates by arming both sides with new information about the role of global flows in raising prosperity. It does not answer specific policy questions (e.g. Are trade missions the best way to increase exports? Do tax subsidies for corporate relocations lead to better economic outcomes?). These are second-order questions, which are currently occurring in a vacuum because local officials are not clear whether participation in globalization is raising average incomes. This analysis shows that participation in global flows—specifically flows of investment and people—can achieve small increases in GDP per capita, but that metropolitan leaders should not lose sight of the fact that investments in public goods like education yield the largest gains in average incomes.
### APPENDIX

Table A.1 Descriptive Statistics, 381 metro areas, 2005-2011

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number of Observations</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP Per Capita</td>
<td>2,667</td>
<td>$42,803</td>
<td>$10,050</td>
<td>$21,279</td>
<td>$126,867</td>
</tr>
<tr>
<td>Share of Population with Bachelor's Degree</td>
<td>2,667</td>
<td>28.1%</td>
<td>6.7%</td>
<td>12.8%</td>
<td>51.5%</td>
</tr>
<tr>
<td>Share of GDP In Advanced Industries</td>
<td>2,646</td>
<td>15.0%</td>
<td>7.7%</td>
<td>3.6%</td>
<td>60.8%</td>
</tr>
<tr>
<td>Capital Expenditures per Worker</td>
<td>2,667</td>
<td>$18,501</td>
<td>$13,403</td>
<td>$4,257</td>
<td>$106,828</td>
</tr>
<tr>
<td>Share of GDP in Exports</td>
<td>2,667</td>
<td>10.3%</td>
<td>5.4%</td>
<td>1.3%</td>
<td>51.4%</td>
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<td>Share of Jobs in Foreign-owned Enterprises</td>
<td>2,660</td>
<td>4.1%</td>
<td>2.6%</td>
<td>0.1%</td>
<td>25.5%</td>
</tr>
<tr>
<td>Share of Population Foreign-Born</td>
<td>2,647</td>
<td>7.6%</td>
<td>6.6%</td>
<td>0.5%</td>
<td>38.0%</td>
</tr>
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BIBLIOGRAPHY


