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The Geography of Economic Segregation

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Abstract: This study examines the key factors that are associated with the geography of economic segregation across US metros. It connects the sociological literature on the extent and variation of economic segregation to the urban economics literature on the factors associated with urban and regional performance. It advances the hypothesis that economic segregation will be greater in larger, denser, more knowledge-based regions as well as in light of racial factors and income inequality. It utilizes measures of Income, Educational, and Occupational Segregation along with a combined measure of Overall Economic Segregation. Our findings are in line with the hypothesis and indicate that economic segregation is associated with larger, denser, more highly educated metros. Economic segregation is also to a certain extent related with race and ethnicity, commuting style, and income inequality.

Keywords: economic segregation; regional performance; population; size; density; knowledge economies; inequality; race; ethnicity

1. Introduction

There has been a surge in interest in inequality among scholars, policy-makers, and the general public over the past decade or so. A large number of studies have documented the sharp rise in the inequality of nations over the past several decades (Atkinson 1975, 2015; Card and DiNardo 2002; Stiglitz 2013; Piketty 2014). Other studies have documented the worsening geography of inequality across U.S. metros (Glaeser et al. 2009; Baum-Snow and Pavan 2013; Florida and Mellander 2014).

Not only has income inequality increased over the past several decades, but economic segregation—the spatial or geographic separation of different groups—has worsened. (see Logan et al. 2004; Watson et al. 2006; Watson 2009; Bishop 2009; Reardon and Bischoff 2011; Fry and Taylor 2012; Bischoff and Reardon 2014). Fry and Taylor (2012) found that the segregation of upper- and lower-income households had risen in 27 of America's 30 largest metros. The segregation of the rich and poor increased in all but three of America's 30 largest metros between 1980 and 2010. Watson (2009) found that approximately 85 percent of people in America's cities and metro areas live in areas that are more economically segregated today than they were in 1970. Bischoff and Reardon (2014) found that the share of families living in middle class neighborhoods declined from nearly two thirds (65 percent) in 1970 to less than half (44 percent) by 2007. The share of families living in affluent neighborhoods increased from 7 percent to 14 percent and the share of families living in poor neighborhoods rose from 8 to 17 percent. Together, the share of population living in either poor or wealthy neighborhoods doubled over those three-plus decades, from 15 percent to 31 percent.

A growing number of studies suggest that the effects of economic segregation on people and neighborhoods may be more deleterious than those of inequality. Because the residents of advantaged and disadvantaged areas are exposed to very different bundles of schools, job prospects, personal and

professional networks, and all manner of other amenities, such segregation can shape widely differential prospects for upward economic mobility. Chetty et al. (2014a, 2014b, 2016) and Ewing et al. (2016) find that economic segregation is negatively associated with the ability of children from low-income to move up the economic ladder. Sharkey (2013) finds economic and racial segregation combine to trap those lower-income and less advantaged Black Americans in neighborhoods of concentrated poverty and distress, leaving them virtually "stuck in place," with little prospects for upward economic mobility. Diamond (2016) has shown that high-skill, high-pay workers derive additional advantages from living in safer neighborhoods with better schools, better health care, and a wider range of services and amenities. The inequality of overall "well-being" that they enjoy is 20 percent higher than the simple wage gap between college and high school grads can account for. Conversely, less advantaged communities suffer not just from a lack of economic resources, but from related neighborhood effects like higher rates of crime and drop-outs, infant mortality, and chronic disease.

Our research aims to identify the metro-level economic and demographic factors that are associated with economic segregation. The preponderance of the literature has focused on documenting the extent and growth of economic segregation across metro areas (Logan et al. 2004; Watson et al. 2006; Watson 2009; Reardon and Bischoff 2011; Fry and Taylor 2012; Bischoff and Reardon 2014). We connect these important, mainly sociological studies to the literature on urban economics which has sought to identify the factors that are associated with urban and regional economic growth and urban and regional housing prices (Glaeser et al. 2001, 2005; Florida and Mellander 2014). This stream of research finds that urban and regional economic growth, growth in income and wages, and growth in housing prices is associated with concentrations of human capital, measured either as highly educated households (Shapiro 2006) or highly skilled occupations (Florida 2017). By connecting the sociological literature which identifies the extent of economic segregation to the urban economics literature on the determinants of urban and regional economic performance, we seek to identify the factors that are associated with the geographic variation in economic segregation across US metro areas.

Drawing from these two literatures, our basic hypothesis is as follows. Economic segregation will be higher in more affluent, more highly educated, and more skilled (based on occupations) metros. A large literature in labor economics identifies the decline of relatively low skill middle-class jobs in factories and the bifurcation of the labor market and class structure into high-skill high-pay knowledge jobs and low-skill low pay routine blue-collar and service jobs (Autor et al. 1998, 2003, 2006). Temin (2018) suggests that as the middle class has declined, the economy and the class structure have split into an upper-class of roughly 20 percent knowledge workers and 80 percent low paid routine workers. Florida (2002) divides the class structure into an advantaged third of highly paid knowledge, professional, and creative workers, 20 percent mid-skill blue-collar workers, and 45 percent much lower paid routine service workers. Autor et al. (1998, 2003, 2006) suggest this labor market and class structure is the result of skill-biased technical change that has replaced formerly reasonably well-paying factory jobs with robots, automation, and/or outsourcing, alongside increasing returns to skill and knowledge. By extension, this would suggest that the economic gap between higher-paid knowledge workers and the rest would result in demand for very different kinds of neighborhoods, ultimately shaping a related and coincident geographic or residential bifurcation. Other research (Glaeser and Resseger 2010; Bacolod et al. 2009; Florida et al. 2008; Manning 2004; Goos and Manning 2007; Goos et al. 2009) identifies the clustering of such high skill occupations in a limited number of "superstar metros" (Gyourko et al. 2006; Florida 2017). This geographic clustering of skill, occupations, and more highly educated, higher income households puts additional pressure on their housing markets. Still other research (Edlund et al. 2015; Baum-Snow and Pavan 2013) has documented the movement of affluent, highly educated households back to the urban core where a large share of highly skilled knowledge and professional jobs are located, in part to be in closer proximity to these jobs and to reduce commute times to them and in part to gain access to unique urban amenities clustered closet to their core. This in turn raises demand for housing in these areas and leads to increased housing prices in certain neighborhoods and in entire cities and neighborhoods,

which has the effect of pricing low income, less educated, and less skilled households out. For these reasons, we hypothesize that more affluent, more skilled, and more educated metros are likely to have greater levels of economic segregation.

Our research conducts an empirical examination of the metro-level factors that are associated with economic segregation. To get at this our research introduces a broader measure of economic segregation based on education and occupation as well as income. Most extant research on economic segregation examines income segregation (Watson et al. 2006; Watson 2009; Reardon and Bischoff 2011; Fry and Taylor 2012). But sociologists have argued that social class is made up of three key dimensions: education and occupation as well as income (Wright 1985; 1997; Weeden and Grunsky 2005; Lareau and Conley 2008).

All three dimensions are related and mutually reinforcing, so it is useful and important to add educational and occupational analysis alongside income in examining the underlying factors that are associated with economic segregation. On the most basic level, income is a consequence of education and occupation, and therefore it is important to understand not just income segregation but the factors that bear on the educational and occupational segregation that will ultimately bear on income and income segregation.

Our research employs seven individual and combined measures of income, educational, and occupational segregation, and an Overall Economic Segregation Index. The individual measures are based on the Index of Dissimilarity (Duncan and Duncan 1955; Massey and Denton 1988), which compares the spatial distribution of a selected group of people with all others in that location, and they are calculated across the more than 70,000 census tracts that make up America's 350-plus metros. We use these measures as dependent variables in examining the key economic, social, and demographic factors that are associated with economic segregation. We utilize both correlation analysis and multivariate regression analysis to identify these factors.

The rest of this article is organized as follows. The next section presents our variables, data, and methodology. We follow that with a comparison of the different types of economic segregation to identify their inter-relationships and describe the types that appear to be more or less severe. We then present the findings of a correlation analysis that examines the key economic, social, and demographic factors that bear on economic segregation. This is followed by the findings of our regression analyses. The concluding section summarizes our key findings and discusses their implications.

2. Variables, Data, and Methodology

This section presents our variables, data, and methodology. The data cover the more than 70,000 U.S. tracts across all 359 U.S. metropolitan regions based on five-year estimates from the American Community Survey (ACS) for the years 2006–2010.

As noted above, we examine educational and occupational segregation as well as the more common measure of income segregation. Income is not a given but is a function of educational and occupational skill. Thus, income and income segregation are in large part products of education level and occupational skill and thus reflect educational and occupational segregation, making them important dimensions of economic segregation to measure and account for, even if all three are reasonably closely related. Understanding the differences among the three as well as how they work together will help us better understand the broader factors that condition economic segregation and its variation across metros

2.1. Economic Segregation Measures

Our key measures of economic segregation are as follows:

Income Segregation: This is the conventional metric and we measure it the following way.

- Segregation of the Poor: This covers households below the poverty level as defined by the ACS for 2006–2010.

- Segregation of the Wealthy: This covers households with an income above $200,000, the highest income group reported by tract by the ACS.
- Income Segregation: This combines the two measures above into a single index score with equal weights.

Educational Segregation: We use measures of lower and higher levels of educational attainment.

- Segregation of Non-High School Grads: This is our measure of lower levels of educational attainment. It measures the residential segregation of adults with less than a high school degree.
- Segregation of College Grads: This is our measure of higher levels of educational attainment. It measures the segregation of adults with a college degree or more.
- Educational Segregation: This combines the two educational measures into a single index score with equal weights.

Occupational Segregation: This is our measure of economic segregation based on occupational skill.

- Creative Class Segregation: This is our measure of more highly-skilled occupations. It identifies knowledge, professional, and creative occupations and is based on Florida's (2002) definition of the creative class which spans computer and math occupations; architecture and engineering; life, physical, and social science; education, training, and library positions; arts and design work; and entertainment, sports, and media occupations; management occupations, business, and financial operations, legal positions, healthcare practitioners, technical occupations, and high-end sales and sales management. These occupations make up roughly a third of all US occupations.
- Service Class Segregation: This is a measure of low-skilled routine service occupations which span food preparation and service, building and grounds cleaning and maintenance, personal care and service, low-end sales, office and administrative support, community and social services, and protective services. These occupations comprise roughly 45 percent of all US occupations.
- Working Class Segregation: This is our measure of declining blue-collar jobs and includes occupations in production, installation, maintenance and repair; construction and extraction; and transportation and material moving. These occupations make up roughly 20 percent of all US occupations.
- Occupational Segregation: This is an index of the three occupational segregation measures above, all with equal weights.
- Overall Economic Segregation Index: This index combines the income, education, and occupation index scores (equally weighted) into a score of overall economic segregation.

The seven individual indexes (poor, wealthy, non-high school grads, college grads, creative class, service class, and working class) are all calculated based on the Index of Dissimilarity (Duncan and Duncan 1955; Massey and Denton 1988). It compares the distribution of a selected group of people with all others in that location. The more evenly distributed a group is compared to the rest of the population, the lower the level of segregation. This Dissimilarity Index ranges from 0 to 1, where 0 reflects no segregation and 1 reflects complete segregation.

The Dissimilarity Index, D, can be expressed as:

$$D = \frac{1}{2}\sum_{i=1}^{n}\left|\frac{x_i}{X} - \frac{y_i}{Y}\right|$$

where x_i is the number of individuals in our selected group in tract i, X is the number of the selected group in the metropolitan area, y_i is the number of "others" in the Census tract, and Y is the corresponding number in the metropolitan area. n is the number of Census tracts in the metropolitan area. D gives a value to the degree to which our selected group is differently distributed

across Census tracts within the metropolitan area, compared to all others. *D* ranges from 0 to 1, where 0 denotes minimum spatial segregation and 1 the maximum segregation. The more evenly distributed a group is compared to the rest of the population, the lower the level of segregation. There are alternative segregation measures which could be used, such as geo-statistical measures as suggested by Wong (1999) and these may capture additional spatial information and dimensions of economic segregation; while useful, we employ the more commonly-used Dissimilarity Index, in order to make our work relevant to and more comparable with the broader body of research on economic segregation.

We combine the individual indices to create our broader measures of Income Segregation, Educational Segregation, Occupational Segregation, and the Overall Economic Segregation Index which aggregates the Dissimilarity Index scores for Income, Educational, and Occupational Segregation, weighting them at 0.33 each.

It is important to remember that while the Dissimilarity Index measures the level of segregation it is not a perfect measure in the sense that it provides an optimal level of segregation. For example, an Index score equal to 0 only indicates that the selected group is geographically distributed across Census tracts in the metro like everyone else. It does in no way imply that 0 would be the optimal segregation level.

2.2. Economic, Social, and Demographic Variables

The main contribution of our research is to identify the factors associated with the geographic variation in economic segregation across metros. To do so, we examine the relationships between economic segregation and the following demographic, economic, and social variables identified in the literature on urban and regional economic growth. All variables are measured at the metropolitan level.

Population Size: A vast amount of research suggests that population size is a key factor in regional performance (e.g., Marshall 1890; Krugman 1980; Duranton and Puga 2003). We thus believe that population size may be a factor in economic segregation as well. Larger metros with more people will not only be more likely to have higher incomes and levels of development, but by virtue of the simple fact that they have more people be more likely to have higher levels of segregation. Therefore we include a variable for metro population based on 2008–2010 ACS. A. logged version of this variable is used for the analysis.

Population Density: Studies also find that population density is associated with higher levels of urban and regional economic performance (Ciccone and Hall 1996; Harris and Ioannides 2000). Density is also related to size, with larger metros having higher densities. Metros with higher density are also likely to have higher levels of economic segregation. Higher density at the urban core tends to be associated with higher levels of knowledge and professional industry and jobs and higher demand for housing. We take this into account using a measure of population-weighted density where density is a function of the distance from the city center or city hall, and where each subdivision of the metro is weighted by its share of the metro's total population (see Wilson et al. 2012).

Income/Wages: Income and wages are a clear measure of regional performance and productivity (Mincer 1974). We suggest that metros with higher incomes are likely to be more segregated as higher incomes and higher wages mean that certain groups can spend more for housing. We use a measure of average income per capita from the 2008–2010 ACS, and a measure of the average metro wage from the United States Bureau of Labor Statistics (BLS) for the year 2010.

Educational Attainment/College Grads: There is a large literature that finds regional incomes and economic performance to be a function of human capital or educational attainment. This literature finds a close connection between the share of adults with a bachelor's degree and above and regional income levels (Rauch 1993; Berry and Glaeser 2005). We believe that more highly educated metros will be more segregated, because more highly educated households will demand not only large housing units but access to neighborhoods with better schools, personal and professional networks, and other services and amenities. We use the conventional measure of the share of adults with a college degree or more. The data is from the 2008–2010 ACS.

Occupational Skill: There is a related literature that finds regional performance to also be related to the level of occupational skill (Florida 2002; Gabe 2009). As per this literature, we define three categories of occupational skill.

- Knowledge/Creative Class: We define this as the share of employment in knowledge, professional, and creative occupations, including: computer science and mathematics; architecture; engineering; life, physical, and social sciences; education, training, and library science; arts and design work; entertainment, sports, and media; and professional and knowledge work occupations in management, business and finance, law, sales management, healthcare, and education. This is based on 2010 data from the BLS.
- Service Class: This is the share of employment in low-skill, low-wage service class jobs including: food preparation and food-service-related occupations, building and grounds cleaning and maintenance, personal care and service, low-end sales, office and administrative support, community and social services, and protective services, also based on 2010 BLS data.
- Working Class: This is the share of employment in blue-collar occupations including: production occupations, construction and extraction, installation, maintenance and repair, transportation, and material moving occupations. This is also based on 2010 data from the BLS.

Housing Costs: Housing costs can be a direct contributor to economic segregation, as people sort themselves according the housing they can afford. Housing costs has increased faster in superstar cities and metros due to the combination of higher demand and restricted, inelastic housing supply (Gyourko et al. (2006) as well as Glaeser et al. (2005)). Diamond (2016) shows how high housing prices in superstar cities lead to sorting and segregation based on wages and earnings. The median monthly housing costs is from the 2008–2010 ACS.

Type of Commute: The type of commute can also influence economic segregation. Chetty et al. (2014a, 2014b, 2016) and Ewing et al. (2016) find an association between sprawl and economic segregation. More geographically dispersed metros limit upward mobility by providing poorer access to jobs, especially for less-advantage and less-skilled workers. Glaeser et al. (2001) suggest that sprawl matters for the economic performance of metros, but that its effects are not necessarily negative so long as infrastructure is able to keep commute times reasonable. We include two variables related to type of commute. The data for the commute variable is also from the 2008–2010 ACS.

- Drive to Work Alone: The first is the share of commuters that drive to work alone, a proxy for sprawl. A higher share of commuters who drive alone to work is a likely indicator of greater sprawl.
- Transit to Work: The second is the share of commuters that use public transit to get to work. A higher share of commuters who use public transit likely is to be associated with more compact, denser metros.

Race/Ethnicity: There is a vast amount literature on connection between race/ethnicity and segregation (Sampson 2012; Sharkey 2013). There are also studies that show the effect of race and ethnicity on regional economic performance (Sparber 2010). We measure four major groups per the 2008–2010 ACS: the share of population that is White, Black, Asian, and Hispanic-Latino.

Diversity: We use two measures to account for demographic diversity.

- Gay Index: Florida (2002) as well as Florida and Gates (2001) suggest that more diverse, open metros also perform better financially and attract more skilled labor. We would therefore assume a positive relation between the Gay Index and economic segregation. This is a location quotient (which measures the regional over-representation of this group compared to the national average) for the concentration of gay and lesbian households, from the ACS for the years 2005–2009.
- Foreign-Born: Peri (2012, 2016) suggests that immigration is positively related to productivity performance of a metro. Based on this we would expect a positive relation between foreign-born and segregation. This is the percentage of population that is foreign-born, from the 2008–2010 ACS.

Income Inequality: Chetty et al. (2014a, 2014b, 2016) as well as Sampson (2012) and Sharkey (2013) show a connection between income inequality and segregation. We include a variable of income inequality to test for that. Our measure is based on the conventional Gini Coefficient measure and is from the 2008–2010 ACS. Glaeser et al. (2009) and Florida and Mellander (2014) find a connection between inequality and the economic performance of metros. Since greater inequality implies a greater dispersion of incomes, we assume that it is likely to go along with greater spatial sorting and economic segregation.

It is important to note that most of these factors serve as proxy variables associated with the knowledge economy and regional economic performance. We do not claim any causal effects but are instead interested in the connection between these factors and economic segregation. Several of the variables capture similar structures—for example, average income and wage levels, or educational human capital and occupational skill. Due to the close relation between many of these factors, we will run a basic correlation analysis followed by a multivariate, stepwise OLS regression analysis.

3. Key Findings

We now turn to our main findings. We begin by looking at the differences and similarities between each of the economic segregation measures.

Table 1 lists the correlations for the various types of economic segregation. They are similar but not the same. The specific correlations range from 0.95 (for Occupational Segregation and the Overall Economic Segregation Index) to a low of 0.65 for Occupational Segregation and Income Segregation. The correlates for Income Segregation and the other two types of segregation are in the range of 0.65–0.83. So, while Income Segregation is related to Educational and Occupational Segregation, they are not the same.

Table 1. Correlations for the Various Economic Segregation Indexes.

	Income Segregation	Educational Segregation	Occupational Segregation	Overall Economic Segregation
Income Segregation	1	0.68 **	0.65 **	0.83 **
Educational Segregation	0.68 **	1	0.85 **	0.94 **
Occupational Segregation	0.65 **	0.85 **	1	0.95 **
Overall Economic Segregation	0.83 **	0.94 **	0.95 **	1

** Significant at the 1 percent level.

Table 2 shows the mean, minimum and maximum values for each of the seven individual segregation variables. Smaller values reflect lower levels of segregation; higher values reflect greater segregation.

Table 2. Scores for Different Measures of Economic Segregation.

Type of Economic Segregation	Minimum	Maximum	Mean
Segregation of the Poor	0.170	0.485	0.324
Segregation of the Wealthy	0.283	0.646	0.456
Segregation of Non-High School Grads	0.102	0.503	0.277
Segregation of College Grads	0.139	0.441	0.288
Segregation of the Creative Class	0.111	0.344	0.206
Segregation of the Service Class	0.059	0.225	0.120
Segregation of the Working Class	0.085	0.330	0.196

The most important finding to come from this part of our analysis is that Income Segregation is relatively more severe than either Educational or Occupational Segregation. The most severe form of segregation by far is the Segregation of the Wealthy, with a mean value of 0.456. It is followed by Segregation of Poverty with a mean value of 0.323, which is also higher than any form of either Occupational or Educational Segregation. Of the three types of economic segregation,

Occupational Segregation appears to be the least severe according to these measures. The Creative Class Segregation is on average marginally higher (0.206) than Working Class Segregation (0.196), while Service Class Segregation is quite a bit lower (0.120). This likely reflects the fact that the Service Class makes up nearly half of all occupations and is therefore more evenly spread out geographically across tracts within metros.

Educational Segregation occupies a middle ground between Income and Occupational Segregation. The mean values for Segregation of Non-High School Grads and the Segregation of College Grads are similar (0.277 and 0.288, respectively). That said, the range for Non-High School Grads is greater, indicating a broader range for this type of segregation, even though the means are similar.

These findings suggest that across these three types, economic segregation to a larger extent could be a function of the locational choices of the more advantaged groups by income, education and occupation. In each case—for Income, Educational, and Occupational Segregation—the mean scores for the more advantaged groups are higher than for less advantaged groups. This is so for Occupational Segregation, where the Creative Class Segregation has a higher mean segregation score than either the Working Class or the Service Class Segregation; for Educational Segregation, where the variable for Segregation of College Grads have a slightly higher mean segregation score than that for the variable for the Segregation of Non-High School Grads; and it is especially true for Income Segregation, where the variable for the Segregation of the Wealthy has a significantly higher score than for the Segregation of the Poor.

Taken together, these findings suggest that more advantaged groups have the resources to isolate themselves from less advantaged groups. This finding is in line with other research on the subject. Fry and Taylor (2012) found that the population of high-income residents living in high-income neighborhoods or tracts doubled between 1980 and 2010 compared to the population of low-income households living in low-income neighborhoods, which grew by just 5 percentage points over the same period. Bischoff and Reardon (2014, p. 33) note that the segregation and isolation of the rich has become "consistently greater" than the segregation of the poor over the past several decades.

A decade or so ago, Bishop (2009) noted how talented and educated people were concentrating more in some places than others, a tendency he dubbed "the big sort". Our findings are in line with this contention. Indeed, America's metropolitan areas appear to have cleaved into small clusters of economic advantaged defined by greater incomes, higher levels of education, and knowledge and professional occupations, and large spans of relative disadvantage defined by lower income levels, lower levels of education, and lower-paying blue-collar service occupations.

To get a better handle on the factors associated with economic segregation across metros, we now turn to the findings of our correlation analysis.

3.1. Correlation Analysis Findings

Table 3 summarizes the key findings of the correlation analysis for our overall economic segregation index and our measures of income, educational and occupational segregation. The Appendix A includes correlations for all economic segregation measures.

Population Size: We hypothesized that economic segregation would be greater in larger metros and this is what our correlations suggest. Economic segregation is closely associated with the Population Size of metros with correlations that range from 0.525 to 0.643. These correlations are roughly the strongest in our analysis. Indeed, the metros with the lowest levels of overall economic segregation are mainly smaller and medium-sized ones. There are more than 200 small and medium-sized metros where overall economic segregation is less than in the least segregated of the 51 large metros.

Population Density: We also hypothesized that economic segregation would be associated with Population Density, and our findings are in line with that hypothesis. The correlations here range from 0.438 to 0.560. These are roughly the second strongest set of correlations in our analysis.

Table 3. Correlation Analysis Results.

	Income Segregation	Educational Segregation	Occupational Segregation	Overall Economic Segregation
Population Size	0.525 **	0.621 **	0.596 **	0.643 **
Population Density	0.438 **	0.557 **	0.520 **	0.560 **
Income	0.159 **	0.279 **	0.321 **	0.291 **
Wages	0.249 **	0.474 **	0.477 **	0.456 **
College Grads	0.300 **	0.431 **	0.495 **	0.465 **
Knowledge/Creative Class	0.352 **	0.503 **	0.554 **	0.532 **
Service Class	−0.109 *	−0.162 **	−0.079	−0.124 *
Working Class	−0.175 **	−0.354 **	−0.426 **	−0.370 **
Housing Costs	0.100	0.362 **	0.342 **	0.312 **
Drive to Work Alone	0.056	−0.256 **	−0.314 **	−0.217
Take Transit to Work	0.232 **	0.337 **	0.417 **	0.377 **
White	−0.254 **	−0.479 **	−0.424 **	−0.434 **
Black	0.304 **	0.234 **	0.264 **	0.292 **
Asian	0.094	0.317 **	0.362 **	0.304 **
Hispanic-Latino	0.018	0.380 **	0.236 **	0.244 **
Gay Index	0.067	0.478 **	0.514 **	0.422 **
Foreign-Born	0.073	0.479 **	0.421 **	0.380 **
Income Inequality	0.322 **	0.514 **	0.532 **	0.517 **

** Significant at the 1 percent level; * significant at the 5 percent level.

Income and Wages: We hypothesized that economic segregation would be higher in more affluent metros with higher incomes and wages. And again, this is what our correlation analysis implies. Economic segregation is positively associated with both Wages and Income. The correlations for Wages are stronger than those for Income, ranging from 0.259 to 0.477, and are among the strongest correlations in our analysis. The correlations for Income are more modest, ranging from 0.159 to 0.321.

Education/College Grads: We also hypothesized that economic segregation would be higher in more educated metros. And, we find close associations between economic segregation and Education measured as the percent of adults that are college grads, with correlations that range from 0.300 to 0.495. These correlations are also some of the stronger correlations in our analysis, being just slightly less strong than those for Population Size and Density.

Occupational Skill: We hypothesized that economic segregation would be higher in metros with higher levels of occupational skill based on the concentration of knowledge, professional, and creative occupations. Again, the correlations are in line with the hypothesis. Economic segregation is positively associated with higher levels of the Knowledge/Creative Class, with correlations ranging from 0.352 to 0.554. These are relatively strong and in line with and reinforce the findings that educational attainment measured as college graduates. Conversely, we find that economic segregation is more modestly negatively associated with the share of workers in blue-collar Working-Class occupations with correlations ranging from −0.175 to −0.426. The correlations for Service Class are also more modest, being negative and weakly significant in most of the cases, ranging from −0.079 to −0.162.

Housing Costs: Housing Costs, we hypothesized, to be associated with economic segregation, and the correlation findings support this hypothesis. Economic segregation is mainly positively associated with our variable for Housing Costs. Most of the correlations are relatively modest, in the mid-0.3 s, with the correlation for income segregation correlation being insignificant. Here, we note that we are looking at median values, which do not capture the distribution of housing costs within a metro. A metro with little variation in costs for housing can end up with the same median value for housing as a metro where the variation ranges from very cheap to very expensive. Also, our analysis covers all 350-plus American metros. Housing costs in high-cost metros like New York or San Francisco likely play a much larger role in residential segregation than they do on average.

Commuting Type: We hypothesized that economic segregation would be related to the way people in different metros commute to work, namely whether they take transit or drive a car to work. Here again, the correlations lend support to this hypothesis. Economic segregation is more highly and

positively associated with the share of commuters who Take Transit to Work, with correlations in the range 0.322 to 0.417. On the flip side, economic segregation is mainly negatively associated with the share of commuters who Drive to Work Alone. The correlations for this variable are negative, being in the range of −0.2 to −0.3, and the correlation for income segregation is insignificant. These findings likely reflect the broader effects of size and density. Transit is associated with larger, denser regions; while commuters are more likely to drive to work alone in smaller and more spread out, lower density and more sprawling metros.

Race/Ethnicity: A broad body of research documents the connection between race, poverty, and segregation (Wilson 2012; Sampson 2012; Sharkey 2013). Our findings also suggest that race and ethnicity is connected to economic segregation. Economic segregation is positively associated with the share of population that is Black. Here, the correlations are in the range of 0.234 to 0.304. Economic segregation is also mainly positively associated with the share of population that is Hispanic-Latino. The correlations are again positive and mainly in the high 0.2 s and 0.3 s, but the correlation for income segregation is insignificant. Economic segregation is also positively associated with the share of population that is Asian. The correlations here are mainly in the 0.3 s, but the correlation to Income Segregation is again insignificant. Conversely, economic segregation is negatively associated with the share of the population that is White with correlations ranging from −0.254 to −0.479. Generally speaking, race and ethnicity play a relatively larger role in educational and occupational segregation than in income segregation. Also, generally speaking, the strength of the correlations seems to suggest that the White share of the population plays a relatively greater role in economic segregation than the shares of racial and ethnic minorities.

Diversity: We hypothesized that segregation would be related to other measures of demographic diversity, with more diverse metros on these measures being more economically segregated. Our correlation analysis shows that economic segregation is positively associated with two common measures of diversity: the concentration of gay and lesbian people and the share of the population that is foreign-born. The correlations for the Gay Index are relatively stronger, being mainly positive and in the range of 0.4 s to 0.5 s, though the correlation for income segregation is insignificant. The correlations for the Foreign-Born mainly range from the 0.3 s to 0.4 s, though here again the correlations for Income Segregation are insignificant. Generally speaking then, more diverse metros tend to be more economically segregated.

Inequality: Following Chetty et al. (2014a, 2014b, 2016) and others, we hypothesized a connection between income inequality and economic segregation. And, our correlation findings are in line with that hypothesis. The correlations for all four measures of economic segregation are positive and significant, and among the stronger associations in our analysis. The correlations are mainly in the 0.5 s with the exception of the correlation for Income Segregation which is 0.322.

Overall and taken together, our bivariate correlation findings support our key hypothesis. Economic segregation appears to be most closely related to the size, density, education and skill levels of metros. In addition, economic segregation is positively related to income, wage, and housing costs, which are in turn connected to education and occupational skill levels as per the urban economics literature on urban and regional growth. Economic segregation is also to a certain extent related to commuting styles, which are in many ways proxy measures for size and density. Furthermore, economic segregation is related to race and ethnicity—positively with our variables for ethnic and racial minorities and negatively with the share of the population that is white. In other words, economic segregation is greater in metros with larger concentrations of racial and ethnic minorities and lower in metros that are more white. Economic segregation is also connected to demographic diversity, being positively associated with our two measures for this. Lastly, economic segregation appears to be closely connected to income inequality, with metros with higher levels of income inequality also having higher levels of segregation.

It is worth pointing out that in some cases the correlations for our measures of Educational and Occupational Segregation as well as for Overall Economic Segregation are stronger than for Income

Segregation. This leads us to believe that our measures for Occupational and Educational Segregation add in helping to understand how economic segregation plays out across metros and the factors that underpin its geographic variation. To deepen this analysis and understanding, we now turn to the findings of our multivariate regression analysis.

3.2. Regression Analysis Findings

We now turn the findings of our regression analysis. Given that many of the variables in our analysis are likely to be closely related, including all of them combined would lead to problems of multicollinearity. To deal with this, we run a basic regression analysis. We employ a stepwise OLS regression, informed by our theory and hypotheses about the role of factors associated with urban and regional growth and development also being associated with higher levels of economic segregation. We use stepwise regression, which estimates each segregation regression based on the variables that best explain the distribution. Based on this analysis, we can examine what variables from our correlation analysis that are relatively strong in relation to our dependent variables, at the same time as we exclude the weaker variables, serves to mitigate issues with multicollinearity in our regression models.

The four Economic Segregation variables—Overall Economic Segregation, Income Segregation, Educational Segregation, and Occupational Segregation—serve as the dependent variables in our analysis.

Table 4 reports the key results from this regression analysis. For each regression, we report both the unstandardized and standardized coefficients to be able to distinguish their relative strength.

Table 4. Regression Analysis Results.

	Income Segregation	Educational Segregation	Occupational Segregation	Overall Economic Segregation
Population Size	0.604 **/0.012 (0.012)	0.063 **/0.251 (0.011)	0.055 **/0.240 (0.011)	0.056 **/0.265 (0.010)
Population Density	0.224 **/0.600 (0.027)	0.088 **/0.207 (0.023)	0.086 **/0.221 (0.020)	0.125 **/0.348 (0.020)
Income	−0.000012 **/−0.206 (0.000004)	-	-	-
Wages	-	-	-	-
College Grads	1.112 **/0.365 (0.182)	0.711 **/0.205 (0.194)	0.447 */0.140 (0.204)	0.761 **/0.260 (0.197)
Knowledge/Creative Class	-	-	1.238 **/0.238 (0.293)	0.932 **/0.196 (0.254)
Service Class	-	−1.543 **/−0.261 (0.274)	-	-
Working Class	-	−1.085 **/−0.227 (−0.273)	-	-
Housing Costs	−0.00028 **/−0.279 (0.00008)	-	−0.00029 **/−0.274 (0.00007)	−0.00027 */−0.306 (0.00005)
Drive to Work Alone	1.458 **/0.311 (0.262)	0.707 **/0.132 (0.242)	-	0.606 **/0.135 (0.201)
Take Transit	0.032 */0.133 (0.015)	-	-	-
White	-	−0.005 **/−0.245 (0.001)	−0.004 **/-0.203 (0.001)	−0.003 **/−0.175 (0.001)
Black	0.006 **/0.288 (0.001)	-	-	0.002 */0.119 (0.119)
Asian	-	-	-	-
Hispanic-Latino	0.002 */0.169 (0.001)	0.007 **/0.441 (0.001)	-	0.002 **/0.157 (0.001)
Gay Index	-	-	0.129 **/0.144 (0.043)	-

Table 4. *Cont.*

	Income Segregation	Educational Segregation	Occupational Segregation	Overall Economic Segregation
Foreign-Born	−0.942 **/−0.282 (0.303)	−1.286 **/0.338 (0.265)	-	-
Income Inequality	-	3.309 **/0.295 (0.397)	2.820 **/0.274 (0.437)	1.943 **/0.206 (0.388)
R^2	0.602	0.711	0.677	0.716
R^2 Adj	0.589	0.701	0.669	0.706

Notes: ** significant at the 1% level; * significant at the 5% level. Unstandardized β-coefficients/standardized β-coefficients, standard errors within parentheses. VIF value for the Income Segregation regression range from 1.3 to 6.3, from 1.3 to 5.1 for the Educational Segregation regression, from 1.6 to 3.9 in the Occupational Segregation regression, and from 2.1 to 4.7 in the regression for Overall Economic Segregation.

The first model is for Income Segregation, which is the standard measure of economic segregation employed in the literature. The R^2 values for Income Segregation are 0.602 and 0.589 indicating that roughly 60 percent of the variation in Income Segregation is explained by the variables included in this model. The coefficient for Population Density is the strongest variable in the model with a standardized beta value of 0.600. It is followed by the variables for College Grads, Drive to Work Alone, Black Share, Foreign-Born, and Housing Costs. These variables have standardized beta coefficients ranging from 0.365 to 0.279.

The second model is for Educational Segregation. The model results suggest a pattern which is somewhat different than for Income Segregation. The R^2 is 0.711 indicating that approximately 70 percent of the variation in Educational Segregation is explained by the included variables. Now, the strongest explanatory variable is a variable for race or ethnicity, Hispanic-Latino, with a standardized beta coefficient of 0.441, followed by Foreign-Born (0.338), Income Inequality (0.295), and Service Class (−0.261). Compare this to the model for Income Segregation where the top two variables were Population Density and College Grads; the variable for Hispanic-Latino was only weakly significant. Furthermore, the variables for both the Service Class and Working Class are significant and negative in this model. When it comes to the measures for race and ethnicity, the variable for White Share of the population is significant in this model, while the variable for Black Share is not.

The third model for Occupational Segregation generates an R^2 of 0.677. The strongest variables are again different: Housing Costs (−0.274) and Income Inequality (0.274). They are followed by Population Size and Knowledge/Creative Class, which are followed in turn by the variables for Population Density and White Share of the population.

The fourth model is for Overall Economic Segregation—our combined measure of all three types of economic segregation. This model generates an R^2 of 0.716, the highest of all four regressions. The strongest variable is Population Density. The next strongest variable is the variable for Housing Costs which is negative and significant. The variables for College Grads and Population Size are both positive and significant with standardized beta values at approximately the same level. The variable for Knowledge/Creative Class and Income Inequality are next with standardized beta coefficients around 0.2. The remaining variables—White, Hispanic-Latino, Drive to Work Alone, and Black Share—generate standardized beta coefficients equal to 0.119 to 0.175, which indicate that while significant they explain relatively less of the variation in this model.

Generally speaking, the results of the four regression models suggest that different factors act on the geographic variation of the different types of economic segregation across metros. Overall, the included explanatory variables vary in relative importance given what kind of economic segregation we examine, which suggests that while they are correlated and overlapping, there are still differences between them and in the factors they represent.

That said, some general patterns are apparent when we look across the results of the four regression models. Indeed, across our regression models, three variables stand out as being positive

and significant in all four models: Population Size, Population Density, and College Grads. We can thus say that economic segregation in all these forms is closely associated with the size, density, and education levels of metro areas. Reinforcing this, the variable high levels of occupational skill, Knowledge/Creative Class, is positively associated with economic segregation in the two models which it is included in for Overall Economic Segregation and Occupational Segregation. Further reinforcing this and in line with our hypothesis, the variables for Working Class and Service Class are negative and significant in the models in which they are included.

Furthermore, five additional variables—White Share, Hispanic-Latino-Share, Drive to Work Alone, and Housing Costs—are significant in three out of four models. But while Housing Costs is relatively strong in all three cases, Drive to Work Alone is relatively stronger in the model for Income Segregation regression than the others. The variables for race tend to vary in strength. The variable for White Share is generally negative and significant and the variable for Hispanic-Latino Share is generally positive and significant. The latter is relatively strong in the Educational Segregation model, but weaker in the models for Income Segregation and Overall Economic Segregation. The variable for Black Share is positive and significant in the two models in which it is included, but stronger in relation to Income Segregation than in relation to Overall Economic Segregation. The variable for Drive to Work Alone is positive and relatively strong in the model for Income Segregation, but less so in the model for Educational Segregation, and is statistically insignificant in the model for Occupational Segregation. The variable for Housing Costs is generally speaking negative and significant. This is different from what we would expect and also different from the results of the correlation analysis where the coefficients were positive and significant. Because housing costs follow education, skill, and income levels, we would have expected these coefficients to be positive and significant. This may have been an effect of multicollinearity issues given that this is one of the included variables which generates one of the highest VIF values. Here it is worth pointing out that while there is not a specific cut-off for acceptable VIF scores several studies (Hair et al. 1995; Kennedy 1992; Neter et al. 1989) note that suggested values should be below 10. All of our included variables have significantly lower VIF scores than this. When we re-run the regressions, excluding the variables for Foreign-Born and Income (also with high VIF), the variable for Housing Cost remains negative. The negative sign may also reflect the fact that this variable measures the median housing values and not the distribution of housing costs within each metro which may have be more closely related to economic segregation.

In addition, the variable for Income Inequality is positive and significantly associated with Economic Segregation in the three models in which it is included. Here, we find a reasonably close connection between income inequality and economic segregation. Metros that are more unequal also tend to be more economically segregated.

In sum, the results of the regression models are in line with our hypothesis. Economic segregation—across all four measures of it—is closely associated with the size, density, and educational level of metros. Economic segregation is also connected to our measure of occupational skill. Economic segregation is also associated with metros where more people drive their cars to work, another proxy for low density and smaller size. Furthermore, economic segregation is associated with race and ethnicity, being greater in metros with higher concentrations of racial and ethnic minorities and lower in more homogenous places where Whites make up a larger share of the population. Lastly, economic segregation is closely connected to income inequality, suggesting that the two reinforce one another.

4. Conclusions

Our research has sought to marry the urban sociology literature on the extent of economic segregation with the urban economics literature on the factors related to regional growth to get a better handle on the factors that are associated with economic segregation across metropolitan areas. Drawing upon these literatures, we hypothesized that economic segregation would largely be a function of factors like population size, population density, educational levels, levels of occupational

skill, and regional income and wealth, as well as factors such as race and ethnicity, diversity, commuting styles, and income inequality.

To test this hypothesis, we developed several measures of economic segregation—including measures of Educational and Occupational Segregation as well as the conventional measure of Income Segregation, and a measure Overall Economic Segregation which combines all three. We used them to conduct both a correlation analysis and regression analysis of the factors that are associated with economic segregation across metro areas.

Our key findings confirm the hypothesis. The findings of our regression analysis identify three key variables that are associated with economic segregation: Population Size, Population Density, and College Grads. These are all key factors identified in the literature on urban and regional economic growth. Economic segregation is greater in larger metros with larger populations. By virtue of their size, such metros have greater potential and capacity for groups to sort and segregate. Economic segregation is greater in denser metros. These are the metros that have tended to attract affluent and highly skilled households back to the core—a factor that may lead to greater sorting and segregation which is greater in metros with higher levels of education. Education is a key determinant of regional income levels which in turn create more economic capacity for segregation and sorting. Economic segregation is also to some extent associated with measures of race and ethnicity, particularly the White and Hispanic-Latino share of the population, Housing Costs, and the share of commuters who Drive to Work Alone, our measure of sprawl.

Our research poses several implications for public policy. For one, the policy discourse which has focused mainly on economic inequality should specifically address economic segregation. While income inequality and economic segregation tends to be associated with one another, they are not the same thing. As Bischoff and Reardon (2014, p. 18) notes, "although income inequality is a necessary condition for income segregation, it is not sufficient." A metro might be quite unequal but not particularly segregated if lower and upper income groups are distributed evenly across neighborhoods. Likewise, a metro could be highly segregated but relatively equal if its different economic groups reside in different neighborhoods.

Segregation by definition isolates more advantaged and less advantaged groups in different neighborhoods and communities, compounding the advantages of the affluent who have access to different and better schools, better personal and professional networks, and better amenities and services. Economic segregation also has the effect of limiting economic mobility of the less advantaged.

Our research suggests that policies should specifically focus on reducing segregation in addition to addressing income inequality. While inequality can be addressed by policies that act to increase human capital, boost wages, or redistribute income, policies to address segregation should deal with the geographic isolation of segregated groups. This entails policies which provide affordable housing and create more integrated mixed-used neighborhoods.

In addition, our analysis suggests that economic segregation appears to be a feature of larger, denser, and more affluent and knowledge-based metros. Here we can say it is a feature of factors associated with economic success. Since larger, denser, more knowledge-based metros also tend to have more progressive politics and more left-leaning mayors, this may be something they are more equipped to deal with. We hope our analysis encourages more research on this important subject.

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Appendix A

Table A1. Correlation Results for the Seven Sub-Groups of Economic Segregation.

	Poor	Wealthy	Non-High School Grads	College Grads	Creative Class	Service Class	Working Class
Population Size	0.427 **	0.377 **	0.575 **	0.538 **	0.603 **	0.282 **	0.614 **
Density	0.536 **	0.172 **	0.626 **	0.392 **	0.557 **	0.392 **	0.420 **
Income	0.397 **	−0.154 **	0.367 **	0.154 **	0.237 **	0.327 **	0.339 **
Wages	0.461 **	−0.079	0.536 **	0.343 **	0.479 **	0.413 **	0.444 **
College Grads	0.508 **	−0.037	0.472 **	0.320 **	0.306 **	0.456 **	0.571 **
Knowledge/Creative Class	0.480 **	0.062	0.483 **	0.421 **	0.422 **	0.472 **	0.591 **
Service Class	−0.201 **	0.033	0.118 *	−0.180 **	−0.152 **	0.034	−0.138 **
Working Class	−0.207 **	−0.062	−0.391 **	−0.253 **	−0.320 **	−0.459 **	−0.345 **
Housing Cost	0.291 **	−0.143 **	0.517 **	0.172 **	0.370 **	0.301 **	0.307 **
Drive to Work Alone	−0.090	0.169 **	−0.349 **	−0.146 **	−283 **	−0.385 **	−0.276 **
Take Transit	0. 367 **	0.014	0. 332 **	0.281 **	0.368 **	0.447 **	0.379 **
White	−0.102	−0.286 **	−0.424 **	−0.445 **	−0.512 **	−0.282 **	−0.315 **
Black	0.119 *	0.338 **	0.057	0.336 **	0.220 **	0.170 **	0.233 **
Asian	0.223 **	−0.067	0.359 **	0.237 **	0.371 **	0.355 **	0.329 **
Hispanic-Latino	−0.094	0.152 **	0.459 **	0.251 **	0.449 **	0.056	0.110 *
Gay Index	0.104	0.001	0.515 **	0.388 **	0.518 **	0.416 **	0.461 **
Foreign-Born	0.071	0.062	0.572 **	0.334 **	0.589 **	0.261 **	0.340 **
Income Inequality	0.223 **	0.306 **	0.355 **	0.575 **	0.477 **	0.354 **	0.499 **

** Significant at the 1 percent level; * significant at the 5 percent level.

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