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Explaining the Economic Competitiveness of the District of Columbia

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EXECUTIVE SUMMARY

1. Introduction

In this report we assess the determinants of city job growth over time. Our focus is on the determinants of job growth in the District of Columbia, and, as a result of our analysis, we project the likely change in job growth in the District over time under various scenarios.

The District of Columbia anchors one of the nation's most dynamic regional economies. From 1990 to 2008 the Washington metropolitan area grew by 27% to over 5.3 million people. In contrast to its surrounding region, the District's population declined by about 3% from 1990 to 2008, employment grew only slightly from 1990 to 2008, and most of the people holding those jobs reside elsewhere in the region.

This same sort of central city/regional difference largely resembles many metropolitan areas across the nation. Central city job loss or slow growth relative to suburban areas is not new as nationally suburbs generally increase jobs at a faster rate than their central cities.

Our purpose in this report is to understand the factors that affect the District's economic competitiveness. Specifically we focus on understanding what affects the location of jobs in the city. Using a statistical model that includes the District and twenty-two other central cities from 1989 to 2008, we examine the impact of city-specific factors on city employment while also controlling for the effects of regional economic performance.

2. Background and Existing Literature

What makes the city a more attractive place for firms relative to the suburbs within a given region? The existing literature suggests that key determinants of the regional decision include characteristics important to the firm that vary among regions such as labor cost and quality, transportation costs, and energy costs. Specific site selection decisions are based on characteristics that vary among locations within the region such as land costs, access to transportation links, and tax/service packages and fiscal incentives of local governments. Our concern in this study rests primarily on firm location at this second level of decision-making, the intra-regional siting decision.

From the literature reviewed in the main report we infer several conclusions about the determinants of intra-regional economic competitiveness. First, many factors affecting intra-regional location of economic activity will differ from factors affecting inter-regional location due to a lack of intra-regional variance. For example, climate varies little within a region and labor markets are metropolitan-wide in scope. Other factors may be more important to local

economic competitiveness than to regional competitiveness. For example, taxes only weakly affect regional growth but may strongly affect intra-regional growth and land costs are likely to hugely affect intra-regional economic activity. In a third category are variables that matter at both the inter-regional level and intra-regional level, but perhaps in different ways. For example, transportation of goods affects inter-regional growth but transportation of labor (commuters) potentially affects intra-regional growth.

3. Literature on Intra-Regional Economic Competitiveness

The literature on intra-regional economic competitiveness is far thinner than that of inter-regional economic competitiveness. Considerably more central cities are losing than gaining market share relative to their regions (Brennan and Hill, 1999; Hill and Brennan, 2005), but research on the determinants of intra-metropolitan competitiveness is largely limited to case studies of single areas (e.g., Boarnet, 1994; Mark, McGuire and Papke, 1998), studies that examine "central" counties, rather than central cities (Carlino and Mills, 1987; Levernier and Cushing, 1994; Clark and Murphey, 1996), and studies that look at change over decades (Leichenko, 2001; Haughwought and Inman, 2002). Altogether, the existing research demonstrates that we have very little evidence regarding the determinants of city employment growth.

4. Modeling Central City Employment

City-based data on economic activity is infrequently collected by the U.S. Census and relevant organizations. Such data is however commonly and frequently gathered at the county level. The problem from an analytical standpoint is that cities rarely overlap perfectly with counties. Yet they do sometimes overlap perfectly or close to perfectly, and we exploit these occurrences to create a database that includes the District and twenty-two other cities. Specifically, we include a number of large independent cities – treated as if they were counties by the Census – and other large central cities that lie within a single county and constitute at least 75% of the county's population from 1989 to 2008. Aside from Washington, DC, the full list of cities include Albuquerque, Anchorage, Baltimore, Boston, Columbus (GA), Denver, Indianapolis, Jacksonville, Lexington, Lincoln, Lubbock, Montgomery, Nashville, New Orleans, New York City, Norfolk, Omaha, Philadelphia, Richmond, St. Louis, and San Francisco.

In the analysis we used each central city's number of jobs (in thousands) for each year from 1990 through 2008. We used two general groups of independent or explanatory variables. The first group captures aspects of each central city's greater metropolitan area and includes metropolitan employment growth and several variables meant to depict each region's

industrial composition. The second group captures aspects of the central cities themselves and includes variables such as crime rates, taxation, government expenditures, and various demographic characteristics. (See Table 1 in the Main Report for a complete list.)

5. Sample & Methods

Using the set of central cities and metropolitan areas noted above, we used time-series-cross-sectional (TSCS) regression methods for the analysis. Each cross-section consists of a city while each time series unit is a year. The full analysis extends from 1990 to 2008 (lagged independent variables start at 1989). The period is long enough to observe significant variation on the dependent and independent variables without outstripping the availability of data. The Main Report provides an overview of the various diagnostics associated with the TSCS models. The result of the diagnostics led us to use fixed effects with panel-corrected standard errors (Beck and Katz 2009). The key consequence to using fixed effects is it effectively suppresses or masks the impact of independent variables that do not vary over time.

6. Results

Table 2 presents the results for our employment model. The dependent variable, city employment, is expressed as the central city's total employment (in thousands) for the given year. Several results in the model deserve highlighting:

a) Not surprisingly the previous year's employment predicts current employment. The relatively large coefficient for lagged employment (.87) suggests that employment levels adjust rather slowly from year to year in response to changes in the independent variables;
b) Regional growth begets central city growth. A one percentage point increase in metropolitan employment growth correlates with an increase of about 5,600 central-city jobs for the city with the average population size (slightly more than 800,000) and employment size (480,000) in our sample;
c) Relative increases in manufacturing in the overall region translates to a decrease in central city employment, probably because the land intensive nature of manufacturing leads to growth outside the central city;
d) In contrast, relative increases in Government as well as the Professional, Scientific, and Technical Services sectors translate to more jobs in central cities;
e) Higher central-city property crime rates decrease central-city employment. The relationship between violent crimes rates and employment are similarly negative though not statistically significant at conventional levels;
f) Taxes matter. Higher central-city taxes translate to lower central-city employment. In contrast, public services provided by central-cities, while positively related to employment, do not prove statistically significant in our models. Public services are

notoriously difficult to measure; we measure them here as government expenditures, an indirect measure at best.

Table 1: Employment Models, 1990-2008

	Coefficient	Standard Errors
City Employment$_{t-1}$	0.867***	0.078
Metro-level Variables		
Employment Growth	5.559***	0.402
Share of Manufacturing Employment $_{t-1}$	-3.830***	1.215
Share of Professional, Scientific, and Technical	18.437***	3.551
Share of Finance Employment $_{t-1}$	543.739	428.302
Share of Real Estate Employment$_{t-1}$	-6.887	641.830
Share of Government Employment $_{t-1}$	6.722***	2.323
Share of Military Employment $_{t-1}$	-106.442	171.478
Central City-level variables		
Violent Crime Rate $_{t-1}$	-0.001	0.002
Property Crime Rate $_{t-1}$	-0.002***	0.001
Tax Burden$_{t-1}$	-247.248**	120.925
Government Expenditures$_{t-1}$	0.915	1.426
Percent White$_{t-1}$	-0.146	0.284
No high school $_{t-1}$	0.433	0.455
BA percent $_{t-1}$	-0.929	0.817
Per Capita Income $_{t-1}$	0.0003	0.000
Population$_{t-1}$	0.00006	0.00004
R^2	0.88	

Note: Linear regression using panel-corrected standard errors with unit fixed effects
*** p<0.01, ** p<0.05, * p<0.1

7. Examining Dynamic Effects

Using a dynamic simulation model we also produced predicted central-city employment growth over time for different possible scenarios. For instance we compared what would happen to central-city employment growth for respective high and low levels of metropolitan employment growth. We performed a similar high-low analysis for all statistically significant variables from Table 2 and found that the variables that most affected predicted central-city employment growth were metropolitan employment growth, the Professional, Scientific, and Technical industrial sector, and property crime. (See Figures 1-5 in the Main Report.) For instance, high metropolitan growth predicts a next year increase of more than 6,000 central-city jobs and more than 40,000 jobs in sixteen years.

8. Predicting District Employment

Setting all the explanatory variables at their values for DC and its region in 2008 (the final year in our dataset), we forecast future DC employment given hypothetical (but quite plausible and conservative) values from actual District experience. Our forecasts for the District yielded three key results. First, regional growth dramatically affects DC employment. High growth in the entire region for ten years translates into 125,000 more jobs for the District than low regional growth. Second, while relative growth rates in neither the Manufacturing sector nor the Professional, Scientific, and Technical sector notably affect District job growth, relative growth in the Government sector does. High versus low levels of metropolitan growth in the federal government predicts a difference of about 50,000 jobs for the District over twenty years. Third, high property crime rates hurt predicted District job growth. As the Figure 11 in the main report indicates, shows, return of high property crimes rate – of the sort experienced by the District in the earlier 1990s – translates into anemic job growth. Firms simply will not want to locate their establishments in a city with high crime rates. Low crime rates – of the sort experienced by the District in the early 2000s – translates into major job growth.

9. Forecasting the District's Share of Metropolitan Employment

Finally, we explicitly consider how well the District fares relative to its region. How much will the District's share (or percentage) of regional employment increase or decrease over time given particular scenarios? Figure 13 in the main report contrasts an "Optimistic Scenario" with a "Pessimistic Scenario" over time. The scenarios were derived using values based on actual District experience from 1989-2008 with the Optimistic Scenario based on setting variables to values that should see high job growth and the Pessimistic Scenario based on values associated with low job growth. The Optimistic Scenario predicts 200,000 city jobs gained within twenty years and the Pessimistic Scenario predicts more than 60,000 jobs lost within twenty years. A subsequent figure illustrates the expected trends in the District's share of regional jobs. Not surprisingly, the pessimistic forecast results in the District steadily losing job share from 23% in 2008 to 16% by 2028. The optimistic forecast shows the District gaining share for a few years before dropping off again; by 2028 the model predicts a share of 22% compared to 23% in 2008.

1. Introduction

The District of Columbia anchors one of the nation's most dynamic regional economies. From 1990 to 2008 the Washington metropolitan area grew by 27% to over 5.3 million people. The number of jobs in the region grew by 31% during the same period and now boasts a diverse industrial mix featuring professional services, telecommunications, educational services, and non-profits that complements the region's notably huge federal government presence (U.S. Census Bureau, various years).

For the District of Columbia itself, the picture differs considerably. The District's population declined by about 3% from 1990 to 2008; indeed, the city lost more than 200,000 residents since the 1950 census. Employment grew only slightly from 1990 to 2008 (about 1%) and, as is clear from the population numbers, most of the people holding those jobs reside elsewhere in the region. Also the District's economy does not reflect the industrial diversity seen elsewhere in the region as tourism and, especially, the federal government constitute a considerable proportion of the District's gross product.

To be sure, the numbers are not all bad for the nation's capital. Serious declines in population and employment in the 1990s leveled off in the 2000s. The District even saw population growth over the last several years and, at least until the onset of the current recession, the District's recent fiscal and economic health was the best it has been in decades.

Still, relative to the rest of the metropolitan area the District compares poorly. In this regard Washington resembles many central cities across the nation. Central city job loss or slow growth relative to suburban areas is not new. During the mid-1990s, Brennan and Hill (1999) found that one quarter of central cities experienced job losses even while their suburbs experienced job growth, while over half of central cities had employment growth rates lower than their suburbs. Based on data obtained from the State of the Cities Data System, in 1990 principal cities accounted for 53.7 percent of all metropolitan workers, while in 2000, principal cities accounted for only 51.8 percent of metropolitan workers, suggesting that nationally, suburbs are increasing jobs at a rate faster than that of cities.

Our purpose in this report is to understand the factors that affect the District's economic competitiveness. Specifically we focus on understanding what affects the location of jobs in the city. To gain leverage on the question we develop a statistical model that compares the District over time against twenty-two other central cities in the United States.

Neither the District nor the other cities in the analysis are themselves economies. As normally conceived the District itself is not a stand-alone economy but rather a political jurisdiction that resides within a larger urban economy roughly coinciding with the Washington metropolitan statistical area (MSA). For instance, the market for labor is not at all restricted to just those who live in the District. Many thousands work in the District but live elsewhere in the region,

while some live in the District but work elsewhere in the region. This point is basically true for all central cities in the nation and for this reason the study of urban economies normally treats the region including and surrounding the central city as the subject of interest.

Yet, while it is true that the economy is regional, it is normally also the case that policy is set not at the regional level, but rather at the level of the region's smaller political jurisdictions like municipalities and counties. It is here that local decisions about policies such as tax levels, provision of public services, and regulation of businesses are made. Collectively these policies affect regional economic performance, but individually there is substantial reason to believe that the policies and other factors specific to a political jurisdiction, the District of Columbia included, directly affects how that jurisdiction performs economically. Put a bit a differently: a central city located within a vibrant regional economy is likely to experience job growth, but the amount of regional growth the central city captures for itself depends on factors specific to the city.

Thus our analysis examines the impact of city-specific factors on city employment while also controlling for the effects of regional economic performance. We compare the District to twenty-two other central cities and their regions over the 1989 to 2008 period that were, as we explain below, readily comparable to Washington, D.C. and the Washington region in terms of data availability. The model we develop allows us to isolate the particular factors that affect central-city employment growth (or shrinkage) over time. From there we are able to use our model to derive concrete predictions about how particular factors, such as taxes, affect the ability of the District to increase its employment base. Likewise we can use our model to examine how the District does relative to its region by examining how different factors – again such as taxes or human capital – affect how much of the region's employment locates in the capital.

We focus our analysis on jobs, specifically the number of jobs located in the central cities. There is considerable empirical evidence regarding the determinants of why jobs locate in particular regions. The evidence on why jobs locate *within* a region is far thinner. The research emphasis on inter-regional rather than intra-regional employment stems from two sources. The first is the theoretical reason cited earlier. We normally conceive an urban economy in terms of a region rather than a specific local government within that region. The second reason is simply practical. Data on economic activity and other factors of interest are normally gathered on an annual basis for states and counties rather than for cities. Generally speaking city-based data only exists on a decennial basis.

Our analysis overcomes this data limitation with an innovative research design focusing on independent cities as well as cities that both lie within a single county and constitute at least

75% of the county's population over our time period of interest. Thus we take advantage of the fact that more county-level data is collected on an annual basis.[1] Throughout the report, therefore, we use the term "central city" even though the data correspond to the county containing the central city. Because we have chosen cities with significant to perfect overlap with counties, findings about the determinants of economic competitiveness among central counties are nearly analogous to determinants of economic competitiveness among central cities.

The report proceeds with an overview of the relevant regional economics literature followed with a focus on the much smaller literature on intra-regional economics. We then develop and test a time-series-cross-sectional model (TSCS) using central-city employment for the District and twenty-two metropolitan areas over the period 1989-2008. Using this model we then derive expectations about the impact of given significant variables on long-term central city employment. Finally, we return to the specific case of the District of Columbia and use our model to predict District employment given particular hypothetical (but realistic) scenarios.

2. Background and Existing Literature

What determines the locating of jobs within the central city? Another way of phrasing this question is why does economic activity locate in the central city or the suburbs within urban areas? The theoretical premise underlying our research into central city jobs is "competitive advantage," which argues that firms will locate in areas where they can produce and market goods and services at the greatest profit. In this particular case, we are interested in the characteristics that alter the competitive advantages of the city relative to its suburbs– or alternatively, characteristics that make the city a more attractive place for firms relative to the suburbs within a given region.

Evidence from research suggests that firm location is a two-step process, with the first step consisting of a regional decision and the following step consisting of a siting decision within the region (Cohen, 2000). At the first stage (between metropolitan areas), key determinants of firm location are characteristics important to the firm that vary among states and regions such as labor cost and quality, transportation costs, and energy costs (Blair and Premus, 1987). At the next stage (within the selected metropolitan area or state), site selection decisions are based on characteristics important to the firm that vary among locations *within* the region such as land costs, access to transportation links, and tax/service packages and fiscal incentives of local governments. Our concern in this study rests primarily on firm location at this second level of decision-making, the intra-regional siting decision.

[1] This problem does not apply specifically to the District since for data gathering purposes it effectively serves as a county and state.

At the metropolitan level, several factors largely determine inter-regional economic competitiveness.[2] Of these, the most consistent and strong relationship is found between levels of regional human capital (usually measured in terms of educational attainment) and economic competitiveness, with evidence consistently finding that employment moves towards regions with more highly-educated labor supplies (Malpezzi, 2001; Weissbourd and Berry, 2004; Simon, 1998; Shapiro, 2006, 2003). Mainly as a result of the importance of a highly-skilled labor supply, amenities and quality of life factors also affect economic competitiveness at the inter-regional level. Evidence finds that employers value warmer and dryer climates all else being equal (Blumenthal, Wolman, and Hill, 2009; Glaeser and Shapiro, 2001). Likewise, places with cultural and other amenities tend to be more economically competitive when they are able to attract highly-skilled labor forces (Florida, 2002; Malpezzi, 2001; Rauch, 1991). Another consistent predictor of economic growth is agglomeration economies – or economies of scale and scope resulting from a concentration of employers and employees or producers and consumers in close proximity to one another. The concentration of actors tends to lower the costs of doing business, thus attracting more business (Fujita, Krugman, and Venables, 1991; Glaeser, Scheikman, and Schleifer, 1995). Analysts often cite agglomeration economies as increasing productivity (Beeson, 1992; Fogarty and Garofalo, 1988) and earnings (Glaeser, Kolko, and Saiz, 2001; Glaeser, Kallal, Scheinkman, and Schleifer, 1992).

Generally, as location-associated costs increase, economic activity declines. Land costs represent a particular problem as in addition to increasing business costs, they drive up housing prices, thus deterring in-migration for potential workers. Additionally, items such as energy prices and tax burdens increase the costs of doing business and serve as a deterrent for prospective businesses. However, insofar as public services are an important component of the production process, they too will attract new economic activity (Bartik 1992, Dalenberg and Partridge 1995, Wasylenko 1997). If the costs of taxes outweigh the benefits provided by public services to the firm, it will deter location to the area. However, if the benefits of the public services provided outweigh the cost of taxes, there will be an incentive for firm location. Unfortunately, because of the difficulty in measuring public service levels and quality, the existing literature usually does not distinguish between tax costs and public services financed by taxes. Transportation access to external markets is also generally associated with increased economic competitiveness (Fujita and More, 1995; Konishi, 2000; Cohen, 2000) as it reduces the costs of obtaining inputs and sending outputs to the market.

From this we can also infer some conclusions about the determinants of *intra*-regional economic competitiveness. First, the determinants of the intra-regional location of economic activity are likely to be different from the determinants of the inter-regional location of economic activity, since many factors at the inter-regional level vary little or not at all *within*

[2] For a complete review of the economic competitiveness literature, see Wolman, Levy, Young, and Blumenthal 2008.

regions. Variables such as climate and amenities simply do not vary enough within regions to justify their inclusion in a model of local economic competitiveness. For example, residents in cities and their suburbs reside in the same climate, follow the same sports teams, and attend the same amusement parks. Since labor markets are metropolitan-wide in scope, the cost, quality, and availability of labor varies much less within a region than between regions. Variables such as energy prices and employee unionization policies generally are a function of state policy and also end up being irrelevant at the intra-regional level – with the exception being metropolitan areas that cross state lines.

Other factors may be more important to local economic competitiveness than to regional competitiveness. Taxes are an important example of a variable that weakly affects regional growth but may strongly affect intra-regional growth. Bartik (1994) finds that a local community within a metropolitan area would increase business activity around 20 percent with a 10 percent reduction in business property taxes, providing they are able to maintain their existing level of public services and surrounding communities leave their tax rates unchanged. Mark, McGuire, and Papke (2000) also find that a 10 percent reduction in tax burdens for a local jurisdiction would yield a 20 percent increase in employment in their study of counties in the Washington, DC region. Similar to taxes, targeted business incentives have a larger impact at the intra-regional level than at the inter-regional level (Anderson and Wassmer, 2000; Bartik, 1992; Haughwout and Inman, 2002). Another type of cost with a larger intra-regional effect is the cost of land. Blair and Premus (1987) find that after firms select a region in which to locate, land costs directly influence their site location within the region.

In a third category are variables that matter at both the inter-regional level *and* intra-regional level, but in different ways. Transportation access is an example of a variable that affects inter- and intra-regional growth very differently. In the case of intra-regional growth, transporting commuters and consumers, rather than goods, is the primary concern. Along these lines, Boarnet (1994) finds that the New Jersey counties that are suburbs of New York City have higher employment growth rates as access to highways and commuter rails increases.

The above sections describe some of the factors that are generally agreed upon drivers of economic growth at the intra-regional and at the inter-regional levels. The following section describes existing literature regarding intra-regional economic competitiveness in more detail.

3. Literature on Intra-Regional Economic Competitiveness

As noted in the introduction, the literature on intra-regional economic competitiveness is far thinner than that of inter-regional economic competitiveness. A major reason for this is the dearth of data available at the city level, particularly when compared to the data available for counties (hence metropolitan areas since they are county-based) and especially states. In this

section we review in depth the types of studies that attempted to assess intra-regional economic competitiveness.

One approach to the topic is simply descriptive, comparing the economic outcomes of cities to those of the suburbs. Using a sample of data put together by the Brookings Center on Urban and Metropolitan Policy, Brennan and Hill (1999) assessed private job growth in the cities and suburbs for 92 metropolitan areas in 1993 and 1996. Of the 92 cities, 23 actually lost jobs, while 69 gained jobs. Of those gaining jobs, 52 nonetheless had job growth rates lower than did their suburbs. Out of the full 92 cities, 75 lost private market share to their suburbs. Using a sample of data put together by the U.S. Department of Housing and Urban Development's State of the Cities Data System, Hill and Brennan (2005) next looked at private sector job growth for 100 metropolitan areas in 1998 and 2001. Of the 100 cities, 16 lost jobs while 84 gained jobs. Of those gaining jobs, 58 had job growth rates lower than that of their suburbs, and out of the full 100 cities, 74 lost private market share to their suburbs. These findings suggest that in recent history, suburbs across the nation have had a competitive advantage relative to cities, but they are unable to explain the reasons behind this pattern.

Of the research that addresses *determinants* of intra-metropolitan competition in employment, earnings, or other related outcomes there are essentially three approaches: in depth case studies, studies of counties, and studies of metropolitan areas that distinguish the city from its suburbs. As we will show, none of these is directly responsive to our research concern. The first approach (Boarnet, 1994; Mark, McGuire and Papke, 1998) consists of intensive studies of employment growth in a single metropolitan area (Washington, DC in the case of Mark, McGuire, and Papke) or region (northern New Jersey in the case of Boarnet). In both cases the units of analysis are all of the local jurisdictions within the region. Obviously it is problematic to generalize from these case studies, and, in addition, the Boarnet study does not include a central city. Thus it is not surprising that these types of studies yield inconsistent results. For example, Mark, McGuire, and Papke find that business personal property tax and sales tax rates are inversely related to county growth in private sector employment, while Boarnet finds that employment growth is associated with *higher* property tax rates.

Several case studies of specific regions that evaluate the intra-regional determinants of employment growth assess population growth and employment growth as jointly determined (see Steinnes and Fisher, 1974; Greenwood, 1980; Deitz, 1988; and Boarnet, 1994). These studies that simultaneously model employment and population outcomes (although in some cases at very small geographies) suggest that at the intra-regional level, population appears to be a more important determinant of employment than employment is of population.

A second approach to assessing the determinants of employment location utilizes counties as the unit of analysis (Carlino and Mills, 1987; Levernier and Cushing, 1994; Clark and Murphey, 1996) and include a dummy variable for those counties that contain a central city.

Unfortunately, for our purposes, central counties are far from synonymous with central cities. Indeed, central counties vary enormously in the extent that they contain central city residents or employment. In some cases most central county residents live in the central city, while in others the proportion may be considerably less than half. (Miami, for example, constitutes about 17% of Dade county population.) In addition, a significant coefficient on a dummy variable indicating a county that contains a central city simply indicates that the growth rate of counties with central cities is significantly different than that of other counties, but it says nothing about why it is different. These studies are unable to explain why employment locates in the city or the suburbs.

Finally, a third approach utilizes metropolitan areas as the unit of analysis with city and suburban variables for each of the metropolitan areas included in the model (Leichenko, 2001; Haughwought and Inman, 2002). Due to the data limitations discussed earlier – namely the fact that city-level data normally is available only on a decennial basis – this line of research examines city economic change from one decade to the next, an undesirably long span.

Taken as a whole, this research leaves us to conclude that relatively little has been econometrically established about the determinants of city employment growth. What the literature does suggest is that city employment outcomes are a function of the metropolitan economy and city demographic and socio-economic characteristics.

4. Modeling Central City employment

Dependent Variables

Our dependent variable is the central city's number of jobs (in thousands) for each year from 1990 through 2008 (for descriptive statistics of the 23 central cities and their regions, see Appendix C). Over the time period most of the 23 central cities increased their level of employment. However, six of the cities lost employment over this time period (Baltimore, New Orleans, Norfolk, Philadelphia, Richmond, and St. Louis), with Baltimore and Philadelphia losing over 100,000 jobs each during this time period. In New Orleans's case, the city experienced significant job losses well before the economic decline wrought by Hurricane Katrina, for an almost 100,000 job loss over the entire time period.

Independent Variables

We model city employment outcomes as a function of the metropolitan economy and city characteristics. Most of the independent variables are lagged one year to account for the fact that firm location and investment choices are based on decision processes that precede the actual implementation of the decision. Thus the full dataset extends back to 1989. In addition, data and perceptions that inform such decisions are also likely to reflect some lag, though we

admit that the choice of a one-year lag structure is somewhat arbitrary. Table 1 indicates the variables in our econometric model, the predicted relationships, the source of the data, and the lag structure for each of the variables. The variables are discussed in more detail in the following sections, and appendices A and B provide the data sources and methodology for calculating the variables where appropriate.

Table 2: Economic Model Variables

Variable	Description	Expected Sign	Data Source
Metro-Level Variables			
Employment growth, metro	Economic growth rate of region measured as one-year MSA employment growth from previous year, percent	+	Economy.com
Manufacturing employment , metro	Change in the share of metropolitan employment accounted for by jobs in the Manufacturing sector from the previous year	-	Economy.com
Professional, Scientific, and Technical employment, metro	Change in the share of metropolitan employment accounted for by jobs in the Professional, Scientific, and Technical Services sector from the previous year	+	Economy.com
Finance Employment, metro	Change in the share of metropolitan employment accounted for by jobs in the Finance sector from the previous year	+	Economy.com
Government employment, metro	Change in the share of metropolitan employment accounted for by jobs in Government from the previous year	+	Economy.com
Military employment, metro	Change in the share of metropolitan employment accounted for by jobs in the Military from the previous year	-	Economy.com
Central City-Level Variables			
Violent crime rate, city	Violent crimes per 100,000 population in previous year	-	FBI Uniform Crime Report

Table 2: Economic Model Variables			
Variable	**Description**	**Expected Sign**	**Data Source**
Property crime rate, city	Property crimes per 100,000 population in previous year	-	FBI Uniform Crime Report
Tax burden, city	Total central county area taxes per $1,000 Gross County Product in previous year	-	Census of Governments
Government Expenditures, city	Total government expenditures in county minus welfare expenditures in per capita $1,000 (2000 dollars)	+	Census of Governments
Percent white, city	Share of the population that is white in the central city	+	Census
No high school, city	Percent of the central city population over age 25 without a high school degree in previous year	-	Census
BA, city	Percent of the central city population over age 25 with at least a Bachelor's degree in previous year	+	Census
Per capita income, city	Per capita income in the central city, lagged one year	+	Bureau of Economic Analysis
City population	Population in central city, lagged one year	+	Census

Metro-Level Variables

Metro-level variables are measured at the metropolitan statistical area and characterize the broader economic environment in which the city is located. One purpose of these variables is to control for regional trends – hence we use metropolitan employment growth to indicate how the metro's inter-regional economic competitiveness affects the central city's economic activity. We also include several measures of metropolitan area industrial concentration to assess whether certain economic and industrial structures are particularly advantageous or disadvantageous to city employment growth. Our industrial sector variables are all measured as the change in the metropolitan share of employment in that particular sector. Our expectation is that the types of industries in which regional employment growth is occurring will affect new jobs location in the central city.

Employment Growth: The purpose of this variable is to capture the economic condition of the region containing the given city to see how the state of the regional economy affects the city's competitiveness. We expect that cities in growing regions will be more likely to increase employment.

Manufacturing Employment Change: A variable for change in regional industrial concentrations in manufacturing is included since manufacturing employment has been increasingly moving to suburban areas. Manufacturing activity tends to require large amounts of space relative to other types of economic activity, and land is more readily available at a lower cost in suburban areas than in cities. Thus regional economies that are gaining manufacturing employment are likely to see a higher proportion of that employment locate in suburban areas, while regions that are experiencing declines in manufacturing activity are likely to see these declines reflected disproportionately in suburban employment. In both cases, these processes will particularly affect city employment if the region has a growing concentration in manufacturing activity. Thus, we expect that cities located in regions where the share of employment in the manufacturing sector is increasing (or decreasing less rapidly) will experience employment losses or slower employment growth.

Finance & Insurance Employment Change: Unlike manufacturing, the Finance and Insurance sectors do not require significant amounts of space and they are more likely to involve interactions between firms, increasing the agglomerative benefits found in central cities. Therefore, we expect that regions that are experiencing growth in Finance and Insurance relative to other sectors are likely to see that growth occurring more in the central city which, in turn, will lead to higher employment for central cities.

Government Employment Change: Federal and state government facilities are likely to disproportionately locate in central cities (Blumenthal et al. 2009). To the extent that incremental growth in state and federal employment is also likely to be located in cities, we would expect that central cities in regions that are gaining state or federal government employment relative to other sectors will experience increases in employment, with larger increases in the government employment share corresponding to larger increases in employment growth.

City-Level Variables

Variables at the central city level are primarily traits of the city that may deter or attract economic activity. Here we include population characteristics, local government tax and spending levels, and characteristics of the labor supply.

Crime: Crime imposes costs on businesses, so we expect that areas with higher crime rates will have lower levels of economic activity. Boarnet (1994) found that municipalities in the northern New Jersey region with higher violent crime rates experienced lower employment relative to municipalities with higher property crime rates. Boarnet attributes the unexpected

property crime coefficient to simultaneity between property crimes and employment – the increased economic activity generated more property to steal. We anticipate that central city increases over time in the rates of crime will make the suburbs a more attractive location choice and that both types of crime will negatively affect city employment. We include two variables measuring crime – the number of violent crimes per 100,000 residents and the number of property crimes per 100,000 residents.

Taxes and Services: Economic theory consistently suggests that higher tax burdens, controlling for public service level and quality, deter economic growth for individual localities within a region, while public services level and quality, controlling for tax burden, can promote growth – particularly when those public services directly affect businesses. The problem with analyzing how public finance influences economic competitiveness is that there is no agreed upon or readily available measure of either tax burden or public-service level and quality and both are needed in order to estimate the effect of the other. Despite these problems, most existing studies include a measure of tax burden. For our study we devised a measure of the city's tax package as the total tax revenues in the central city divided by the central city's gross product. As a measure of public services we calculated real per capita total government expenditures minus welfare expenditures in the central city in $1,000 units. Neither measure is ideal[3]. Our tax burden measure fails to distinguish between business and residential taxes and we acknowledge that since many local taxes are raised on the basis of property values, gross county product is a highly imprecise proxy for an area's tax base. Our public service measure relies on expenditures to capture the level and quality of public services. While the only practical measure available, it is obviously not the case that high expenditures always translate to service quantity or quality. We expect that over time, cities with rising tax burdens will have lower rates of employment growth, while those with rising expenditures will have higher rates of economic growth, all else being equal.

[3] To generate the total taxes estimate, we used the Census of Government County Area files, which include taxes paid to city and county governments, as well as school and special purpose districts. This is important because without inclusion of all of the different levels of government, central counties with a highly decentralized finance system would have artificially low tax burdens. In addition to using the county area estimates, we added to each county, its share of state taxes apportioned on the basis of county share of state income. While we acknowledge that apportioning state taxes to counties on the basis of county-income shares is highly imprecise, given that states devolve different levels of fiscal responsibilities to their counties, county-area estimates without an estimate of state burdens would be misleading. Further, Washington DC, while not a state, performs many of the functions of a state, therefore its tax burden appears particularly high without the inclusion of state taxes for the other counties. One of the limitations to our expenditure measure is that we were unable to apportion state expenditures in a similar fashion – largely because state aid to local governments tends to be redistributive (though imperfectly so) and using income as a basis for apportionment would make even less sense. However, we have omitted welfare expenditures from our estimates, which are generally paid by the states as opposed to local governments.

Race: Existing studies often include variables to account for the racial composition of an area, though the empirical findings on these variables are mixed. We include racial characteristics (percent non-Hispanic, white) in our model as a means of picking up unobserved characteristics that are related to race (such as discrimination). One plausible reason for a negative relationship between minority populations and economic growth is the lower quality of education minorities experience as a result of inferior schools, even at similar levels of educational attainment, an effect that would not be picked up by the educational attainment variable (Malpezzi, 1999). We expect that cities with increasingly white populations will grow faster than cities whose minority populations are experiencing faster relative growth.

Human Capital: As noted above, one of the concerns about locating in the central city is the availability of human capital (Shapiro, 2006, 2003). Here, we include the percent of central city residents over the age of 25 without a high-school degree and the percent with a bachelor's degree or higher level of education. If employers seek employees with skill levels above those of relatively low-skilled employment, increases in the presence of a large proportion of low-skilled employees in the city labor force may act as a disincentive for location in the central city. Conversely, increases in the percent of the population with a college education may serve as an incentive for location in the central city.

Per Capita Income: The income of city residents is likely to improve economic outcomes for several reasons (Berry and Glaeser, 2005). High-income residents are attractive to businesses because they create a larger base for retail sales. Further, they tend to be more educated and skilled workers, creating an attractive labor force pool. For governments, high-income residents represent a source of tax revenue that might otherwise need to be raised by taxes on businesses. For these reasons, we anticipated that cities with increasing per capita income will also have increasing employment.

Population: Although traditional economic theory suggests that employment opportunities attract mobile labor and thus drive population growth, as noted in the literature review, studies jointly modeling employment and population tend to find that population is a stronger predictor of employment growth than employment is of population growth. Thus, we include a measure of lagged population in our model, and expect that in cities where population is increasing, employment will increase as well.

5. Sample and Methods

We employ a time-series-cross-sectional (TSCS) research design, with the time series extending from 1990 to 2008 for the dependent variable (and back to 1989 for some independent variables). The period was selected as long enough to permit time to observe significant change, yet not so far back into time as to make data collection impossible. The units of

analysis are independent cities and counties in metropolitan areas in which the principal central city coincides with or constitutes a substantial proportion (over 75 percent) of the county's population.

Central City Selection

The first challenge in this study was identifying the principal cities of MSAs that were either identical to or significantly overlapping with single counties. A starting point was a list of Census Places in 2005 that linked each place to the county and MSA in which it lay (U.S. Census Bureau 2009).[4] We dropped all places that were not principal cities from this list and then all principal cities that were not the primary principal city in a given MSA.[5] We also dropped all single-county MSAs since, by our measure, the central city and the MSA are equivalent. In the next step we dropped all of the principal cities whose population spilled into more than one county so that we were left with a list of principal cities that fell into a single county. Next, we obtained population data for all cities on the list for 2008 and dropped those cities having a population of less than 100,000 in 2008. For the cities still on our list, we identified those cities that made up over 75 percent of the county population for entire time period with which we were interested (indeed, in all but one of these cities – Wichita – the city population comprised more than 80% of the county population). The corresponding counties were selected as cases for inclusion in this study. Below we list the central cities included in the study and their respective counties for the non-independent cities. We also denote the mean percentage of the county population comprised by the central city's residents over our time period. (Independent cities are by definition 100% since they lack a county but are treated as a county by the Census and other key data gathering entities. Our 22 cities and their metropolitan areas are[6]:

1. Albuquerque (Bernalillo County) [80.8%] in Albuquerque, NM MSA;
2. Anchorage [100%] in Anchorage AK MSA;
3. Baltimore [100%] in Baltimore-Towson, MD MSA;
4. Boston (Suffolk County) [85.6%] in Boston-Cambridge-Quincy, MA-NH MSA;
5. Columbus (Muscogee County) [99.8%] in Columbus, GA-AL MSA;
6. Denver (Denver County) [100%] in Denver-Aurora, CO MSA;
7. Indianapolis (Marion County) [91.2%] in Indianapolis-Carmel, IN MSA;

[4] U.S. Census Bureau. 2009g. Metropolitan and Micropolitan Statistical Area Resources, Geographical Relationship File *2005 Place to 2006 CBSA* [in excel files downloadable by state]. Retrieved December 14, 2009 from: http://www.census.gov/population/www/metroareas/metroarea.html.

[5] The exception here is Norfolk, VA. Currently, Virginia Beach is the primary principal city of the Virginia Beach-Norfolk-Newport News MSA. However, between 1989 and 2008, Norfolk was the primary principal city for a number of years. Further, while Virginia Beach currently has a larger population, Norfolk has more jobs, so it was selected as the principal city for the purposes of this study.

[6] The Census Bureau's Boundary and Annexation Survey indicates that none of our counties experienced geographic changes or annexed additional territory between the years of 1989 and 2008. With respect to the metropolitan definitions, our sources of metropolitan data (the State of the Cities Data Set and Economy.com) hold the geographic metropolitan definitions constant over time.

8. Jacksonville (Duval County) [94.4%] in Jacksonville, FL MSA;
9. Lexington (Fayette County) [100%] in Lexington-Fayette, KY MSA;
10. Lincoln(Lancaster County) [90.5%] in Lincoln, NE MSA;
11. Lubbock(Lubbock County) [83.3%] in Lubbock, TX MSA;
12. Montgomery (Montgomery County) [90.7%] in Montgomery AL MSA;
13. Nashville (Davidson County) [95.5%] in Nashville-Davidson-Murfreesboro, TN MSA;
14. New Orleans (Orleans Parish) [100%] in New-Orleans-Metairie-Kenner, LA MSA;
15. New York City [100%][7] in New York-Northern New Jersey-Long Island, NY-NJ-PA MSA;
16. Norfolk [100%] in Virginia Beach-Norfolk-Newport News, VA-NC MSA;
17. Omaha (Douglas County) [86.5%] in Omaha-Council Bluffs, NE-IA MSA;
18. Philadelphia (Philadelphia County) [100%] in Philadelphia-Camden-Wilmington, PA-NJ-DE-MD MSA;
19. Richmond [100%] in Richmond, VA MSA;
20. St. Louis [100%] in St. Louis, MO-IL MSA;
21. San Francisco (San Francisco County) [100%] in San Francisco-Oakland-Fremont, CA MSA;
22. Washington, DC [100%] in Washington-Arlington-Alexandria, DC-VA-MD-WV MSA;
23. Wichita (Sedgwick County) [76.1%] in Wichita, KS MSA.

These cities broadly represent the range of central cities across the U.S and our dataset's observations vary nicely in terms of region, city and metropolitan size, industrial mix, demographic composition, etc. Employment levels (our dependent variable) exhibit overall means comparable to those for all principal cities nationwide, but also provide us with substantial variation to analyze. (For descriptive statistics of the dependent variables, see Appendix C.) As with most central cities across the nation, most of the cities experienced job growth from 1989 to 2008 but rarely at the same rate as their suburbs. The mean employment growth rate for the central cities in our sample was 10% with a range from Anchorage's 40% increase in employment to New Orleans's 33% decline. Seventeen of the central cities enjoyed increases in employment while six (Baltimore, New Orleans, Norfolk, Philadelphia, Richmond, and St. Louis) suffered declines. (The District's employment grew by 2.8% from 1989 to 2008.) In contrast all the metropolitan areas saw increases in employment excepting the New Orleans MSA, which was slightly negative.[8] On average the regions in our sample experienced 26% growth during the period. In all but three cases (Columbus, Lincoln, and Lubbock) regional growth exceeded central city growth.

[7] New York City comprises five counties: Bronx, Kings, New York, Queens, and Richmond.

[8] New Orleans as a city and region fared worst of all the cases in our study. For the city itself employment decline was accelerated but not started by Hurricane Katrina. However, the region's decline occurred in Katrina's aftermath. We had originally included a Hurricane Katrina dummy variable in our model to capture this affect but it ended up being statistically insignificant.

Statistical Methods

TSCS models present a variety of methodological challenges, choices, and tradeoffs. TSCS data sets are susceptible to the threats present in both cross-sections (namely unit heteroscedasticity), time series (namely non-stationarity and serial correlation), and in combination (e.g., contemporaneously correlated errors across panels). Beginning with the dynamic issues, both the Fisher's test (Maddala and Wu 1999) and the test suggested by Im, Pesaran, and Shin (2003) indicated a stationary series. A set of diagnostics including the Wald test suggested by Wooldridge (2002) revealed first-order serial correlation that we addressed using a lagged dependent variable (Beck and Katz 2009).

During our initial diagnostics the Breusch-Pagan Legrange multiplier test (Baum 2006) confirmed that straight OLS was inappropriate for our purposes. A Hausman or Durbin-Wu-Hausman test (Rabe-Hesketh and Skrondal 2008) revealed that a random effects model is inappropriate.

Consequently we ran a fixed-effects model with panel-corrected standard errors [PCSEs] similar to the model illustrated by Beck and Katz (2009). One of the limitations of fixed effects is that the time-invariant explanatory variables drop out of the model.[9] Also variables with minor or sluggish temporal variation potentially suffer suppression.[10] What is left in a fixed-effects model is the overtime variation. For this reason, the fixed-effects estimator is also known as the within estimator as it measures variation within units as opposed to across them. Since our analytical question lends itself well to a within-effects focus, a fixed-effects model is a reasonable compromise.

6. Results

Table 2 presents the results for our employment model. The dependent variable, city employment, is expressed as the central city's total employment (in thousands) for the given year. The high R^2 (.88) is no surprise given the model's lagged dependent variable. Indeed, the relatively large coefficient for lagged employment (.87) suggests that the employment levels adjust rather slowly from year to year in response to changes in the independent variables.

[9] In our case this meant dropping a variable that measured how much each central city constituted the MSA's land area, a constant in our sample.

[10] Usually analysts implement fixed effects by fitting unit-specific intercepts. One alternative method that yields exactly equivalent results is demeaning (or mean centering) the variables in the model (Angrist and Pischke 2009). We find the latter method more flexible and easier to implement.

Metro-Level variables

The economy of the region as a whole should significantly affect city employment levels. As Table 2 indicates, metropolitan *Employment Growth* positively and significantly predicts central city employment. An increase in metropolitan *Employment Growth* of one percentage point correlates with an increase of about 5,600 central-city jobs for the city with the average population size (slightly more than 800,000) and employment size (480,000) in our sample.

Looking at specific sectors at the MSA level reveals that changes in the share of employment in the *Manufacturing; Professional, Scientific, and Technical Services*; and *Government* sectors affect central city employment at statistically significant levels. Note that these measures are based on the change in the percentage of total MSA employment located in that sector. Thus an increase in, say, the value for manufacturing, denotes an increase in the percentage point share of overall regional employment that is located in manufacturing. As we argued earlier, the land intensive nature of manufacturing likely leads to a disproportionate amount of growth in that sector locating outside the central city. Our results confirm this as a one percentage point increase in the share of *Manufacturing* variable at the MSA level translates to about a 3,800 job drop in an averaged-sized central city.

In contrast changes in the share of *Professional, Scientific, and Technical Services* and *Government* sectors correspond positively with central city employment with a one point increase in *Professional, Scientific, and Technical Services* predicting over 18,400 new central city jobs, and a one point increase in *Government Employment* variable predicting an increase of a little over 6,700 central city jobs. Finally, neither the *Real Estate* nor the *Finance* variables proved statistically significant.

Table 3: Employment Models, 1990-2008

	Coefficient	Standard Errors
City Employment$_{t-1}$	0.867***	0.078
Metro-level Variables		
Employment Growth	5.559***	0.402
Share of Manufacturing Employment $_{t-1}$	-3.830***	1.215
Share of Professional, Scientific, and Technical	18.437***	3.551
Share of Finance Employment $_{t-1}$	543.739	428.302
Share of Real Estate Employment$_{t-1}$	-6.887	641.830
Share of Government Employment $_{t-1}$	6.722***	2.323
Share of Military Employment $_{t-1}$	-106.442	171.478
Central City-level variables		
Violent Crime Rate $_{t-1}$	-0.001	0.002
Property Crime Rate $_{t-1}$	-0.002***	0.001
Tax Burden$_{t-1}$	-247.248**	120.925
Government Expenditures$_{t-1}$	0.915	1.426
Percent White$_{t-1}$	-0.146	0.284
No high school $_{t-1}$	0.433	0.455
BA percent $_{t-1}$	-0.929	0.817
Per Capita Income $_{t-1}$	0.0003	0.000
Population$_{t-1}$	0.00006	0.00004
R^2	0.88	

Note: Linear regression using panel-corrected standard errors with unit fixed effects
*** p<0.01, ** p<0.05, * p<0.1

City-Level Variables

While both crime variables (*Violent Crime Rate* and *Property Crime Rate*) have negative coefficients, only *Property Crime Rate* is significant. The model predicts that an increase of 1,000 crimes per 100,000 city residents drops city employment by about 2,000.

Higher taxes, all else equal, negatively affect both supply and demand sides of economic activity. Our model confirms this with a negative and statistically significant coefficient for *Tax Burden*. A one standard deviation increase in *Tax Burden* – about a .02 increase in units – decreases predicted employment level by a bit less than 5,000 for the average size city in our sample. While taxes suppress economic activity in a jurisdiction, we expect public services to boost it, but our measure of public expenditures does not capture this effect, and the coefficient is both statistically and substantively insignificant.

None of our demographic and population variables were substantively or statistically significant. Our data set suggests that changes over time in a city's population, per capita

income, residential educational attainment, and racial composition do *not* predict employment outcomes.

7. Examining Dynamic Effects

The change in city employment with respect to changes in the various explanatory variables and their statistical significance discussed above tell only part of what we can learn about employment using our model. The model's autoregressive nature (i.e., inclusion of a statistically significant lagged dependent variable) gives us the ability to dynamically simulate the impact of a particular explanatory variable on employment over time given particular interesting values of that explanatory variable (Williams and Whitten 2008). We can also look at various combinations of variables and even evaluate whether or not the substantive effects themselves are statistically significant.[11]

Figure 1 shows a dynamic simulation focusing on the MSA employment growth rate. Excepting Metropolitan *Employment Growth* we set all the independent variables and the lagged dependent variable at their means. For reference, the mean city size to which these findings apply is 814,000. We then ran two dynamic simulations varying *Employment Growth* from high (the sample's 75th percentile or 2.3% growth) to low (the sample's 25th percentile or 0.37% growth). The bars indicate 95% confidence intervals for the given level of central city employment for the given year. The values for each year are cumulative. Thus a high employment growth rate at the MSA level translates to more than 6,000 jobs created in the next year for the mean city, another 5,000 jobs in the subsequent year – bringing the total to over 11,000 jobs. Another 4,500 jobs are added in the third year, etc. Eventually the total accumulation settles at over 40,000 jobs around the 16th year. In contrast, low in-sample levels of employment growth in the MSA translates to major job losses for the central city in the long term. Note too that the two intervals do not overlap, even in the first year. Thus in both the short and long runs, MSA *Employment Growth* has a substantively strong impact on central city employment.

[11] We do this using the Stata module *Dynsim* developed by Williams and Whitten (2008). *Dynsim* works within the well-known software suit *Clarify* (King, Tomz, and Wittenberg 2000). As with *Clarify*, *Dynsim* simulates a distribution of model parameters. The analyst can then input specific interesting values for various explanatory variables and produce predicted values of the dependent variable (along confidence intervals around those predicted values). Using OLS[11] *Dynsim* works much the same way but provides dynamic predictions of the impact of explanatory variables over time. It does this through an iterative process starting with a given value for the lagged dependent variable (such as the sample mean), simulating a predicted value of the dependent variable, and then using that predicted value as the lagged dependent variable for the next time period, producing a predicted value for the next time period, and so on.

Figures 2 through 4 contrast high and low levels of growth in the regional employment shares of the three industrial sectors that were statistically significant in our model. Of the three, the *Professional, Scientific, and Technical* sector has the biggest impact. Set at the high in-sample level (an increase of .18 percentage point compared to that of .02 percentage point decrease in the low sample level), PST associates with an increase of about 12,500 central city jobs in the out years for the average size city in our sample.

In Figure 5, we contrast the effects of high and low *Property Crime* rates (again at the 75th and 25th sample percentiles, respectively or 7316 property crimes per 100,000 residents compared to 5194). The trends here mirror those for *Metropolitan Employment Growth* with high property crime leading to long-term city employment declines. The overall impact is not as pronounced as *Metropolitan Employment Growth* but still quite notable with low property crime leading to an accumulation of 12,500 jobs in the out years (holding all other factors constant). The impact of low and high crime is statistically distinct by the second year.

Finally, in Figure 6 we show the effect of taxes. Over time, high tax rates cost a central city jobs (about 7,500 lost jobs in the out years for the average size city when taxes are set at the in-sample 75th percentile).

8. Influences on District Employment

In the previous section we examined the dynamic substantive effects of various variables on employment, but based on values pertinent to all cities in our sample. We can take the dynamic simulations further by specifying explanatory variables values specifically relevant to the District of Columbia and its region. There are a variety of ways of doing this, but perhaps the most useful approach is to use our model to forecast the future. Thus we set all the explanatory variables at their values for DC and its region in 2008 (the final year in our dataset). We then forecast future DC employment given hypothetical levels of notable statistically significant variables (metropolitan employment growth, various industrial sectors, crime, and tax burden).

For the variables we examine, we obtained hypothetical values from actual District experience. So for example, to simulate the impact of different levels of metropolitan employment growth we set the *Employment Growth* variable at the 75th percentile and the 25th percentile of employment growth that Washington, DC MSA experienced between 1989 and 2008.

Note also that when forecasting into the future it is advisable to make the confidence intervals more conservative as we are now accommodating not just the uncertainty from the model's estimates estimated from a known past, but also the predictive uncertainly that accumulates

into an unknown future (Williams and Whitten 2008). The simulations we derive below incorporate this added uncertainty and thus feature larger 95% confidence intervals than shown in Figures 1 – 6.

Figure 7 presents dynamic simulations of District employment twenty years into the future conditional on different levels of metropolitan employment growth. Excepting *Employment Growth*, the simulations assume that all variables are set at the 2008 values experienced by the District and its region. *Employment Growth* was then set at the 75th (2.36% growth) and 25th percentiles (0.59% growth) to capture high and low growth, respectively.

As Figure 7 shows, regional growth dramatically affects DC employment. By the tenth year, the high regional employment growth rate of 2.36% translates into the accumulation of more than 125,000 DC jobs compared to the low rate of 0.59%. By year twenty the effect is more than 200,000 jobs. In contrast, low regional growth translates into just an accumulation of about 100,000 jobs by the twentieth year. (By the fourth year the relative effects of high and low regional growth on DC employment are statistically distinct.) In short, Figure 7 highlights the critical relationship between the District and its region. Regional growth begets District growth.

Figures 8 through 10 show the impact of change in the share of industrial sectors on District employment. In each case all of the model's variables were set at the District's 2008 values excepting the individual variable of interest (which was set at 75th percentile and 25th percentile in-sample values for the Washington MSA). Interestingly, neither the *Manufacturing* nor the *Professional, Scientific, and Technical* sectors exhibit a notable impact on future District employment. Government does, however. High versus low levels of metropolitan growth in the federal government (.078 percentage point growth compared with .61 percentage point decline) predicts a difference of about 50,000 jobs for the District over twenty years.

In Figure 11 we see the impact of high versus low property crime on predicted future District employment. Here too we set the high and low property crime rate levels in terms of actual District experience during the 1989 to 2008 period. The relative effects of low (5,663 per 100,000 residents) and high (8,497 per 100,000 residents) property crime rates are statistically distinct by the ninth year. As the figure shows, return of high property crimes rate – of the sort experienced by the District in the earlier 1990s – translates into anemic job growth. Firms simply will not want to locate their establishments in a city with high crime rates. Low crime rates – of the sort experienced by the District in the early 2000s – translates into major job growth.

Finally, in Figure 12 we graph the expected effects of varying taxation levels. In essence, high versus low historic levels of taxation yield only negligibly different employment levels.

9. Forecasting the District's Share of Metropolitan Employment

Thus far we have focused solely on estimating the levels of DC employment over time without regard to how well the District does relative to its region. As we have seen, District employment is strongly affected by the regional economy. Generally speaking, as the regional economy grows, so does the District's economy. The other factors in our model – property crime, for example – determine how much of the regional growth the District captures. For example, both the scenarios in Figure 11 assume the same rate of regional employment growth. What the contrasting scenarios illustrate is how much of that growth goes to the District rather than other parts of the region, such as Fairfax County, VA. The question to answer now is how much will the District's share of regional employment increase or decrease over time given particular scenarios?

By share we mean simply the percentage of the region's employment that is located in the District of Columbia. One reasonably straightforward way to think about the District's likely share over time is to present two forecasts of markedly different levels of optimism regarding District job growth. Figure 13 presents an "Optimistic Scenario" with low property crime, low taxes, high regional levels of the professional, scientific, and technical sector growth, high regional levels of government growth, and low regional levels of manufacturing growth. The "Pessimistic Scenario" uses the exact opposite assumptions. High and low values are based on the 75th and 25th percentile, respectively, for the given variable as actually experienced by the District over the 1989-2008 period. All other variables – including regional employment growth – are kept at the District's average for the given variable for the 1989-2008 period.

Thus the projection in Figure 13 shows what happens if several variables are set at optimistic values contrasted with several variables set at pessimistic values. The differences are dramatic with the optimistic scenario predicting 200,000 city jobs gained within twenty years and the pessimistic scenario predicting more than 60,000 jobs lost within twenty years. What is the impact on District share of jobs? Figure 14 shows the predicted trends. Not surprisingly, the pessimistic forecast results in the District steadily losing job share from 23% in 2008 to 16% by 2028. The optimistic forecast shows the District gaining share for a few years before dropping off again; by 2028 the model predicts a share of 22% compared to 23% in 2008.

Clearly, these forecasts dramatically depend on what type of assumptions we make about factors such as metropolitan growth, property crime, and tax rates. Our optimistic and pessimistic scenarios represent fairly exaggerated "bookends" about likely District performance. Reality will likely fall somewhere in the interval between those bookends. A key point that emerges from these scenarios is that the District is fated to see a declining share of regional employment over time. Even in a very optimistic scenario the District eventually sees its employment share decline.

In all cases we have grounded our assumptions in the recent history of the District and its region on the reasonable assumption that past experience most likely best predicts future experience. It is of course possible for us to use even more optimistic scenarios than we present here by going outside of District experience and positing even lower property crime rates and so forth than the District actually experienced in recent decades.

10. Summary and Conclusions

Our research assesses the determinants of central city employment growth over time. While there is a considerable amount of research on the determinants of regional employment, there has been relatively little research done on the determinants of city employment. We attribute this primarily to the difficulty in obtaining employment by place of work data by sector for cities in non-Census years. These data *are*, however, available annually for counties. To address our concerns we identify a set of counties for which the central city is either coincidental with the county or comprises over 75% of county residents. The resulting set of 23 counties serve as proxies for central cities in our research.

We employ a time-series cross-section design using for these 23 cities over the period 1990-2008 (with lags back to 1989) to explain employment growth in central cities over time. Our use of fixed effects (or the "within" estimator) can be thought of intuitively as an average of 23 time series models, thus allowing us to predict the impact of a change in the independent variable over time on a given city's employment.

Our results show that increases in city employment over time are positively related to increases from the prior year in: (a) metropolitan employment; and (b) the share of metropolitan employment in the *Professional, Scientific and Technical Services*; and *Government* sectors. Increases in city employment over time are negatively related to increase from the prior year in: (a) the share of metropolitan employment in the *Manufacturing* sector, (b) property crimes, and (c) tax revenues as a share of gross city product. These results indicate that the condition of the metropolitan economy is a primary determinant of city employment levels and growth, but that within the city, property crimes and high taxes may be a significant deterrent to economic growth.

We then use these results to simulate the impact of these various factors on a hypothetical city over time. In doing so, our simulations show the impact of moving from the 25th percentile for a given variable to the 75th percentile, finding that at the metropolitan level, the single most important predictors of city employment growth are the overall regional growth rate and the share of employment in the *Professional, Scientific, and Technical Services* sector. At the city level, our simulations reveal that both property crime and tax burdens have the potential to significantly stunt city employment growth.

Finally, we attempt to forecast the District of Columbia's employment future, again comparing future outcomes if city values are set at the 25th percentile to those at the 75th percentile. This allows us to look at the employment impact of plausible changes in the next 20 years. For the District, we see that overall regional economic outcomes are particularly important: over a 20-year time horizon, if the region grows at the 75th percentile rate, the city will gain about twice as many jobs as if the region grows at the 25th percentile rate. On the other hand, sector-specific outcomes have a much smaller impact, with only the effect of *Government* sector employment producing statistically distinguishable outcomes in the next 20 years. While property crime is a significant determinant of the District's future employment growth, moving from the 25th to the 75th percentile in tax revenues as a share of gross city product has an insignificant impact on future city employment growth. We also find that even under an optimistic scenario, the District is likely to continue to lose job share to its suburbs over the next 20 years.

These findings suggest that city and regional employment outcomes are intrinsically bound; much of the city's economic future is a function of the regional economy. Further, given the dominant impact of the lagged dependent variable, almost 90% of the growth rate is a function of current conditions. What, then, is the city official interested in increasing employment to do? Our results suggest that at the city level, the two factors most likely to increase employment, at least for many cities, are reducing property crime rates and lowering tax rates. Perhaps more importantly, these results suggest the importance of cooperation and collaboration within regional governments, since city outcomes are so largely a function of regional outcomes.

In addition to the interdependence between city and suburban employment outcomes, our research suggests that the movement of employment to the suburbs witnessed over the past two decades is likely to continue over the next two. For the District, even under our most optimistic scenario, it will lose job share to the suburbs over the next 20 years. Thus, the role of the city as the center of the metropolitan economy has changed and is likely to continue changing. While central cities will continue to function as regional hubs or cores, metropolitan employment is becoming more widely dispersed throughout regional economy. How central city governments respond to this shift has important implications for the future structure of regional economies. Realizing that they no longer capture a given share of new employment, central cities may begin to compete not only with cities across the nation but also with their own suburbs. Such competition can undermine the cooperation and collaboration necessary to support central cities in this new economic environment. Alternatively, central cities may see this transformation as an opportunity for them to shift from employment centers to civic or cultural centers, thus creating greater opportunities for synergies to emerge between neighboring jurisdictions that share a single economic base.

Figure 1
Impact of High and Low Metropolitan Employment Growth Rates on Central City Employment

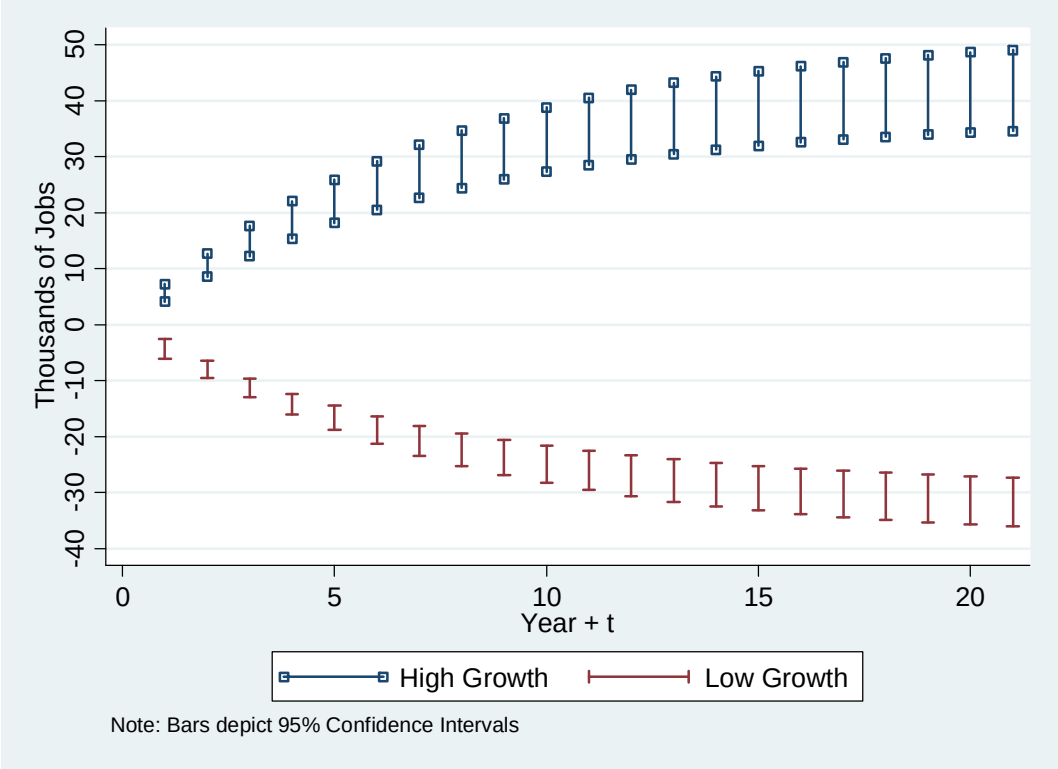


Figure 2
Impact of High and Low Metropolitan Manufacturing Growth on Central City Employment

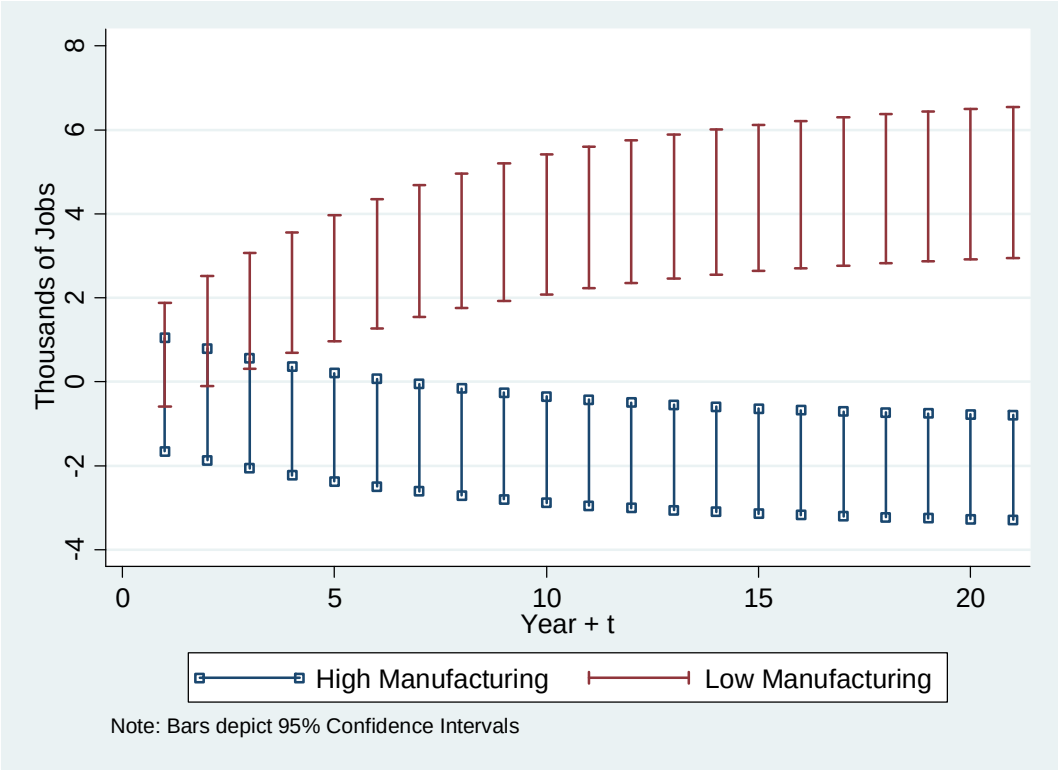


Figure 3
Impact of High and Low Metropolitan Professional, Scientific, and Technical Growth on Central City Employment

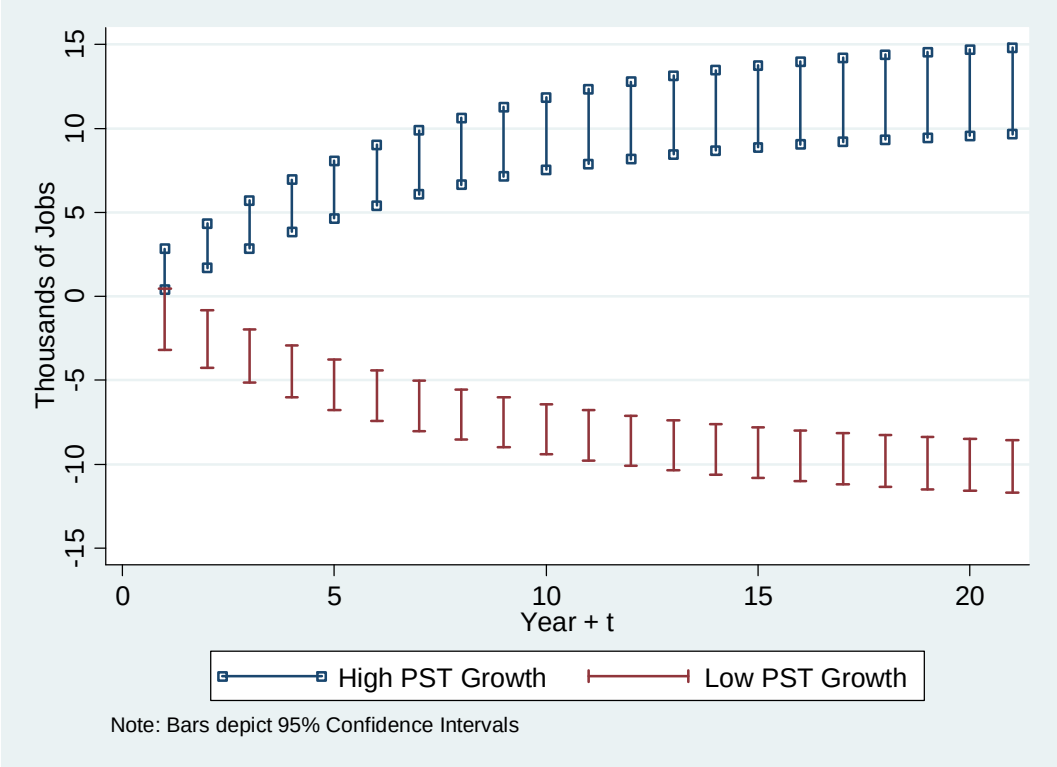


Figure 4
Impact of High and Low Metropolitan Government Growth on Central City Employment

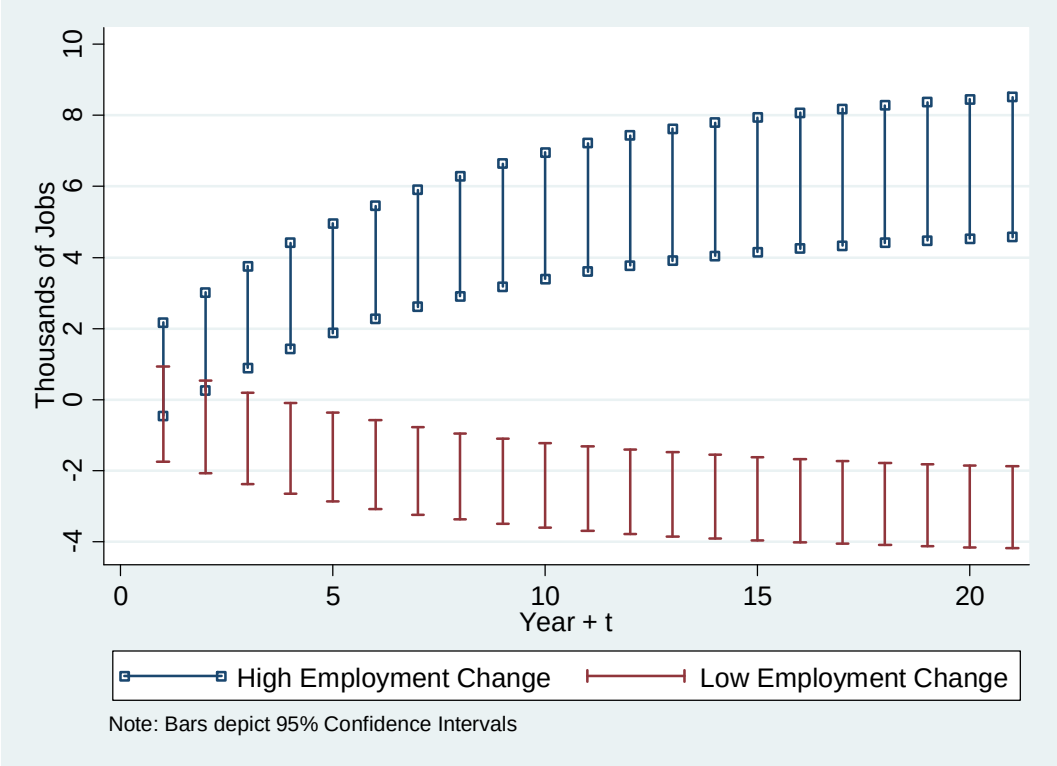


Figure 5
Impact of High and Low Property Crime Rates on Central City Employment

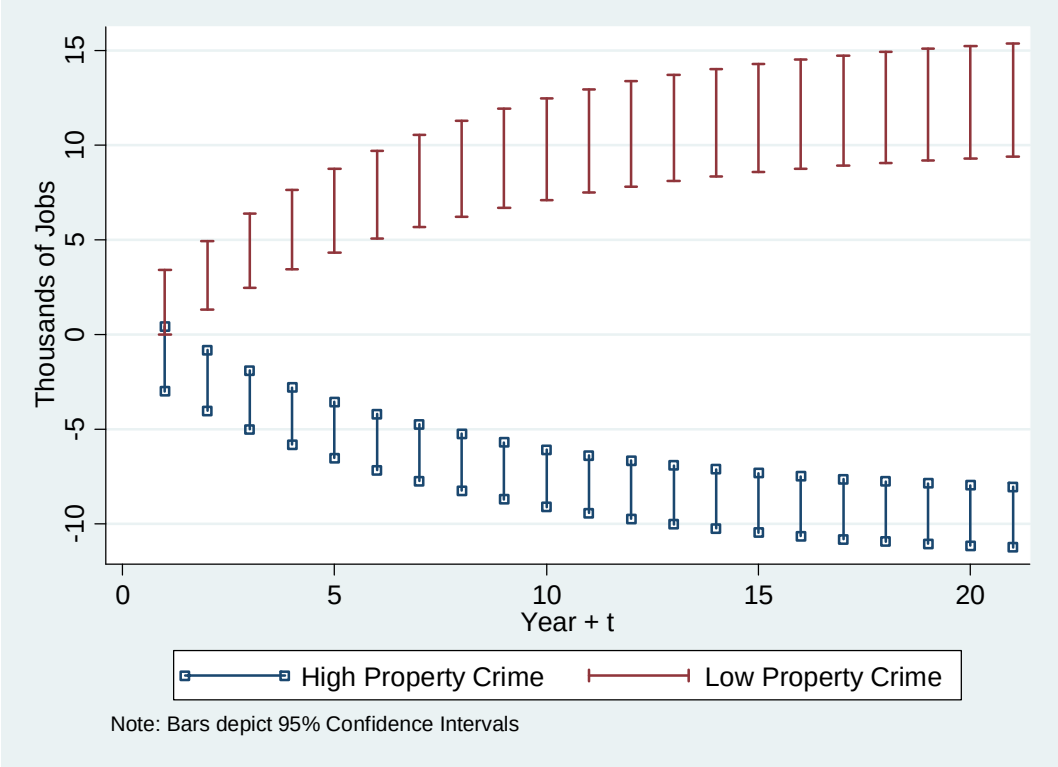


Figure 6
Impact of High and Low Tax Levels on Central City Employment

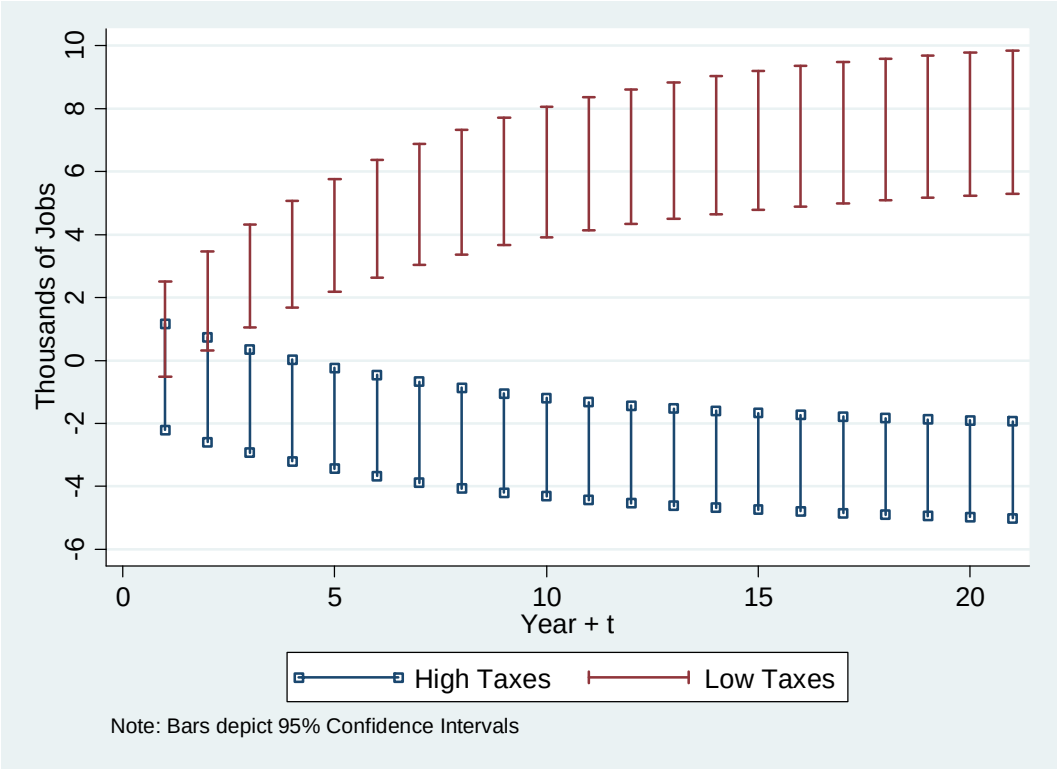


Figure 7
Forecasting DC Employment Conditional on MSA Employment Growth

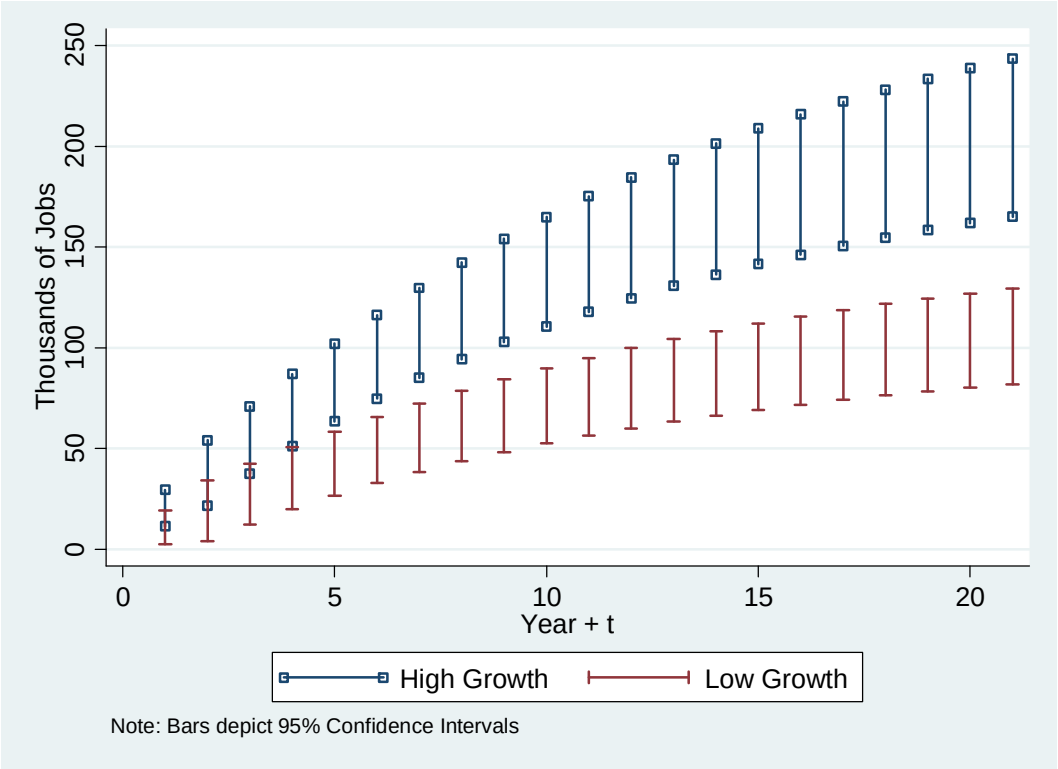


Figure 8
Forecasting DC Employment Conditional on Metropolitan Growth in Manufacturing Employment

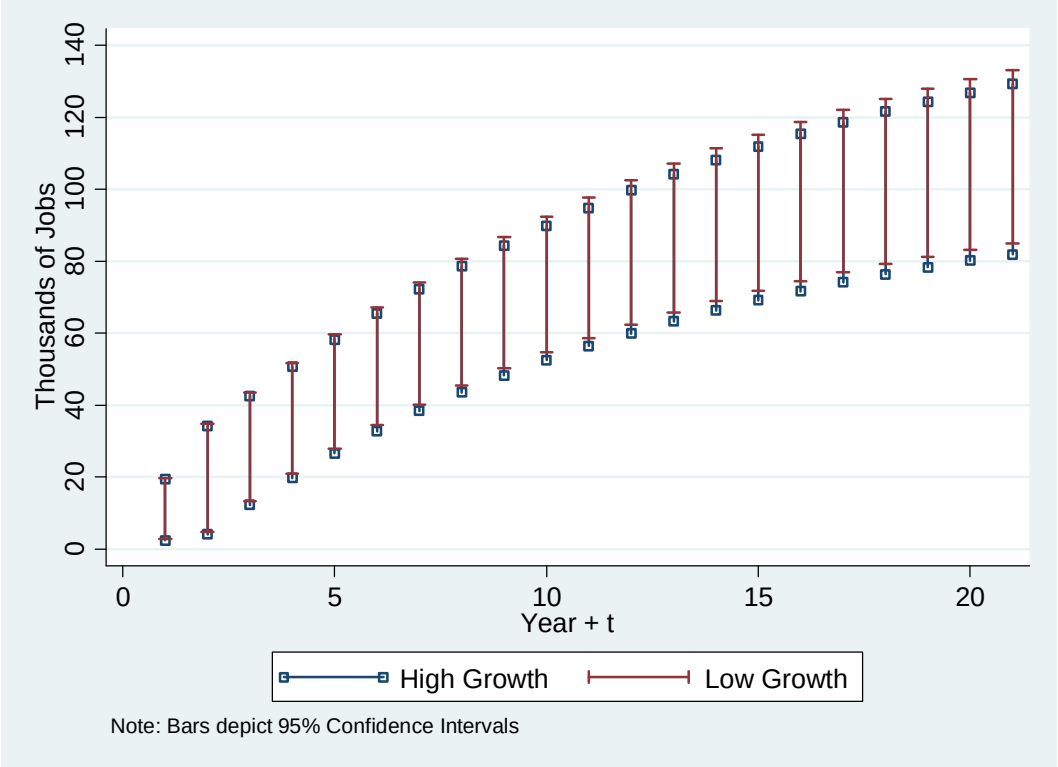


Figure 9
Forecasting DC Employment Conditional on Metropolitan Growth in Professional, Scientific, and Technical Employment

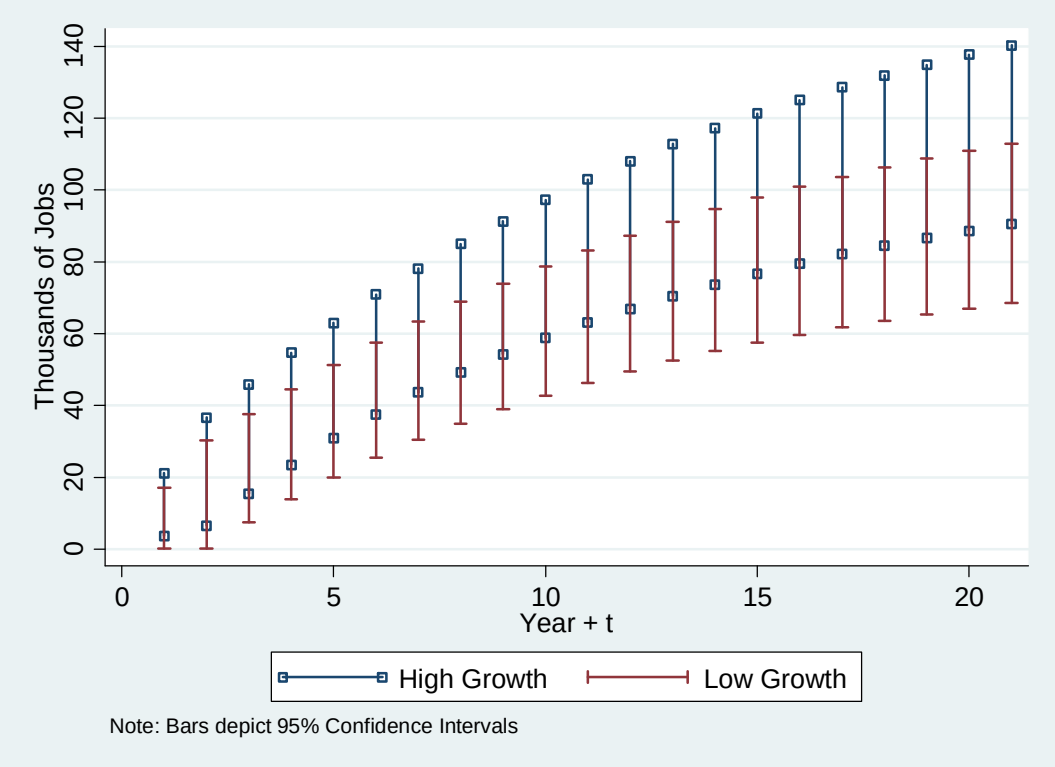


Figure 10
Forecasting DC Employment Conditional on Metropolitan Growth in Government Employment

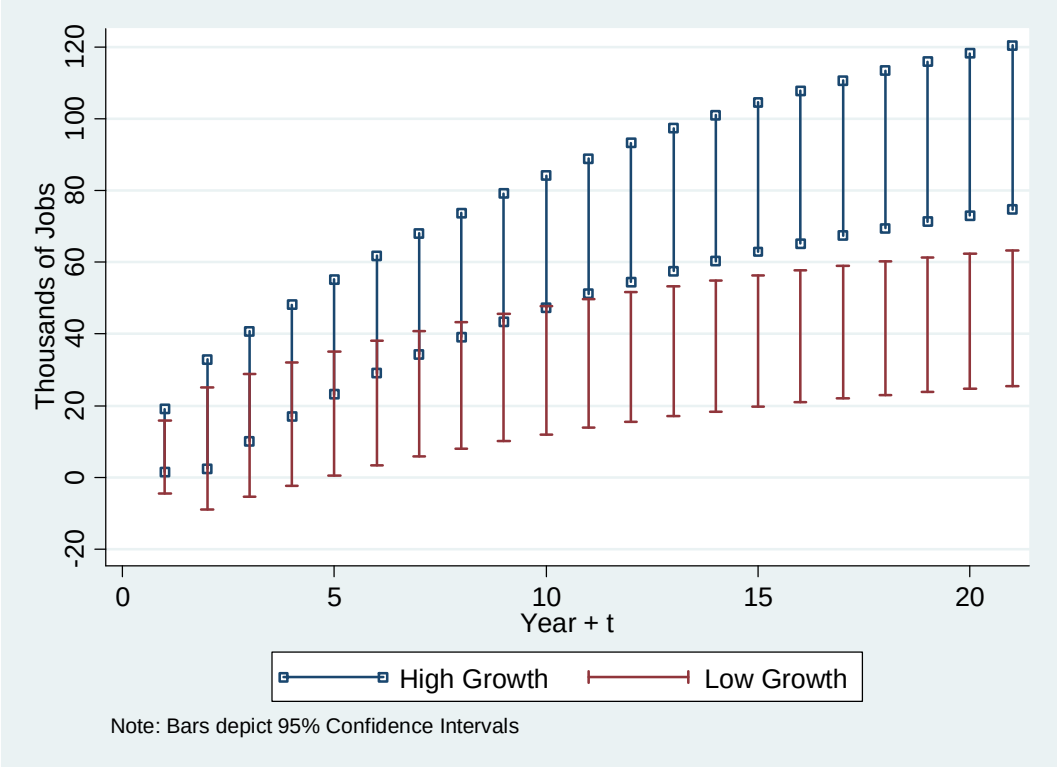


Figure 11
Forecasting DC Employment Conditional on Property Crime

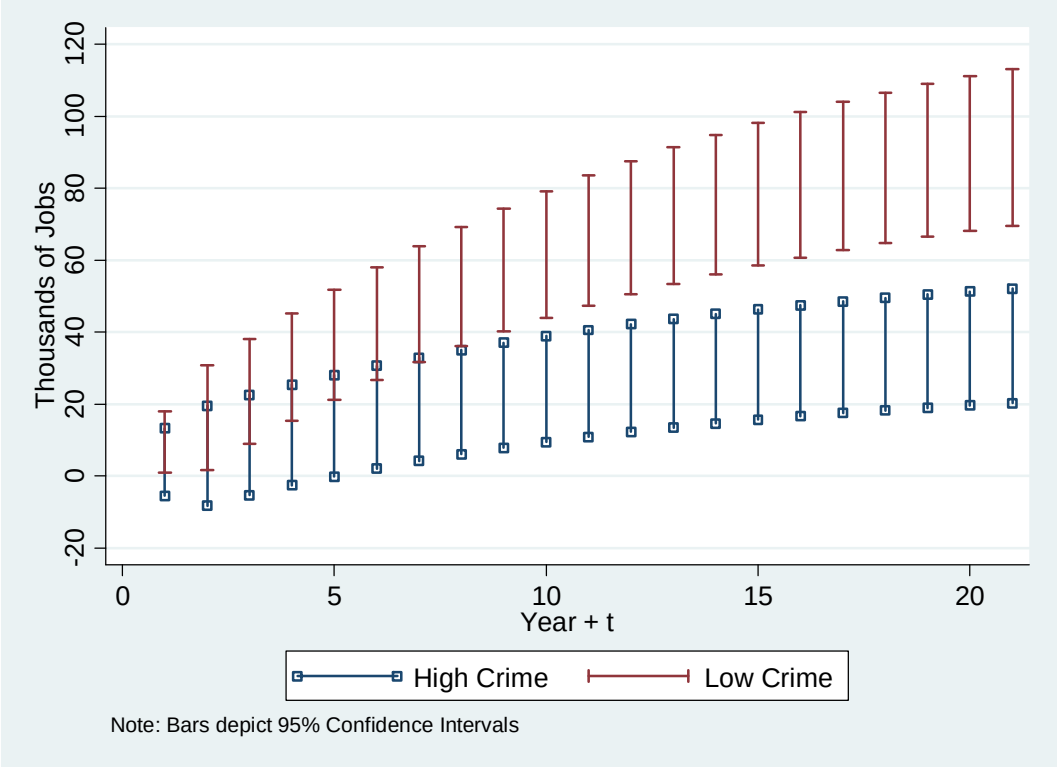


Figure 12
Forecasting DC Employment Conditional on Taxes

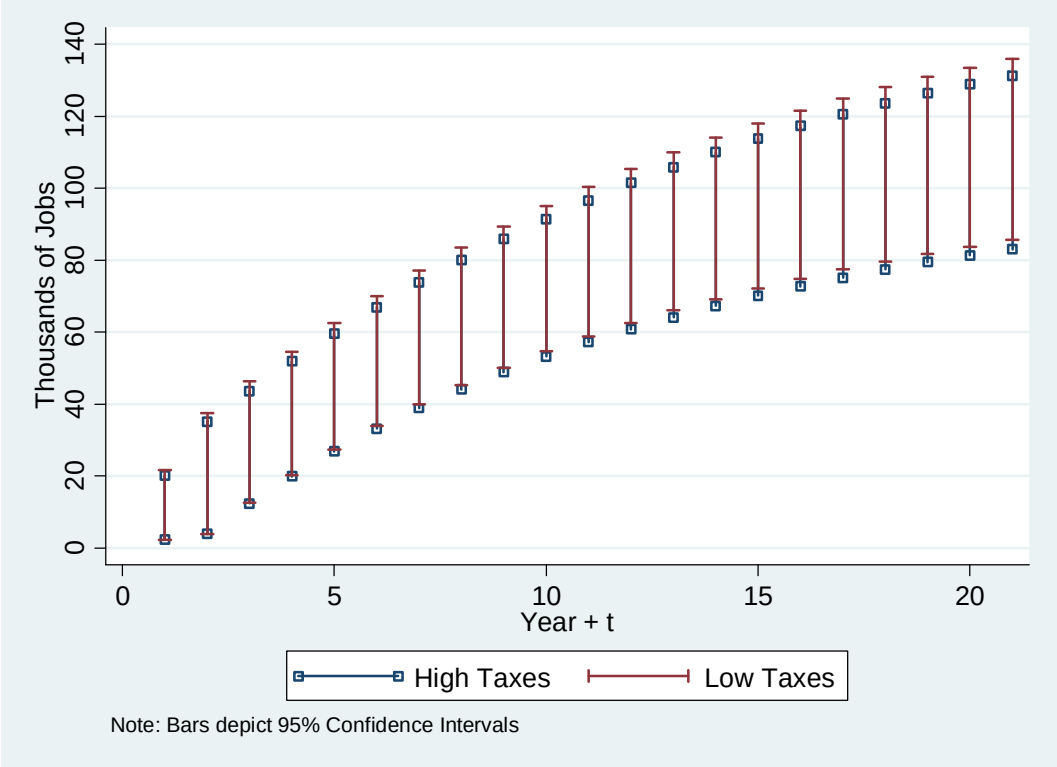


Figure 13
Forecasting DC Employment Conditional on Optimistic and Pessimistic Scenarios

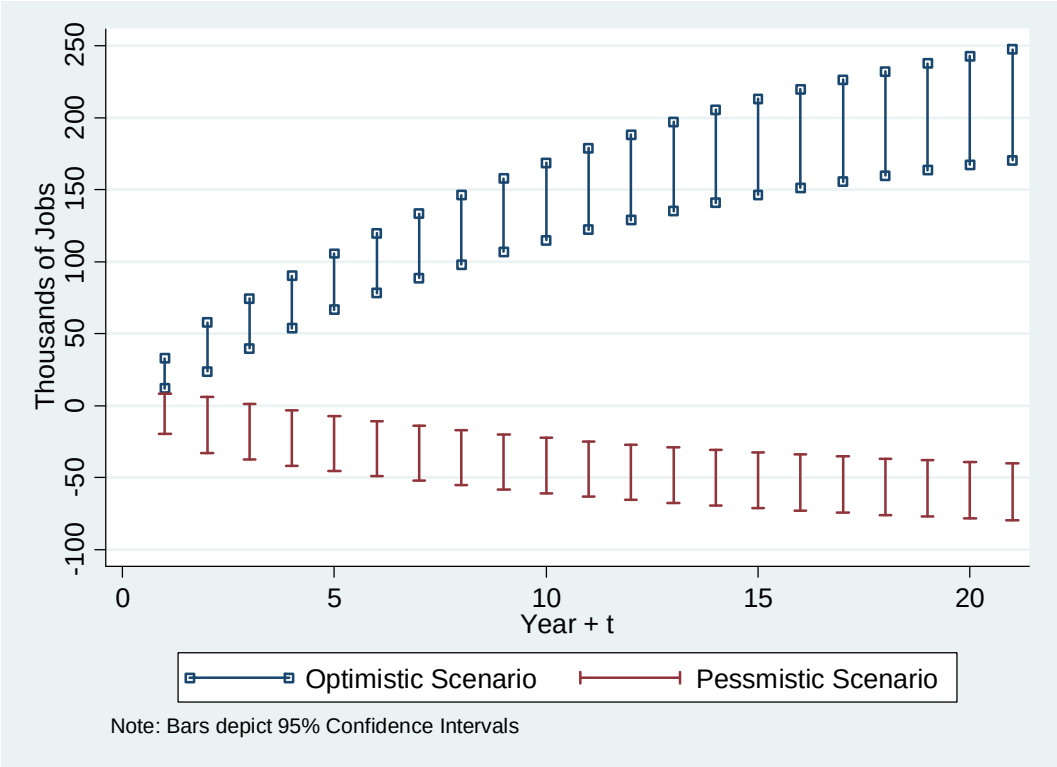
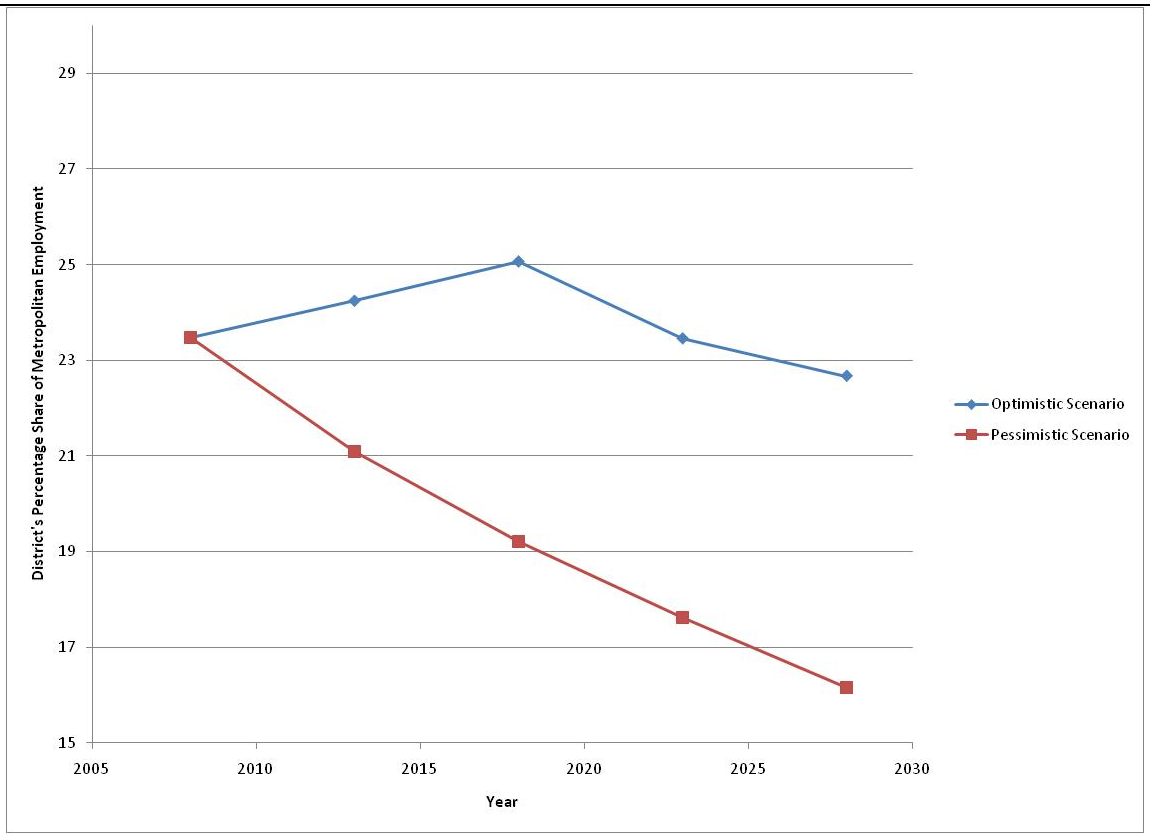


Figure 14
Forecasting DC Percentage Share of Metropolitan Employment



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Appendix A: Employment Data

All of the data for the employment measures were obtained from a subscription to Moody's economy.com. The major advantages to using economy.com as opposed to data from the Bureau of Labor Statistics are: (a) ease of access to the data; (b) economy.com estimates data for county or industry data points that are suppressed by government agencies; (c) economy.com updates old data files when metropolitan area definitions are changed allowing for comparable figures for MSAs over time; and (d) economy.com updates old data files when industry codes are changed allowing for comparable figures for industries over time. Economy.com data are updated monthly, though generally only the forecast numbers change with the historic estimates remaining unchanged – unless there has been a change to either the MSA or NAICS systems. While there is not a specific day each month when updates are released, MSA-level data are updated around the 20th of every month, while county databases are updated towards the end of each month. Economy.com numbers are estimated from data collected by the Bureau of Economic Analysis and the Bureau of Labor Statistics and numbers from the smaller geographic units are adjusted so that they sum to equal their larger geographic units. National and state numbers are computed first, followed by metro area and county numbers, with county numbers squeezed to equal the state and metro totals. Likewise, industry sub-categories will add up to industry totals. Data were downloaded from economy.com November 10, 2009.

A major advantage to using the data from economy.com is that Moody's estimates numbers where there are missing data. The quarterly census of employment and earnings (QCEW) and the Current Employment Survey (CEW) are the basis for employment figures; both of which are collected at the 6-digit NAICS code level by county. However, there are cases where the numbers for a specific industry in a specific county are too small for release. The government's economic data are suppressed when the number of employers for a given county is below a specific number – with this specific number not being released by the government. In the words of Isserman and Westervelt (2006), "Suppression rules riddle it [County Business Pattern Data] with holes like a moth-eaten sweater and limit its usefulness…. In 2002, employment and payroll was suppressed for two-thirds of the 2.19 million records. Thus, no payroll information and limited employment information exist for 1,461,702 records" (pg. 312-315). Since the suppression rules pertain to the Bureau of Labor Statistics and the Bureau of Economic Analysis in addition to County Business Patterns, missing data is prevalent in research at the industry-county level. Moreover, when a single county is missing industry-level data, the data for that industry in the entire MSA is suppressed, causing suppression in some major sectors. For example, in 2006, the following wage sector-level data was suppressed by the Bureau of Economic Analysis in the Washington metro: mining, utilities, manufacturing, and transportation and warehousing. At the three-digit level the problem is even more acute. Using the estimates generated by economy.com has allowed us to avoid having missing data for our estimates of industry concentration at the metropolitan level.

Appendix B: Data Dictionary for Other Variables

This appendix documents the sources of data for other variables used in this study, as well as the methods used for calculating each variable.

Per Capita Income

County per capita income estimates were obtained from the Bureau of Economic Analysis Local Area Personal Income Accounts. For county personal income, data for an entire state needs to be downloaded and then the per capita income figure for the individual county was pulled out. In the case of New York City, total personal income and population were obtained for the five county components (Bronx, Kings, New York, Richmond, and Queens). Per capita personal income was then calculated for the city as a whole.

Bureau of Economic Analysis. 2009. Local Area Personal Income. Retrieved November 2, 2009 from the World Wide Web: http://www.bea.gov/regional/reis/.

Educational Attainment Data

Data on the educational attainment of county residents was obtained from American Fact Finder for the 1990 and 2000 Census. The growth rate between the ten-year period was used to predict the missing values for 1989, 1991-1999, and 2001-2007.

American Fact Finder. 2009. Decennial Census Data. Retrieved December 15, 2009 from the World Wide Web: http://factfinder.census.gov/home/saff/main.html?_lang=en.

Percent White, County

The major reason for using the percent of the population that is white is that over the time period of interest, the Census Bureau made significant changes to the way in which it categorized races, making estimates of specific minority populations incomparable over time. The data on the percent of the population that is white was obtained from the Census Bureau's yearly population estimates which break down county population into age groups, gender groups, and racial categories. In the year 1989, all counties were available in a single Excel file. For the years 1990-2007, a separate Excel file was available for each state, each year. From 2000-2007, there were two categories of white: white alone or white in combination. According the Census Bureau, the category white alone is most directly analogous to the old white category collected prior to 2000 (personal communication November 20, 2009); however, the data do jump around between 1999 and 2000 reflecting the new methodology. For the years 1990 and 2000, the actual census numbers were used as opposed to the July estimates. In the case of New York, data for each of the five boroughs (Bronx, Kings, New York, Queens, and Richmond) were obtained and then the percent white was calculated.

U.S. Census Bureau. 2009. County Population Estimates *Intercensal County Estimates by Age, Sex, Race: 1980-1989* [in excel files downloadable by state]. Retrieved December 14, 2009 from the World Wide Web: http://www.census.gov/popest/archives/1980.

U.S. Census Bureau. 2009. County Population Estimates, *1990 to 1999 Annual Time Series of County Population Estimates by Race and Hispanic Origin* [in excel files downloadable by state]. Retrieved December 14, 2009 from the World Wide Web: http://www.census.gov/popest/archives/1990s/CO-99-11.html

U.S. Census Bureau. 2009. County Population Estimates, County-Characteristics *Annual Estimates of the Resident Population by Age, Sex, Race, and Hispanic Origin for April 1, 2000 to July 1, 2008* [in excel files downloadable by state[12]]. Retrieved December 14, 2009 from the World Wide Web: http://www.census.gov/popest/counties/asrh/CC-EST2008-alldata.html.

Crime

Data on crime were obtained from a personal request to the FBI's Uniform Crime Reporting Division. Violent and property crime variables were created for each central county in each MSA in the study. Central county was defined as the county containing the central city of interest, e.g., Duval for Jacksonville. Variables are sums of all reporting jurisdictions in the county, not just the central city's. New York variables are comprised of the five counties composing New York City. Variables were created using the raw Uniform Crime Report data files named below. These data files excepted, the files used to create the variables are included in a "crime" subfolder included with project files. This includes the SAS command file that created the variables, the SAS dataset it created, and the Excel file created from the SAS dataset. Also included is the code sheet for the Uniform Crime Report data (retarecdesc.wpd).

The source data files are as follows: KCRETA89.dat, KEN90, KEN91, KEN92, KEN93, KEN94, KEN95, KEN96, RETAFIX.Y97, KCRETA98.DAT, KCRETA99.DAT, KCRETA00.dat, RETA01.y01, RETA02, RETA03.dat, RETA04.dat, reta05.dat, RETA06.dat, RETA07.dat.

Violent Crime: Violent crimes are the sum of "Number of Actual Offenses" categorized as murder, manslaughter, rape, robbery, and assault, for the given county for the year. Several values for violent crime clearly were in error. Cases where the preceding year and the succeeding year were at least 50% different in the same direction as the subject year, the value

[12] For these data files, the age group 0 indicates all age groups combined. The year codes are as follows: 1 = Census 2000; 2 = 2000 population estimates base; 3 = July 2000 population estimate; 4 = July 2001 population estimate; 5 = July 2002 population estimate; 6 = July 2003 population estimate; 7 = July 2004 population estimate; 8 = July 2005 population estimate; 9 = July 2006 population estimate; and 10 = July 2007 population estimate.

for the subject year was imputed using the preceding and succeeding years as endpoints. These were 1999 Baltimore, 2002 Baltimore, 1998 Columbus, GA, 1996 Jacksonville, 1999 Jacksonville, 2003 Jacksonville, 1992 NY, and 1993 NY. In addition 2000 Anchorage was missing data. Values were imputed from 1999 and 2001.

Property Crime: Property crimes are the sum of "Number of Actual Offenses" categorized as burglary, larceny, and vehicular theft, for the given county for the year. Some values for property crime clearly were in error. Cases where the preceding year and the succeeding year were at least 50% different in the same direction as the subject year, the value for the subject year was imputed using the preceding and succeeding years as endpoints. These were 1999 Baltimore, 1998 Columbus, GA, and 1999 Norfolk. In addition 2000 Anchorage was missing data. Values imputed from 1999 and 2001.

Federal Bureau of Investigation. 1999. Uniform Crime Reports 1989-2007. Requested CD-ROM from the FBI: http://www.fbi.gov/ucr/ucr.htm#cius.

Tax/service package

Tax burdens and public expenditures were calculated using the Census of Government Finances county area estimates. The county area data is useful because it aggregates all types of governments – city, county, special purpose, and school districts into a single county area. As different states and counties employ different divisions of labor between governments, measures of tax burden based on taxes paid to a single level of government – e.g. city or county taxes – are not meaningful as they may drastically over- or understate the tax burden of people living in that jurisdiction depending on local use of special purpose government and school districts as tax-raising authorities. These numbers are produced by the Census of Governments every five years – in the years ending in 2 or 7. Data were obtained for 1987, 1992, 1997, and 2002, with linear growth assumed to impute the missing values for county area taxes. Because the District of Columbia is also treated as a state by the Census of Governments, data were available on a yearly basis for DC.

In addition to accounting for local governments, it was necessary to account for state taxes paid. Different states devolve different amounts of taxing powers to their subcomponents, so an estimate of county area taxes only is likely to be misleading. Further, this would overstate the tax burden of the District of Columbia, which is a local government but assumes many of the responsibilities assumed by state governments nationwide. State government tax data were obtained by the Census of Governments for all of the states. It was assumed that county tax burdens within each state were directly proportional to that city's share of state personal income. Thus, total state taxes were multiplied by the percent of state personal income accounted for by residents of the central county to derive an estimate of the city's share of state taxes. State tax estimates were available on a yearly basis through 2006 because the

Census of Governments surveys all states each year. 2007 state taxes were estimated assuming that they grew at the 2005-2006 growth rate. The city's share of state taxes was then added to the county area taxes for an estimate of total taxes paid to state and local governments by residents of the central county.

Tax burdens were standardized using Gross County Product, obtained from economy.com December 2, 2009. Gross County Product (GCP) is a measure of economic and as taxes can be considered the amount of money that government is taking out of the private sector economy, GCP allows us to standardize tax burden to reflect the percent of the economy made unavailable for private use as a result of taxation.

Public expenditures include "all amounts of money paid out by a government during its fiscal year – net of recoveries and other correcting transactions – other than for retirement of debt, purchase of investment securities, extensions of loans, and agency or private trust transactions." The expenditures included in our measure exclude welfare expenditures (which counts Medicaid payments to vendors, but not Medicaid payments to hospitals), as wells as expenditures of liquor stores, utilities, and insurance trusts. Expenditures include those of all local governments in the county area, but state expenditures are not apportioned to localities. Expenditures were standardized using population; thus we have included per capita expenditures.

Bureau of Economic Analysis. 2009. Local Area Personal Income. Retrieved November 2, 2009 from the World Wide Web: http://www.bea.gov/regional/reis/.

Census of Government Finances. 2009. Retrieved November 18, 2009 from the World Wide Web: ftp://ftp2.census.gov/pub/outgoing/govs/special60/.

Appendix C: Descriptive Statistics

Variable		Mean	Standard Deviation	Min	Max	Observations
County employment (in thousands)	Overall	478.7904	688.118	82.57401	3840.637	N = 460
	Between		701.6357	98.96461	3581.929	n = 23
	Within		39.89815	241.1792	737.4983	T = 20
Employment growth, MSA	Overall	1.192868	1.848393	-3.41292	6.764303	N = 437
	Between		.6056021	.0719635	2.101937	n = 23
	Within		1.750698	-2.29201	7.885207	T = 19
Manufacturing	Overall	9.540752	4.524647	1.161878	24.71972	N = 460

employment (%), MSA	Between		4.348594	1.416026	22.51854	n = 23
	Within		1.531321	3.818821	13.5757	T = 20
Professional, Scientific, and Technical Services employment (%), MSA	Overall	5.421747	2.226932	2.174753	14.717	N = 460
	Between		2.173704	2.402499	12.07573	n = 23
	Within		.6556097	3.175776	8.063017	T = 20
Finance employment (%), MSA	Overall	.0481367	.0146599	.0209605	.0856035	N = 460
	Between		.0146015	.0252243	.077065	n = 23
	Within		.0032455	.0381427	.0602635	T = 20
Government employment (%), MSA	Overall	8.044136	3.789027	3.315075	19.1212	N = 460
	Between		3.784498	3.594725	15.77348	n = 23
	Within		0.791936	5.906636	11.39186	T = 20
Military Employment (%), MSA	Overall	0.031992	0.040262	0.003877	0.190366	N = 460
	Between		0.040119	0.005801	0.148199	n = 23
	Within		0.008839	0.001534	0.07416	T = 20
Violent Crime rate, city	Overall	2422.748	1072.739	73.45136	6103.199	N = 437
	Between		974.2932	1209.009	4948.339	n = 23
	Within		490.6229	297.3067	3699.817	T = 19
Property Crime rate, city	Overall	6338.792	1734.169	1875.689	11449.1	N = 437
	Between		1257.137	3907.878	9700.828	n = 23
	Within		1221.554	1553.408	9836.906	T = 19
Tax Burden (Taxes per $1,000 GCP), city	Overall	0.071725	0.020832	0.045161	0.278156	N = 460
	Between		0.016597	0.049383	0.110242	n = 23
	Within		0.013035	0.042284	0.267714	T = 20
Government Expenditures (per	Overall	4.42677	2.505313	1.001605	15.64891	N = 460
	Between		1.81755	1.943092	9.951397	n = 23

capita), city	Within		1.763478	-0.50934	10.84682	T = 20
Percent white, city	Overall	64.48041	19.1319	29	99.8	N = 460
	Between		19.36167	32.9885	93.618	n = 23
	Within		2.583224	56.04991	70.66242	T = 20
Percent no High School, city	Overall	20.92248	6.719557	7.58	40.07	N = 460
	Between		6.16563	9.685	32.755	n = 23
	Within		2.951451	12.84748	28.99748	T = 20
Percent bachelor's degree, city	Overall	27.36826	7.065552	14.92	53	N = 460
	Between		6.679781	17.495	43.5	n = 23
	Within		2.673864	17.86826	36.86826	T = 20
Per capita income, city	Overall	28597.98	12996.26	0	85895.77	N = 438
	Between		6339.348	21636.9	45455.06	n = 23
	Within		11418.08	3397.962	72445.01	T = 19.0435
Population, city	Overall	813882.7	1519892	178198	8363710	N = 460
	Between		1550117	184530.6	7794295	n = 23
	Within		81697.8	140155	1383298	T = 20