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Predictors of Employment Growth and Unemployment in U.S. Central Cities, 1990–2010

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ABSTRACT

This paper considers employment growth and unemployment from 1990-2010 in a cross-section of cities in light of practical tools that city governments have at their disposal to provide relief. In particular, I test educational attainment (both initial levels and growth over time) and public capital investment as influences on job growth and changes in unemployment rates in 83 central cities in the United States. Change in educational attainment over time is suggestive of causing higher job growth and lower unemployment. The implication is that initiatives to attract and retain college-educated professionals and investments in increasing college attainment among incumbent residents have the potential to reduce joblessness and improve social welfare. Despite some evidence that public capital outlays led to employment growth and reduced unemployment in the 1990s, the overall association between capital outlays and labor market health is weak. Intergovernmental spending as part of the American Recovery and Reinvestment Act (ARRA), however, was found to have a positive effect on unemployment rates in 2009 and 2010. A relatively weak correlation between the two dependent variables used in the analysis—employment growth and unemployment rates—underscores the mitigating roles of migration and labor force participation in translating job creation into employment growth for members of the unemployed population.

JEL Classification Codes: O15, R23, J68

Key Words: regional labor markets, unemployment, employment policy, human capital, public capital

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Predictors of Employment Growth and Unemployment in U.S. Central Cities, 1990–2010

This paper considers employment growth and unemployment over the past two decades in a cross-section of cities in the context of practical tools that city governments have at their disposal to provide their constituents—and their fiscs—with relief. While labor markets are metropolitan phenomena—a metropolitan area is in fact defined in terms of economic integration as measured by commuting patterns—virtually no levers of social and economic policy can be pulled at the metropolitan level. In cities where unemployment is high and budgets are constrained, local officials have a narrow range of alternatives. These include incentive strategies designed to attract and retain firms and promote development projects; a newer breed of strategies, borne of the emphasis on human capital as a growth driver, designed to attract or produce skilled residents; and physical infrastructure investment strategies designed in the short term to create employment demand and in the long term to produce favorable conditions for growth in conjunction with private capital investment.

The paper begins by providing a brief overview of three types of municipal employment growth strategy: 1) tax abatements and grants, 2) enhancements to the human capital of the local labor supply, and 3) capital financing for public infrastructure. It then reports the results of a series of panel regressions in which I test predictors of job growth and unemployment rates at the municipal level between 1990 and 2010, using 83 U.S. central cities as cases. In particular, I test educational attainment (both initial levels and growth over time) and public capital investment as influences on job growth and changes in unemployment rates. While there are some disadvantages to using cities (as opposed to metropolitan areas) in this analysis, these are outweighed by the advantage of a focus on geographic units that overlap with political

jurisdictions, and by the advantage of being able to rely on municipal-level reporting of public infrastructure outlays.[1] The main findings are as follows:

- There was a strong association between labor market health and growth in college-educated residents in cities during the 1990–2010 period. In contrast, the data contain much less evidence of an association between cities' *initial levels of educational attainment* and positive labor market outcomes in the two decades. Strong growth in the number of degree-holding residents led to employment growth across a decade and low unemployment at its end; a high initial "stock" of bachelor's degree holders did not.

- In Ordinary Least Squares (OLS) regressions, high expenditures of "public capital" at the beginning of the 1990s predicted better urban labor market conditions at the end, but this factor was insignificant or negative in the panel regressions and in OLS regressions for the 2000s. Some panel specifications indicate that high public capital outlays exerted a significant negative effect on cities' employment growth. These ambiguous results are likely driven by significant diversity, in baseline conditions and in motivation, among cities that spent similar amounts on public capital over the period. Some cities' investments sparked population and employment growth, or enabled them to "catch up" after prior periods of expansion, while in other cities, larger than average capital outlays were needed to shore up obsolete infrastructure in the midst of decline. Despite some evidence that public capital outlays led to employment growth and reduced unemployment in the 1990s, the overall association between capital outlays and labor market health is weak.

- Intergovernmental spending as part of the American Recovery and Reinvestment Act (ARRA) had a positive effect on unemployment rates in 2009 and 2010. This result follows on the work of other researchers who conclude that the increase in effective demand represented by a national-level stimulus appears to have prevented much greater instability and unemployment in the wake of the 2008 financial crisis than would otherwise have occurred.

- A relatively weak correlation between the two dependent variables used in the analysis—employment growth and unemployment rates—underscores the mitigating roles of migration and labor force participation in translating job creation into employment growth for members of the unemployed population. In many cities, adding employment did not "move the needle" on the difficult problem of reducing the unemployment rate.

Because the variables in the panel regressions are mostly endogenous, the policy conclusions to be drawn from the research are necessarily somewhat tentative. However, the

[1] For example, payroll employment (as contrasted with resident employment) is not available from the Bureau of Labor Statistics at the city level.

results suggest that deliberate and aggressive policies to increase the number of bachelor's degree holders within cities' populations are not misplaced. There is a need for more work to discern the efficacy of municipal policies targeted at attracting, retaining, and "home-growing" college graduates, and to elaborate the local conditions under which such policies succeed. Operationalizing variables associated with the interventions, and measuring outcomes as a function of them, is challenging, but this project deserves the same kind of attention that has been paid to the evaluation of tax incentives to firms. Initiatives to raise the level of educational attainment among cities' incumbent residents also deserve more comprehensive investigation. While there is little enthusiasm at the moment in Congress or in state legislatures for comprehensive initiatives such as universal pre-K or inexpensive public postsecondary education, human capital development efforts that originate at higher governmental scales are likely to be necessary if policymakers hope either to mitigate the devastating effect of long-term unemployment on people in severely distressed municipalities or to strengthen the fiscal positions of those places.

The finding that municipal infrastructure outlays, in contrast to gains in educational attainment, exerted an insignificant or negative impact on employment in this cross-section of cities during the time period examined implies that local-level infrastructure spending is not a reliable job growth strategy for central cities. This may be attributable to the diverse circumstances in which cities might find themselves spending more than average amounts on infrastructure (such as in reaction to either growth or obsolescence) and to variation by place in the quantity of infrastructure gained per dollar of public capital expended. The models show a positive employment impact from the ARRA in the cross-section of cities, however, suggesting that exogenous infusions of infrastructure spending going forward (such as those proposed in the

current American Jobs Act initiative) could help cities reduce unemployment and prevent its deleterious effects on both neighborhoods and households.

BACKGROUND AND LITERATURE REVIEW

Employment has been slower to recover nationally since the recession that ended in June 2009 than after previous recessions; even after three years of recovery, the national unemployment rate averaged 8 percent during 2012, considerably higher than the prerecession 5 percent.[2] Moreover, with seasonally adjusted employment at about 135 million at the end of 2012, there were still 3.3 million fewer jobs in the economy than in December 2007, the first month of the recession (Bureau of Labor Statistics, Current Employment Statistics series). In 2012, net job gain in the economy averaged about 181,000 jobs per month, only slightly exceeding the level of job growth needed simply to absorb new entrants into the labor force.[3]

Unemployment affects America's cities in distinct ways. Table 1, which displays unemployment trends in the nation's 10 largest central cities since the nation officially emerged from recession in June 2009, shows that cities in the western and southern United States (with the exception of California) have unemployment that, while higher than the 5 percent that characterized the last expansion, remains below the national average. High unemployment rates in California and parts of the East and Midwest have been stickier, and there is no evidence of convergence. Additionally, there is no regional pattern observable in unemployment changes since 2009. Phoenix, which had the fourth-highest unemployment rate in 2009, had the third-

[2] When the recession began in December 2007, national unemployment was 5 percent and had been at or below 5 percent for the previous 30 months (Bureau of Labor Statistics 2012).

[3] According to the Hamilton Project, an economic policy initiative at the Brookings Institution, more than 10 million more jobs than currently exist would be needed in order to regain prerecession employment levels, accounting for new entrants into the labor force (Hamilton Project 2013).

lowest rate in 2012, while San Antonio's unemployment rate grew by two-tenths of a percent over the same time period. Outside the Sunbelt there have also been large improvements (Chicago) and large slippages (Philadelphia), while in every region there are some cities where unemployment has remained persistently high (New York, Los Angeles) or low (Houston).

Table 1 Unemployment in Large U.S. Central Cities, 2009–2012 (%)

City	December 2012	Monthly avg. 2012	2009 (Annual)	June 2009[a]	Percent point change: Jun 2009–Dec 2012
New York	8.8	9.5	9.2	9.4	0.6
Los Angeles	11.3	12.2	12.8	13.0	1.7
Chicago	9.7	10.0	10.9	11.7	−1.6
Houston	6.1	6.9	7.2	7.6	−0.4
Philadelphia	10.6	10.7	9.6	9.8	0.7
Phoenix	6.9	7.5	10.6	11.0	−3.2
San Antonio	5.7	6.5	6.3	6.5	0.3
San Diego	8.1	8.9	9.6	10.0	1.9
Dallas	6.4	7.4	8.1	8.3	−0.6
San Jose	8.3	9.3	12.0	12.7	4.4
United States	8.4	8.3	9.3	9.5	−1.2

NOTE: Figures are not seasonally adjusted. Highlighted cells indicate unemployment in excess of the national average.

[a] June 2009 was the first month of the official recovery.

Unemployment at the municipal level is the result of multiple and interacting influences.[4] Fundamentally, firms' birth, death, expansion, and contraction—as well as their relocation—drive net job growth, with hiring and location decisions a function of production costs and revenues. However, a city that loses jobs may register a large or small change in its unemployment rate, depending on migration and labor force participation trends. Similarly, a city that gains jobs experiences a relatively small decline in its unemployment rate if the

[4] See Elhorst (2003) for a comprehensive review of theoretical and empirical explanations for regional unemployment differentials.

additional jobs are filled by in-migrants from other regions or by noncity residents of the metropolitan area (see Bartik [1991] and Persky et al. [2004]). Locally, specific rates of worker discouragement and local reservation wages also exert effects on unemployment. From their work on state growth patterns from 1950 to 1990, Blanchard and Katz (1992) conclude that unemployment rates were sensitive to economic shocks only in the short term (5–7 years) and that labor mobility, rather than job creation, in fact constituted the dominant adjustment mechanism after booms or slumps. Evidence that a disconnect between employment growth and unemployment persists in the present day can be observed by comparing Tables 1 and 2. In several cities, high employment growth during the recent recovery seems to have done little to reduce high rates of unemployment.

Table 2 Employment Change in Large U.S. Central Cities, 2009–2012

City	Employed population		Change in employed population (Jun 2009–Dec 2012)	Percent change in employed population (Jun 2009–Dec 2012)
	June 2009	December 2012		
New York	3,606,722	3,630,179	23,457	0.7
Los Angeles	1,674,997	1,688,532	13,535	0.8
Chicago	1,180,905	1,152,782	−28,123	−2.2
Houston	981,568	976,817	−4,751	−0.5
Philadelphia	592,302	586,540	−5,762	−1.0
Phoenix	705,808	678,402	−27,406	−3.9
San Antonio	597,388	588,430	−8,958	−1.5
San Diego	624,538	660,361	35,823	5.7
Dallas	541,531	547,493	5,962	1.1
San Jose	403,092	444,920	41,828	10.4
United States	140,196,000	142,415,000	2,219,000	1.6

Just as many social and economic vectors contribute to fluctuations in local unemployment rates, many consequences ensue from these fluctuations that transcend their impact on near-term welfare at the household level. Labor market shocks have been decisively

shown to exert effects on individuals' lifetime earnings profiles.[5] Over a longer time horizon, prolonged periods of high unemployment have a hysteresis effect for places as well as for individual workers, atrophying human capital stocks and placing strain on the social infrastructure of neighborhoods and communities (Bartik 2001; Martin 2011). Moreover, unemployment has fiscal effects as municipalities collect less revenue in times of joblessness. Cities' fiscal and employment positions are mutually reinforcing; inevitably, lack of revenue for municipal services in turn hampers cities' abilities to generate conditions conducive to private employment growth. The relationship is particularly strong when a tax on wages or income comprises a proportion of the revenue dedicated to municipal government, but user fees, sales tax revenue, and property tax collection also suffer when unemployment is high. This link between economic health and local fiscal capacity is surely one factor explaining Blanchard and Katz's (1992) finding that at the state level between 1950 and 1990, employment shocks typically had permanent effects on growth.

The recession and recovery of the late 2000s have been unique not only for the slow recovery of the job market during the recovery period but also for having occurred against a backdrop of increased devolution of fiscal burdens from federal to state and from state to local governments (see Krane, Ebdon, and Bartle [2004] and Tannenwald [1998]). Faced with declining revenues, local governments have shed workers and deferred capital spending at rates that distinguish this recovery from past ones, exacerbating already severe private sector job loss.[6]

[5] Hysteresis effects of displacement and long-term unemployment for individual workers, particularly for those displaced during recessions, are well-documented (see Davis and von Wachter [2011]). Long-term unemployment (unemployment lasting at least six months) has reached an unprecedented high during this recession (see Burtless [2012]).

[6] On a seasonally adjusted basis, the public sector shed 721,000 jobs between June 2009 and January 2013, 92 percent of which were in state and local governments. The employment effects of foregone or deferred capital spending amplify this figure, since most of the job creation impacts of public capital investment occur in the private sector.

A signal feature of the ARRA, enacted in February 2009, was its provision of direct transfers to state and local governments in order to mitigate these effects. Roughly one-third of the stimulus dollars (which totaled approximately $821 billion in all) were authorized to compensate for tax losses (through the State Fiscal Stabilization Fund) and to offset the fiscal impact of increased demand for services such as Medicaid (Chodorow-Reich et al. forthcoming; Conley and Dupor 2012). ARRA spending also reached individuals directly through tax relief. However, ARRA funds allocated to federal Departments of Transportation and Energy and the Environmental Protection Agency were a more conventional fiscal stimulus in that they financed direct federal spending on capital infrastructure.[7] Studies evaluating the impact of the federal stimulus package, particularly its transportation component, reignited a long-dormant discussion about the impact of public capital on economic growth.

Despite the limited set of tools available to municipal governments to induce growth in employment, local officials, often joined by real estate interests and coalitions of prominent place-bound enterprises and institutions, devote considerable effort to this task (Logan, Whaley, and Crowder 1997; Giloth 2004; Peterson 1981). Growth strategies pursued at the municipal level may be conceived in terms of three "policy levers."

Tax Expenditures and Grants

The most common local government response to the imperative to grow employment is to offer tax incentives to firms and development projects based on the premise that tax costs are a critical determinant of establishment location. The logic of tax expenditures is that in allowing the private sector actors to retain and invest a larger proportion of revenues or profits, the danger

[7] As of early 2013, approximately $90 billion had been paid out in the Transportation, Infrastructure, and Energy/Environment categories (see www.recovery.gov).

of crowding private investment with public expenditure is diminished. State and local governments use tax abatements, land write-downs, low-cost financing, and outright grants to compete against one another for private investment, spending an estimated $50 billion per year in the process (Peters and Fisher 2004).

There is a substantial literature evaluating the employment impact of targeted tax expenditures intended to attract and/or retain businesses within municipal or state jurisdictions.[8] Some researchers find that incentives make a positive impact on employment growth at the establishment level (Greenstone and Moretti 2003; Loh 1993), especially if targeted at firms in industries that have been the object of long-term economic development planning activities such as state-funded research centers and workforce development initiatives (Lester, Lowe, and Freyer 2012). But a majority of scholarship on incentives questions both their efficiency and their net impact on local resident employment and social welfare (Bartik 2007; Brindisi and Ehrenberg 2008; Kolko and Neumark 2009; Persky, Felsenstein, and Carlson 2004; Peters and Fisher 2002). Many studies suggest that incentives are not often effective at inducing jobs, and when they do, the fiscal costs ("cost-per-induced-job") tend to be quite high.[9] When conditions are attached to development incentives through agreements, in an attempt to ensure that job growth occurs or that local residents are hired, these are often not enforced or carried through. Studies tracking subsidy agreements in New York City, for example, have estimated that subsidized projects and enterprises meet or exceed stated job creation and retention goals less than 50 percent of the time (ALIGN 2011). The policy implications of findings such as these are

[8] This is a major reason why I do not directly test tax expenditures in this analysis.

[9] Only induced jobs—jobs that would not have been created but for the presence or offer of an incentive—should rightly be counted as outcomes of an incentive policy. Firms and their location consultants often "game" the process by encouraging potential locations to outbid one another (thus creating rents for the firm at the expense of the host locality). They may also, having chosen a locality, seek abatements and grants from economic development officials there as though the prechosen site were still in competition with other locations.

contested, with some researchers urging a legislated moratorium on incentives (Fischer 2007; LeRoy 2007) while others advocate reforms.[10] Many researchers have concluded that the optimal policy is to eschew economic development "deals" and maintain a transparent, rational, and easy-to-navigate tax environment across the board, and one in which firms' tax expenditures are repaid with high-quality services. However, the fierce competition for mobile capital among localities is a classic prisoner's dilemma. Local officials eager to demonstrate that their specific actions have led to economic growth also tend to favor high-profile subsidized projects.

Enhancements to Local Labor Supply

Research linking economic prosperity and resilience to educational attainment at the urban and metropolitan scale has recently turned officials toward policies to produce a local labor supply possessing high levels of skill and entrepreneurship (Glaeser and Saiz 2003; Glaeser and Shapiro 2001; Gottlieb and Fogarty 2003; Simon and Nardinelli 2002). The evident success of "skilled, entrepreneurial areas that thrive by producing new ideas" (Glaeser, Ponzetto, and Tobio 2011) has prompted economic development agencies to track the proportion of residents holding bachelor's degrees as a key indicator of adaptation to a "knowledge economy" and to adopt measures geared toward influencing the in-migration or retention of college-educated residents (CEOs for Cities 2012; Moretti 2012).[11] In cities with universities, these efforts may focus on encouraging the commercialization of academic discoveries and the localization of the resulting spin-off firms, or on efforts to induce students graduating from local colleges and universities to remain after graduation (see Cortwright [2005] and Hansen, Ban, and Huggins

[10] Suggested reforms range from aggressively enforced clawback provisions to selective use of incentives in times of high unemployment (when their welfare effect is greater), to the linkage of incentives to hiring behavior and/or wage standards (Bartik 2007, 2010; Schweke 2007).

[11] Glaeser's work generally suggests that the primary mechanism linking education to income and population growth is increased productivity and entrepreneurship.

[2003]). Other strategic measures center on amenities designed to attract and retain high-skilled workers with the propensity to start businesses and/or to contribute to the local economic base through consumption behavior. Amenities seen as crucial to the attraction of a creative, entrepreneurial resident base include high-quality public spaces, specialty retail, infrastructure for bicycling and walking, and affordable housing and workspace for artists and artisans (Florida 2002; Markusen 2004).

The human capital profile in a city may also improve via investment in the educational attainment of its incumbent population. Several cities have launched initiatives to increase graduation rates by focusing on degree attainment among "hometowners" who started but did not complete college (New York City Comptroller's Office 2012; Perna and Wolf-Powers 2012). Efforts are also afoot to build better career pathways for youth transitioning from secondary school to the postsecondary training (whether college or occupational certification) that is now seen as essential for economic success in the United States (Carnevale, Smith, and Strohl 2013).

Early childhood education investments have been asserted to yield the highest return on government investment (Bartik 2011; Carneiro and Heckman 2003), and K–12 education is also in need of strategies that increase occupational preparation through contextualized learning (Ferguson 2013; O'Connor 2012). However, interventions at these levels hold little appeal for elected officials attempting to alleviate unemployment and generate revenue in the near term. As a result, human capital attraction policies (together with efforts, in some cases, to increase degree attainment among incumbent residents), tend to carry the day among local governments intent on increasing education levels. Despite the growing adoption of these strategies, research evaluating the effect of human capital attraction or development programs on urban employment or

unemployment rates is virtually nonexistent. This is in contrast to the large literature on the efficacy of firm-targeted incentives.

Public Capital Investment

A third local growth strategy revolves around public sector capital expenditure. The type of capital financing most commonly associated with contemporary local economic development policy consists in outlays that, either backed by the city government or making use of its tax-privileged status, go into private projects. Sometimes referred to as "public debt for private purposes," these expenditures encompass industrial development bonds, the proceeds of bonds issued by tax increment financing districts or projects, and debt issued by redevelopment authorities and quasi-public development corporations, which borrow to undertake commerce-specific (sometimes firm-specific) infrastructure projects. Cities increasingly offer firms these types of capital financing options when extending the incentive packages discussed above. However, aside from debt issued expressly for economic development "deals," the public goods character of basic transportation, sanitation, and water and utilities infrastructure continues to form the basis of a municipality's capacity to support private employment growth. This study investigates the proposition that infrastructure-related municipal capital outlays have an impact on employment and unemployment outcomes.[12]

Scholarship on what might be termed the growth effects of public capital investment first emerged in the late 1980s. These studies conceived of two mechanisms by which growth effects might operate: public infrastructure might augment the productivity of private capital, or it might

[12]One original goal of this research was to determine whether cities that issued substantial public debt for private purposes (also known as conduit debt) experienced faster job growth and lower unemployment than cities that did this less aggressively. Unfortunately, as discussed earlier, data on this type of debt are extremely difficult to compile. The current research therefore tests the impact of general city-level public infrastructure expenditures on job growth and unemployment rates. The impact of public debt for private purposes, isolated from general infrastructure expenditure, is a subject for future research.

reduce firms' factor costs (Eberts 1990). In either case, public capital outlays would affect firm output at particular locations, and through that medium influence a variety of local growth measures. Research in the 1980s and early 1990s found positive impacts of public capital on productivity, output, and regional income (Aschauer 1989a,b; Carlino and Voith 1992; Duffy-Deno and Eberts 1989; Eberts and Fogarty 1987; Munnell 1990), though not without qualifications.[13] In a study notable for using employment growth as a dependent variable, Munnell (1990) uses a firm location model to relate private nonagricultural employment growth in the 50 states to explanatory variables that represented production costs (labor, land, and energy), as well as factors affecting revenues (market density and the tax environment). Public capital was introduced to determine whether it had an independent effect on employment . Munnell's results show a positive and significant contribution of public infrastructure to employment growth. Later, in a time series model testing determinants of household, rather than firm location, Glaeser, Sheinkman, and Shleifer (1995) also find lagged public debt levels to be positively associated with subsequent growth in population and employment; however, they inferred from this not that capital expenditure had induced growth but rather that rapid economic growth had presented cities with both infrastructure needs and the fiscal means to undertake investment.

A second wave of research on public capital advanced methodological criticisms of early research on the link between public capital and growth, noting (like Glaeser, Sheinkman, and Shleifer [1995]) a potential for reverse causality and arguing that data containing stochastic trends should not be estimated using a static production function approach (Evans and Karras

[13] Eberts (1986) points out, for example, that the impact of public infrastructure on growth appears to be smaller if financed through local taxation (as opposed to federal grants) and smaller if a given city or metropolitan area already has a large amount of public capital stock relative to private capital or if it is a lagging region with a weak basis on which to build. A later study by Eberts (1990) finds no evidence of an impact on new firm formation.

1994; Gramlich, 1994; Tatom 1991). The contribution of public capital to output, productivity, and job growth was cast into doubt, and discussion of it disappeared from the literature. However, the debate remained unsettled. Pereira (2001) used a dynamic multivariate approach to correct for misspecification and found that transportation and other core infrastructure public investment "crowds in" private investment in the sense that public capital may complement private capital in the production and distribution of private output. More recently, as noted above, research estimating the impact of the ARRA stimulus has shed new attention on the potential contributions of public capital, particularly spending on transportation, to growth (Feyrer and Sacerdote 2011; Leduc and Wilson 2012a,b; Wilson forthcoming). Feyrer and Sacerdote disaggregate the impacts of different types of ARRA spending and find a strong effect for infrastructure spending, with an implied employment multiplier of 1.85 However, the potential of debt-financed infrastructure spending to stimulate local job growth is unquestionably more straightforward in the case of intergovernmental spending than in the case of infrastructure spending self-financed by municipalities. Even when interest costs are low, municipal borrowing to finance capital investment may have a negative growth effect that overwhelms the impact of its job creation and productivity-enhancing impacts. Research finding a relationship between public capital and growth has generally been focused on state or federal-level capital investment.[14]

[14] An exception to this is Lobo and Rantisi (1999), who find that growth in levels of investment in public capital (as measured by total capital outlays, total long-term debt, and transportation expenditures) predicts productivity growth over time at the level of the metropolitan region.

DATA AND METHODOLOGY

The data for this study come from a cross-sectional time-series of observations constructed for 83 U.S. primary cities. There are two time periods, the first beginning in 1990 and ending in 2000 and the second beginning in 2000 and ending in 2010. In constructing the data set, I began with the 100 most populous U.S. central cities in 2010. As data collection proceeded, I first removed three cities that were difficult to compare across the time period due to city/county consolidations.[15] Subsequently, a decision was made (again for comparability purposes) to include only primary cities in metropolitan divisions, ensuring that the data set would include cities that were truly central to their metropolitan areas, representing the earliest settled portions of these regions and, frequently, those in the greatest fiscal distress and with the highest unemployment rates. Finally, Washington, D.C., and New Orleans, Louisiana, were removed from the data set because they are unusual cases in which (for different reasons) employment gain and/or loss during the two decades in question was assumed to be unrelated to the independent variables of interest.

In 2010, resident employment in the cities in the data set ranged from around 78,000 (Oxnard, California) to almost 3.6 million (New York City). The cities trailed the nation in population and employment growth over the 20-year period examined, posting 9.1 percent employment growth against 17 percent nationally. Unemployment rates in the group of 83 central cities also exceeded national rates in 1990, 2000, and 2010; the annual unemployment rate for 2010 was 10.4 percent for the cross section of cities as opposed to 9.6 percent for the nation. The mean poverty rate in the cities was 17.9 percent in 1990 and had increased to 21.5 percent in 2010, consistently exceeding national rates by 5–6 percentage points. Mean bachelor's

[15] Nashville, Tennessee; Augusta, Georgia; and Louisville, Kentucky.

degree attainment rates in the cities, however, tracked or slightly exceeded those for the general population: 22.4 percent versus 21.3 percent in 1990, 26 percent versus 25.6 percent in 2000, and 29.7 percent versus 29.9 percent in 2010. Growth in bachelor's degree attainment was relatively evenly distributed over the two decades, with the mean proportion of adults over 25 with bachelor's degrees growing 3.7 percentage points in the 1990s and 3.6 percentage points in the 2000s (Appendix A).

Across the panel, then, the cities in the data set got more populous and "smarter," but also (despite a short-lived decline in poverty in the 1990s) poorer. It is notable that between 2000 and 2010, average real earnings per household decreased by 3 percent. As a group, cities in the panel have suffered higher rates of unemployment than the nation as a whole. With respect to educational attainment, the cities have consistently been "competitive" with the nation, with a roughly equivalent concentration of college-educated residents on average. But mean values mask considerable variation. For example, only 12 percent of Detroit's residents over 25 had a college degree in 2010, compared with 56 percent in Seattle. Poverty rates ranged from 5.9 percent (1990) and 7.5 percent (2010) in Virginia Beach to 37.3 percent (1990) and 37.6 percent (2010) in Laredo and Detroit, respectively. New York City gained 482,429 employed residents in the period covered by the panel, while Chicago lost 94,437. There are also regional differences: median job growth in cities in the West census region averaged an increase in employment of nearly 38,000 in the period 1990–2000. In contrast, the median Northeastern city lost 9,652 jobs during that period.

The model applied to this data specifies city-level changes in employment and unemployment as functions of decisions on the part of firm principals to found, locate, or expand establishments in those cities. It follows the work of Munnell (1990), which assesses the effect of

public capital on employment growth, controlling for other factors influencing profitability at alternative locations. Munnell's independent variables capture both cost and revenue components of profitability; her results suggest that job growth is sensitive to labor cost and productivity, the level of market demand, the tax burden, and the availability of inexpensive land. She finds both educational attainment and public capital to be significant predictors of employment growth. Because they relate to two of the policy levers discussed above, educational attainment and public sector capital outlays are the independent variables of greatest interest in this model.

The Model

Specification 1: Employment growth between time t and t + 10

The first specification estimates the effects of predictor variables on growth in resident employment in the cities. The dependent variable (LBEMPCHGPC) is the log of the average change in total nonfarm employment per capita over a 10-year period. As described above, employment is conceived as a function of firms' location and hiring decisions contingent on the independent variables in the model. The variable is derived from the Bureau of Labor Statistics' Local Area Unemployment Statistics series and represents resident employment.

The basic specification of the model to be estimated is

$$\mathrm{D}\log(E)t10 - t0 = \beta + \beta(Wit0) + \beta(Tit0) + \beta(\mathrm{BA}it0) + \beta(PCit0) + \beta(Pit) + \beta(Ait0) + e,$$

where E is employment, W is wages, T is taxes, BA is skilled labor availability, PC is public capital, P is population density, A is an exogenous, unexpected infusion of federal funds, and e is the error term. Subscripts for time at 0 years and 10 years ($t0$, $t10$) and city (i) are included to capture the time-series and cross-sectional nature of the data.

The basic model also includes fixed effects for each city and for each year. The inclusion of city fixed effects controls for changes in employment attributable to innate differences among cities—differences, for example, due to path-dependent characteristics and to quantifiable but time-invariant distinctions such as temperature, region, and, to an extent, industry mix. The inclusion of a year dummy controls for changes in employment attributable to cyclical trends correlated with time. This control is particularly important given the fluctuations in the business cycle and the macroeconomic shocks that affected cities in the United States during the years in question. Interpretation of the coefficients on year dummy variables included in the fixed effects model reveals trends common to all cities in the database that are specific to the decades 1990–2000 (which ended at a business cycle peak) and 2000–2010 (which ended in the aftermath of a recession). The paper also discusses the results of OLS regressions for each decade.

Specification 2: Unemployment; change in unemployment rate between time t + 6 and time t+10

The second specification uses the same predictor variables but regresses them on measures of unemployment and unemployment change. The first unemployment variable, BUET5A, represents the average of a city's annual unemployment rates during the last five years of the decade (i.e., from time $t + 6$ to time $t + 10$). The second unemployment variable, BUETCHG—the change in the unemployment rate across the five-year period ending each panel—is a resilience measure. In the 1990s, it measures the response of unemployment to a ramp-up in the business cycle, and in the 2000s it measures the labor market's resilience to the negative shock represented by the bursting of the housing bubble. Did a city's unemployment rate go down in a national boom period, or was it sticky? Was it comparatively stable in recession or did it spike? This measure is possible because the country was coming out of recession and gaining jobs in the last decades of the 1990s, while the reverse was true in the last

several years of the 2000s. In each case a *lower* value on the "change in unemployment rate" variable is an indicator of greater labor market health, in the same way that lower unemployment is considered positive.[16] For example, if the sign on the coefficient of the independent variable for, say, population density is positive in one of these models, this indicates that higher population density is associated with lower unemployment (BUET5A) or a lower level of volatility/higher level of resiliency (BUETCHG).

Like the first specification, the basic model includes fixed effects for each city and for each year. With this specification, I also show the results of a random effects model as warranted by the results of Hausman tests, where the fixed effects model was not preferred at a 1 percent level of significance when compared with the random effects model, based on orthogonality.

Educational Attainment

Higher levels of educational attainment in the primary cities and their regions were predicted to exert positive effects on employment growth and unemployment rates during the 20-year period examined. As noted in the first section of the paper, a large body of research links educational attainment to urban and metropolitan prosperity, generally measuring educational attainment as the proportion of adults over 25 years old with at least a bachelor's degree. It is well documented that as many more jobs than in the past require college credentials, individuals without college degrees have substantially lower earnings than their college-educated counterparts (see Goldin and Katz 2008) and are less likely to be employed (Bureau of Labor

[16] Imagine a city where the unemployment rate dropped from 7 percent to 5 percent in the late 1990s. (t+ 10) minus (t + 6) would be 2 – the smaller the value, the greater gain in employment in the course of the expansion. Similarly, as the unemployment rate increased in the late 2000s, cities with smaller differences between their mid-decade unemployment rates and their 2010 unemployment rates were better off.

Statistics 2012).[17] Accordingly, cities with low concentrations of residents holding bachelor's degrees—Detroit, Memphis, El Paso, Philadelphia—have some of the highest poverty rates in the nation, and are in chronic fiscal distress. Cities with high concentrations of bachelor's degree holders are asserted to incubate innovation and entrepreneurship and, relatedly, to be resilient to economic shocks (Glaeser, Ponzetto, and Tobio 2012; Gyourko 2005).

Two measures of educational attainment were used: the proportion of residents over 25 with a bachelor's degree at the beginning of the decade (EDUT0), and the percentage point change in the number of bachelor's degree holders over the course of the decade (BACHCHG). The educational attainment variables were obtained from the decennial census (for 1990 and 2010) and from American Community Survey one-year 2010 estimates (See Appendix B).

Public Capital Investment

There was a predicted positive relationship between city-level capital investment, employment growth, and low unemployment rates. Two theories support this hypothesis. First, as noted above, public capital expenditure, especially in periods of labor underutilization, stimulates the economy. Per Feyrer and Sacerdote's (2011) estimates, infrastructure spending under the ARRA created 900,000 jobs (Feyrer and Sacerdote 2011), albeit under exceptional economic circumstances. Second, in enhancing productivity and lowering production costs, public capital investments increase firms' propensity to locate operations in an area and increase incumbent firms' propensity to expand. It was theorized that the job growth and resident employment effects of city-level capital investments would be discernible in the form of

[17] In 2011, the unemployment rate among high school graduates was 9.4 percent, compared with 8.7 percent among those with some college but no degree, 6.8 percent among associate's degree holders, and 4.3 percent among those with at least a bachelor's degree.

systematically higher employment rates (and lower unemployment) in cities that had spent relatively more on such investments.

There are several reasons, however, to question the expectation that municipal-level capital outlays would have this effect. First, in order to engage in capital investment, local governments must levy taxes. For cities bearing large debt burdens, the cost of capital is greater, intensifying the growth-suppressing effect of indebtedness. Second, cities may use capital to replace obsolete infrastructure, with public capital exerting only a small marginal effect on productivity as money is spent simply to get roads and sewer systems to baseline. In other words, in distressed cities, capital spending may be helping cities to "tread water" as opposed to growing (see Eberts and Fogarty [1987]). Third, it is probable that the unit of productivity-enhancing infrastructure per dollar of public capital expended varies from place to place, possibly vitiating a systematic link between capital outlays and growth. Finally, an observed relationship between public capital investment and employment growth might indicate a reverse-causality phenomenon under which cities with high employment growth rates are more apt to finance new infrastructure (Glaeser, Schenkman, and Schleifer 1995; Rodriguez 2010).

The data used to estimate the public capital variables are drawn from the Individual Finance Files of the Census of Local Government Finances. This survey is conducted quincentenially as part of the Census of Governments in years ending in 2 and 7.[18] The survey requires that cities report capital outlays both in the aggregate and in detail by functional area, defining a capital outlay as "direct expenditure for contract or force account construction of buildings, roads, and other improvements, and purchase of equipment, land, and existing structures, and for payments on capital leases." Repairs are classified as operating expenditures.

[18] The Census Bureau uses a sample of governments to generate estimates in the intervening years.

Because variables used in this analysis represent 4-year averages of capital outlays on the part of each city at the start of each 10-year period, I make use of the 1990–1993 editions and the 2000–2003 editions of the files.

Several public capital variables were constructed, all of them representing per capita values averaged over the first four years of the panel. The most comprehensive is LCAPOUT4YRPC_R, a broad per capita measure of capital outlays for education, hospitals, air and ground transportation, parks and recreation, housing and community development, police, fire and correction, solid waste management, utilities, and general government administration (see U.S. Census Bureau [2012]). I disaggregated the components of this encompassing variable to produce per capita measures of outlays in relevant subcategories: transportation, sanitation and sewerage, and housing and community development, and then combined these three into a more precise "infrastructure outlays" variable (LAGGCAPOUTPCR). Since the vast majority of outlays were identified as being associated with construction, a decision was made not to separate construction outlays from outlays for equipment. A variable representing debt outstanding per capita at the start of the period (LDEBTOS4PC_R), also based on a 4-year average), was created as well (Appendix B). All monetary figures used were expressed in 2010 dollars.

A final public capital category of interest could not be investigated in this paper. Reported separately in the Census of State and Local Government Finances from capital outlays for construction and equipment is "public debt for private purposes." This classification was first introduced into the Census of Governments in 1988 through a consolidation of several accounting categories. Public debt for private purposes is issued by a public sector agency, such as an industrial development authority, but its proceeds go directly to private for-profit or not-

for-profit entities for capital projects. These entities are then entitled to the lower interest rates associated with the federal tax exemption for municipal debt. This mechanism (also known as conduit debt) is often used by local governments in efforts to extend incentives to firms and property developers. It is also deployed in support of private, not-for-profit entities that such as healthcare centers and arts organizations. Technically, however, it is not publicly held in that it is backed by the private organizations whose activities are being financed.[19] Since the Census Bureau began to track its issuance, public debt for private purposes has represented one of the largest categories of local government debt.[20] Its contribution to economic development outcomes is of great interest. However, institutional discrepancies problematize the comparison of cities on this variable. While some cities issue debt that fits this description through so-called dependent agencies (and report it through the Census of Governments), others do so through special purpose governments such as economic development authorities, which independently report to the Census Bureau. Further, one major form of debt-financed local development, tax increment financing (TIF), is not considered by the census to involve public debt for private purposes; while a city may report TIF borrowing on its *Consolidated Annual Financial Report*, it does not report this to the Census of State and Local Government Finances. Thus, the amount recorded in the "public debt for private purposes" category on the census form is inadequate to describe many cities in terms of debt issued for economic development within their jurisdictions, and inadequate to compare cities to one another. The lack of comparable census information in

[19] This type of debt is nonetheless often backed with tax revenues projected to be generated by an economic development project. An example would be a stadium or master-planned commercial development that would ordinarily be subject to property taxes, but for which a local government has decided to issue a tax abatement. Payments in lieu of taxes or (in the case of tax increment financing districts) incremental property taxes go directly into an escrow fund on which the private entity draws in servicing the debt.

[20] Regulatory changes have also begun requiring cities to identify conduit debt more explicitly in their Consolidated Annual Financial Reports.

years prior to 1988 poses another barrier. The impact of public debt for private purposes, isolated from general infrastructure expenditure, is a rich subject for future research.

Control Variables

Following Munnell (1992), control variables used in the model are factors influencing firm costs and revenues at alternative locations. Changes in the dependent variables are related in most cases to Time 0 levels of the predictor variables, operationalizing the theory that conditions prevailing at the start of a 10-year period influence employment growth and unemployment as measured at the end of that period. Predictors measured at Time 0 include wages per employee (LAWAGET0_R); a 4-year average of the local tax burden per employee (LTXPEREMP4_R); and population density (LPOPDENST0), which proxies for land cost and also for market size and agglomeration effects.[21] A final control variable in the model captures the exogenous, unexpected infusions of federal funds received through the ARRA in 2009 and 2010. Values on the ARRA variable for each city are taken directly from Wilson's forthcoming paper estimating employment multipliers from ARRA spending. As assigned to the cases in the database, the figures represent the per capita stimulus funding announced, as of February 2010, for the state in which each city is located.[22] Full descriptions of the control variables appear in Appendix C.[23]

[21] Variables with names starting with L have been logged for scaling to a normal distribution.

[22] In Table 2 of his forthcoming paper, "Fiscal Spending Jobs Multipliers: Evidence from the 2009 American Recovery and Reinvestment Act," Wilson lists, by state, per capita amounts of non–Department of Labor stimulus spending announced from August 2009 through February 2010. While these state per capita figures are an imperfect proxy for city-level recovery dollars received (and while they could never be used to directly estimate the impact of the stimulus itself on the cities), they serve as a satisfactory instrument of comparison among cities for the purposes of constructing a control variable. Because the ARRA was enacted in 2009, the value for the ARRA variable for all cities in the 1990s panel is zero.

[23] Because a number of central cities annexed land during the period under examination, a variable (SQMDELT) was initially included, indicating the extent to which the city's area had increased in square miles, to ensure that observed employment growth was not simply an artifact of a city's territorial expansion. This variable was removed from the model after it consistently showed no significant effect on the dependent variables and did not improve goodness of fit.

EMPIRICAL RESULTS

Educational Attainment

In 1990, bachelor's degree attainment among people over age 25 in the cross-section of cities ranged from 8.1 percent in Cleveland, Ohio, to 42 percent in Madison, Wisconsin, with a mean of 22.4 percent. The mean grew to 26 percent in 2000 and to 29.7 percent in 2010, at which time Seattle boasted a rate of 56 percent and Detroit was in the lowest position at 12 percent. The average city increased its attainment level by 7.3 percentage points over the two decades, with all of the cities posting an increase.

Given the emphasis conventionally placed on human capital as a determinant of place prosperity, it was expected that both initial levels of educational attainment and high rates of growth in working-age residents with bachelor's degrees would be predictive of employment growth and low unemployment rates. The results are somewhat surprising: evidence of growth in educated population may be suggestive of causing positive outcomes (low unemployment and employment growth), but initial educational attainment—that is, the proportion of bachelor's degree holders at the beginning of the decade—does not.

Growth in College-Educated Population

Table 3 presents results from two versions of a fixed effects model using the log of employment growth per capita as the dependent variable (LBEMPCHGPC). In the first version (3A), the educational attainment variable used is initial endowment of education (EDUT0), or the proportion of residents over 25 with bachelor's degrees. In the second version (3B), the educational attainment variable is the percentage point change, from time T0 to time T10, in the number of residents 25 and older with bachelor's degrees (BACHCHG). The results indicate, as expected, that controlling for local factors, cities that added bachelor's degree holders at high

rates between 1990 and 2010 experienced greater employment growth per capita than their peers (3B). Specifically, a one-percentage-point change in the number of individuals with bachelor's degrees in a city's population is associated with an 11.1 percent increase in employment per capita. This effect is quite large, but it makes sense in the context of the fact that fast-growing cities such as Raleigh, Austin, Denver, Seattle, and Portland experienced significant growth in well-educated residents during the period covered in the panel. It suggests that growth in skilled labor supply is an important determinant of labor market health, providing support for the hypothesis that a kind of virtuous circle of growth is at work in "skilled cities," whereby highly educated residents simultaneously respond to labor demand through in-migration and create new labor demand through consumption and entrepreneurship (see Shapiro 2006).

Table 3 Dependent Variable: Employment Change Per Capita, Logged

	3A	3B
Proportion of residents with BA degree, Time T=0	−0.0043	N/A
% change in residents with BA degree T=0 to T=10	N/A	0.1119***
Wages per employee, Time T=0 (L)[a]	−0.3246***	−0.2808***
4-year average of local tax burden per employee (L)	0.0018	0.0164
Persons per square mile T=0 (L)	−0.1753***	−0.1282***
4-year average of infrastructure outlays per capita (L)	−0.0095	−0.0119**
Per capita ARRA funding for state where city is located	0.000005	0.000005
Fixed Effects	Yes	Yes
Year Dummy	Yes	Yes
Robust S.E.	Yes	Yes
Prob > F	0.0000	0.0000

NOTE: ** significant at the 95% confidence level; *** significant at the 99% confidence level.
[a] (L) denotes that variable is logged.

Table 4 presents results from fixed and random effects models using the unemployment variable (BUET5A) as the dependent.[24] Here, under both specifications, change in educational attainment also suggests the expected, using fixed effects, a one-percentage-point change in the number of bachelor's degree holders over the decade may be suggestive of causing an almost two-point reduction in the five-year unemployment rate at the end of the decade (4C). Under a random effects specification, the effect of an increase in educational attainment on unemployment is even stronger (4D).[25]

Table 4 Dependent Variable: 5-Year Average Unemployment Rate, t=6 through t=10

	BUET5A			
	4A	4B	4C	4D
Proportion of residents with BA degree, Time T=0	0.3100**	−0.1738***	N/A	N/A
% change in residents with BA degree T=0 to T=10	N/A	N/A	−1.8263**	−1.8841***
Wages per employee, Time T=0 (L)[a]	−7.534**	2.0768*	−2.7069	−2.5082
4-year average of local tax burden per employee (L)	1.5318	0.2544	1.3419	0.1002
Persons per square mile T=0 (L)	4.0751*	0.7147***	2.3699	1.0326***
4-year average of infrastructure outlays per capita (L)	0.1829	−0.1059	0.2207	−0.1578
Per capita ARRA funding for state where city is located	−0.0022***	−0.0017*	−0.0021***	−0.002*
Fixed effects	Yes	No	Yes	No
Year dummy	Yes	Yes	Yes	Yes
Robust S.E.	Yes	Yes	Yes	Yes
Prob > F	0.0000	N/A	0.0000	N/A
Prob > chi2	N/A	0.0000	N/A	0.0000

NOTE: * significant at the 90% confidence level; ** significant at the 95% confidence level; *** significant at the 99% confidence level.

[a] (L) denotes that variable is logged.

[24] Results of Hausman specification tests suggested that with respect to the dependent variable for unemployment, random effects models conform as well or nearly as well to the data as fixed effects models.

[25] A negative value on an education variable in a model where unemployment is acting as the dependent variable indicates that either a *higher* initial concentration of bachelor's degree holders (EDUTO) or a larger rate of rate of change in the number of bachelor's degree holders (BACHCHG) is associated with *lower* unemployment.

The cities in the upper right-hand quadrant of Table 5—cities ranked highly on both growth in bachelor's degree holders and on the unemployment metric—instantiate the virtuous circle noted above. The cities in the lower right-hand quadrant, by comparison, might be seen as being trapped in an opposite cumulating pattern. The cities that ranked highly on growth in bachelor's degree holders and lowly on the unemployment metric instantiate the virtuous circle noted above. By comparison, the cities that ranked lowly on growth in bachelor's degree holders and highly on the unemployment metric might be seen as being trapped in an opposite cumulating pattern. In these cities, stagnation both in in-migration of college graduates and in the attainment of college credentials by members of the incumbent population is preventing the

Table 5 Growth in Bachelor's Degree Holders and Unemployment

High growth in bachelor's degree holders, High unemployment Laredo, TX (1, 65) Las Vegas, NV (2, 56) Miami, FL (15, 76) Bakersfield, CA (16, 71) Atlanta, GA (20, 58)	*High growth in bachelor's degree holders, Low unemployment* Charlotte, NC (5, 16) Boise, ID (6,10) Austin, TX (9,7) Raleigh, NC (13,6) Durham, NC (14,3) Colorado Springs, CO (17,26) San Antonio, TX (19,19)
Decline (or slow growth) in bachelor's degree holders, low unemployment Tulsa, OK (77, 14) Des Moines, IA (73, 11) Baton Rouge, LA (72,28) Pittsburgh, PA (71, 33) Little Rock, AK (70,17)	*Decline (or slow growth) in bachelor's degree holders, high unemployment* Detroit, MI (83, 83) Buffalo, NY (81, 68) Rochester, NY (79,61) Toledo, OH (76,66) Milwaukee, WI (69, 60) Cleveland, OH (68,75) Baltimore, MD (67,69) Philadelphia, PA (63,63) Riverside, CA (60,72) Fresno, CA (57,81)

Growth in bachelor's degree holders = High rank indicates high percentage change in number of residents over 25 with a bachelor's degree or higher, 1990–2010
Unemployment = High rank indicates low average annual unemployment rates 1990–2000 and 2006–2010

creation of new, high-skilled employment even as the lack of such employment discourages in-migration. Slow or negative employment growth constrains demand for goods and services and leads to even higher rates of unemployment among less-skilled, less-mobile residents.

Initial College-Educated Population

While change in educational attainment—a large proportional increase in the number of adults with bachelor's degrees—consistently predicts both employment growth and low unemployment rates, the impact of initial educational attainment—namely the proportion of residents over age 25 with a bachelor's degree at time T = 0—is much more ambiguous. There is no significant association between initial educational attainment and employment growth in these models (Table 3, column 3A; see also Figure 1. With respect to unemployment rates, random effects models (Tables 4B and D) suggest that joblessness is positively affected both by initial education endowments (stocks) and by changes in attainment (flows), but the fixed effects models (Table 4, columns 4A and 4C) indicate a positive effect for flows and a negative effect for stocks. These are puzzling results.[26] A linear and positive relationship between initial attainment and growth has been observed in other studies (Glaeser, Sheinkman, and Schleifer 1995; Munnell 1990), and the observation of such a relationship would conform to the logic that human capital stocks represent assets that yield benefits over time, as highly educated people enable existing firms to choose from large pools of talent, or, in some cases, start and grow new businesses themselves.

[26] The initial educational attainment variable performs somewhat more expectedly in Ordinary Least Squares regression by decade (see Table 9), but again, only reliably where unemployment (rather than employment growth) is the dependent variable.

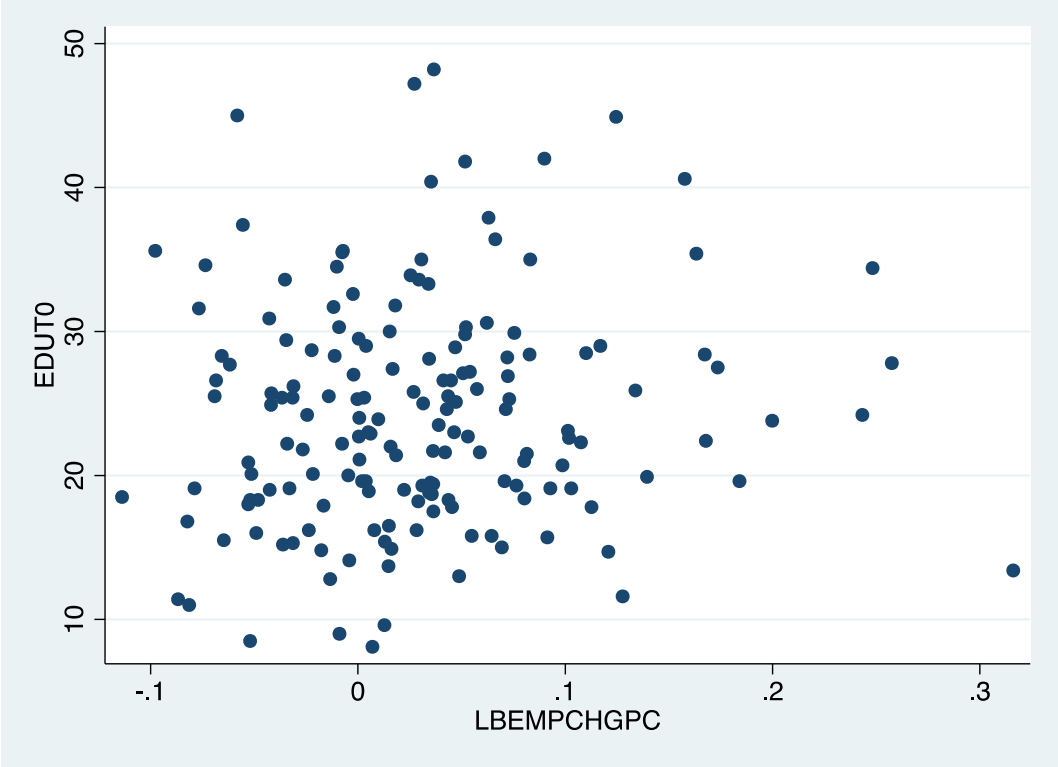

Figure 1 Education at Time 0 (EDUT0) and log of employment change per capita t = 0 through t = 10 (LBEMPCHGPC).

There are several explanations for the finding that initial education levels (at the start of the decade) are not good predictors of high employment growth and low unemployment. First, because college degree holders typically already number among the ranks of the employed in a given labor market, boosting employment growth may require more than posting a high value on the "stock" variable. In other words, if new jobs require high levels of education, they do not represent opportunities for those in the labor market who are most likely to be unemployed or out of the labor force. Rather, these are opportunities for individuals with bachelor's degrees—a population whose members are more likely to have jobs already. In this situation, an inflow of educated migrants filling newly created jobs may be needed in order for cities to see increases in employed population. Only as new earnings stimulate marketwide demand would demand for less-educated workers expand, leading to decreases in unemployment.

This explanation is supported by the appearance of many of the same cities—Austin, Charlotte, Raleigh, Durham, and Boise—in the top right quadrants of Tables 5, 6, 7, and 8. In these initially "skilled" cities, increases in bachelor's degree holders were accompanied both by high employment growth and by relatively low unemployment. Other patterns observable in these tables, , however, cast some doubt on the proposition that a confluence of high initial attainment and a high rate of growth in bachelor's degree holders is a prerequisite for labor market health. Two initially highly educated cities with modest growth in college graduates (Madison, Wisconsin, and Lincoln, Nebraska) experienced both employment growth and low unemployment rates. San Francisco, Boston, Minneapolis, and Little Rock maintained low unemployment rates despite lackluster employment growth. Finally, a few initially educated cities with high rates of growth in bachelor's degree holders (San Jose, Atlanta) experienced both low employment growth and high unemployment rates during the 1990–2010 period.

A second explanation for the absence of an association between initial educational attainment and employment growth rests on the argument that labor market dynamics during this period were frequently driven by factors other than market demand for college graduates. These include housing market expansion, job creation in the wake of the North American Free Trade Agreement (NAFTA), and, most notably, territorial annexation. All of the cities in which high employment growth coincides with low initial educational attainment grew in land area during the period under study, from 5 percent growth in Fresno to nearly 200 percent in Laredo (see Table 6, lower right quadrant). Although I attempt to control for this using a population density variable, territorial growth clearly mediates the expected relationship between dependent and

independent variables.[27] In addition to the simple phenomenon of annexation, employment growth in a number of cities—particularly those where the effects of the housing bubble were most pronounced—is driven by industries in which college-educated workers were in relatively low demand, such as construction, retail, and transportation,. In NAFTA-affected cities, the establishment of manufacturing branch plants is an additional factor.

Table 6 Initial Education and Employment Growth per Capita, 1990–2010

High initial educational attainment, Low employment growth	*High initial educational attainment, High employment growth*
San Francisco, CA (5, 47) Minneapolis, MN (8,54) Little Rock, AK (8,60) Lexington-Fayette, KY (7, 67) Baton Rouge, LA (17, 63) Oakland, CA (20,48) Atlanta, GA (23, 66)	Madison, WI (1,20) Raleigh, NC (2,4) Durham, NC (4,9) Austin, TX (6,3) Lincoln, NB (14, 15) Charlotte, NC (15,8) Boise, ID (18,7) Colorado Springs, CO (19,10)
Low initial educational attainment, Low employment growth	*Low initial educational attainment, High employment growth*
Cleveland, OH (83, 76) Newark, NJ (82,73) Detroit, MI (81,75) Toledo, OH (76, 77) Milwaukee, WI (75,74) Akron, OH (74,69) Philadelphia, PA (72,71) Baltimore, MD (70, 79)	Laredo, TX (80,6) Las Vegas, NV (77,w) Fort Wayne, IN (69,19) San Antonio, TX (61,14)

Initial educational attainment = high rank indicates high proportion of residents with Bachelor's degrees or higher in 1990
Employment growth = high rank indicates high rate of growth in employment per capita, 1990-2010

Relevant to this argument is an August 2012 Brookings Institution study that uses real-time data on vacant positions and their skill requirements to calculate, for the 100 largest U.S. metropolitan areas, an *education gap index* estimating the shortage of educated workers in each region relative to demand for those workers (Rothwell 2012). The study holds that variations in

[27] As a result of annexation, in fact, Laredo and Las Vegas were not only quite low-ranked with respect to initial attainment but also held the two highest ranks for increase in bachelor's degree holders.

Table 7 Growth in Bachelor's Degree Holders and Employment Growth per Capita, 1990–2010

High growth in bachelor's degree holders, Low employment growth	*High growth in bachelor's degree holders, High employment growth*
Indianapolis, IN (3,53) Tampa, FL (7,51) Miami FL (15,55) Atlanta, GA (20,66) San Jose, CA (22,52) Chicago, IL (26,68)	Laredo, TX (1,6) Las Vegas, NV (2,2) Fayetteville, NC (4,1) Charlotte, NC (5,7) Boise, ID (6,7) Reno, NV (8, 11) Austin, TX (9,5) Portland, OR (11, 17) Orlando, FL (12, 13) Raleigh, NC (13,4) Durham, NC (14,9) Bakersfield, CA (16,5) Colorado Springs, CO (17,10) Ft. Worth, TX (18,12) San Antonio, TX (19, 14)
Decline (or slow growth) in bachelor's degree holders, low employment growth	*Decline (or slow growth) in bachelor's degree holders, high employment growth*
Detroit, MI (83,75) Birmingham, AL (82,83) Buffalo, NY (81,80) Toledo, OH (80,77) Rochester, NY (79,78) Cincinnati, OH (78,81) Tulsa, OK (77,70) Des Moines, IA (73,61) Baton Rouge, LA (72,63) Mobile, AL (71, 62) Little Rock, AK (70,600	Riverside, CA (60,18) Lubbock, TX (58,26) Fresno, CA (57,22) Corpus Christi, TX (53,23)

Education change = High rank indicates high percent change in number of residents with a bachelor's degree or higher, T = 0 through T + 20
Employment growth = High rank indicates high rate of growth in employment per capita, 1990–2010

this gap explains about two-thirds of the variance in unemployment rate levels in the 100 largest metros between 2006 and 2010. However, regions vary widely in the level of education required by posted job openings; thus, it is not high educational attainment per se but high attainment relative to demand for college-educated employees that matters.

In explaining the ambiguous effects of educational attainment on labor market health in these models, one must also point to the absence of an expected alignment between employment growth and unemployment. Although it was also observed in Tables 1 and 2, this finding is counterintuitive. Employment growth and the unemployment rate on the local level are obviously related; at a given moment, a city's labor force consists of its employed residents plus its unemployed residents, with the unemployment rate expressed as 1 − (employment/labor force). One would expect, for example, that since growth in educational attainment is suggestive of causing employment growth, it should also be suggestive of causing low unemployment. Interestingly, however, the employment change per capita variable (LBEMPCHGPC) and the average unemployment variable (BUET5A) have a Pearson correlation coefficient of just 0.42. The relationship is a moderate one, signaling the mitigating roles of migration and labor force participation dynamics in translating job creation into employment growth for members of the unemployed population.[28]

While many low-growth cities in the data set consistently experience high unemployment (such as Newark, Cleveland, Buffalo, and Baltimore), there are also low-growth/low-unemployment cities where a steady state of sorts appears to preside. For example, Minneapolis, which ranks 54th of 83 cities in employment growth across the 20-year period, has maintained an unemployment rate that is low enough to be in the top quintile in the data set for both the 1990s and the 2000s. A number of cities in the panel also experienced a confluence of rapid employment growth and high unemployment rates. Some of these were low-initial-attainment

[28] Bartik (1991) shows that, on average, 80 percent of new jobs created in a metropolitan area go to in-migrants rather than incumbent residents. Recently, large discrepancies in some cities between measured growth in payroll employment and the growth in resident employment have led to speculation that payroll employment gains are being offset by an increase in the size of the labor force, prompted by the reentry of formerly discouraged workers into the labor market (see New York City Independent Budget Office [2013]).

cities with employment growth based on housing appreciation and/or territorial annexation during the 1990s and early 2000s.[29] Others, such as New York City, Los Angeles, and San Jose, are large cities in which the persistence of high unemployment amid growth in resident employment is likely attributable to high rates of in-migration.

Table 8 Initial Education and Unemployment

High initial education, High unemployment Oakland, CA (20,77) Atlanta, GA (23,58) Portland, OR (25,50)	*High initial education, Low unemployment* Madison, WI (1,2) Durham, NC (4,3) Raleigh, NC (2,6) Austin, TX (6,7) Boise, ID (7,9) Minneapolis. MN (8, 13) Little Rock, AK (8, 17) Boston, MA (10,21) Lincoln, NE (14,1) Albuquerque, NM (15, 15) Charlotte, NC (15,16)
Low initial education, low unemployment Des Moines, IA (57,11) San Antonio, TX (61,19) Jacksonville, FL (60,32) Fort Wayne, IN (69,40)	*Low initial education, high unemployment* Cleveland (83,75) Newark, NJ (82,80) Detroit, MI (81,83) Miami, FL (79,76) Oxnard, CA (78,78) Toledo, OH (76,66) Milwaukee, WI (75, 60) Stockton, CA (73,82) Philadelphia, PA (72,63) St. Louis, MO (71,70) Baltimore, MD (70,69)

Initial educational attainment = High rank indicates high proportion of residents with bachelor's degrees or higher in 1990
Unemployment = High rank indicates low average annual unemployment rates 1996 to 2000 and T 2006-2010

Public Capital Investment

Total capital outlays at the city level (indicated by variable LCAPOUT4YRPC_R), smoothed over four years for calculation purposes, averaged $292 per capita during the 1990–

[29] At the end of the 2000s, in spite of two decades of employment growth, the collapse of overheated housing markets in Laredo, Las Vegas, and a number of central California cities induced extremely high unemployment rates in these places.

1993 period (in real 2010 dollars), ranging from $62 per capita in Stockton, California, to $2,254 per capita in Orlando, Florida. Average capital outlays increased faster than the pace of inflation between the first and second periods (using 1992 and 2002 as benchmarks), averaging $421 per capita in 2000–2003, from $121 in Miami to $1,919 in San Francisco. Although most cities saw real increases in their capital outlays per capita between 1990 and 2010, just over one-fifth of the sample (18 cities) saw real decreases on capital outlays spending per capita over the period covered by the panel. Spending on transportation, sewerage, and housing and community development infrastructure (a subset of total outlays designated with the variable LAGGCAPOUTPCR) averaged $226 per capita in 1990 and $229 per capita in 2000. Average debt outstanding among the cities averaged $2,106 per capita in 1990, increasing markedly to $3,054 per capita in 2000.

In Tables 9 and 10, the impact of infrastructure outlays is reported alongside the results for the educational attainment and control variables. The independent variable used encompasses combined outlays for transportation, sewerage, and housing and community development (LAGGCAPOUTPCR); this is a more precise measure of infrastructure spending than the variable for all capital outlays. In Table 3, column A (with employment growth per capita as the dependent variable) the capital outlays variable is insignificant. In column B, where the "attainment growth" rather than the initial attainment variable is used, there is a small negative effect, specifically, a 0.01 percent decline in employment growth with every 1 percent increase in capital outlays. Across Table 4, which uses unemployment as the dependent variable, the capital outlays measure is insignificant. In Table 9, the dependent variable is a "resiliency" measure that (as noted above) proxies for the stability of a city's employment rate in the face of macroeconomic changes. Here in three of the four specifications, the sign on the public capital

Table 9 Dependent Variable: Resiliency

	BUETCHG			
	9A	9B	9C	9D
Proportion of residents with BA degree, Time T=0	−0.4043	−0.03895**	N/A	N/A
% change in residents with BA degree T=0 to T=10	N/A	N/A	1.6450	0.9041
Wages per employee, Time T=0 (L)[a]	−1.5479	1.474	−8.7872**	0.3187
4-year average of local tax burden per employee (L)	−0.9072	−0.00058	−0.7618	−0.1116
Persons per square mile T=0 (L)	1.836	−0.3335*	3.2072	−0.2479
4-year average of infrastructure outlays per capita (L)	0.6368*	0.3214*	0.6030*	0.2697
Per capita ARRA funding for state where city is located	−0.005***	−0.0049***	−0.0060***	−0.0048***
Fixed effects	Yes	No	Yes	No
Year dummy	Yes	Yes	Yes	Yes
Robust S.E.	Yes	Yes	Yes	Yes
Prob > F	0.0000	N/A	0.0000	N/A
Prob > chi2	NA	0.0000	N/A	0.0000

NOTE: * significant at the 90% confidence level; ** significant at the 95% confidence level; *** significant at the 99% confidence level. Five-year unemployment rate change, calculated as t=10 minus t=6. Columns 9A and 9C are fixed effects regressions; columns 9B and 9D are random effects regressions. Negative coefficient indicates greater resiliency in association with the independent variable.

[a] (L) denotes that variable is logged.

variable is significant (at 90 percent) and positive, suggesting that cities with higher infrastructure outlays were *less* resilient; in these places, unemployment rates were likely to decrease during the expansion of the late 1990s and more likely to increase during the recession of the late 2000s. In summary, the data suggest that higher infrastructure outlays exert either no influence or a negative influence on labor market outcomes. Substitution of other measures of capital expenditure (the generalized LCAPOUT4YRPC_R and disaggregated measures for individual categories of expenditure) yields similar results, as does the use of debt outstanding per capita rather than capital outlays.

Table 10 Ordinary Least Squares Results

	A. Employment growth per capita (LBEMPCHGPC)				B. Unemployment (BUET5A)			
	10A 1990	10B 2000	10C 1990	10D 2000	10E 1990	10F 2000	10G 1990	10H 2000
Proportion of residents with BA degree, Time T=0	0.0024**	0.0003	N/A	N/A	−0.1862***	−0.1535***	N/A	N/A
% change in residents with BA degree T=0 to T=10	N/A	N/A	0.1644***	0.1819***	N/A	N/A	−1.7814*	−1.436
Wages per employee, Time T=0 (L)[a]	−0.0333	0.0077	−0.0054	0.0147	−0.1423	0.3247	−3.706*	−5.328***
4-year average of local tax burden per employee (L)	−0.0662***	−0.0362**	−0.0385**	−0.0222*	0.4704	0.9674**	0.3792	0.9721**
Persons per square mile T=0 (L)	−0.0079	−0.0096	−0.02	−0.0105	1.001**	0.2542	1.242**	0.3943
4-year average of infrastructure outlays per capita (L)	0.02025**	0.0021	0.011**	−0.0062	−0.492**	0.2444	−0.6518*	0.33**
Per capita ARRA funding for state where city is located	N/A	−0.0000009	N/A	0.0000004	N/A	−0.003***	N/A	−0.0037**
City is in Northeast Census region	0.013	0.0462**	0.0194	0.0164	0.2237	−0.9633	0.1229	−0.4877
City is in West Census region	0.0551***	0.0403***	0.0477***	0.0173	1.858***	1.071*	2.03***	1.916***
City is in Southern Census region	0.009	0.0405**	0.0131	0.177	1.305***	−0.5455	0.989*	−0.331
R-Squared	0.48	0.25	0.7	0.47	0.60	0.6	0.37	0.41

NOTE: * significant at the 90% confidence level; ** significant at the 95% confidence level; *** significant at the 99% confidence level. Year dummies were omitted from all Ordinary Least Squares equations due to collinearity.

[a] (L) denotes that variable is logged.

When I investigate the data in separate time periods, placing them within OLS models for 1990–2000 and 2000–2010, a different picture emerges. For example, as seen in Table 10, columns 10A and 10C, a 1 percent increase in capital expenditures at the start of the 1990s is suggestive of a 0.01–0.02 percent increase in employment by the end of the decade. Similarly, as seen in columns 10E and 10G, a 1 percent increase in capital expenditures at the start of the 1990s is suggestive of a 0.0049 to 0.0066 point reduction in the average unemployment rate in the decade's last five years. These results indicate that, controlling for other factors, cities with high infrastructure expenditure experienced both lower unemployment and higher employment growth than their peers during the 1990s.[30]

Despite evidence of an association between capital outlays and labor market health in the 1990s, it is important to observe that high-capital expenditure cities—and their low-spending counterparts—are a diverse group (Table 11). New York City and San Francisco had substantial outlays that coincided with and supported healthy if not spectacular population and job growth during the period. Richmond, Atlanta, and Minneapolis, however, represent exceptions to the proposition that public capital expenditure leads to high growth. High capital investments in these cities in the 1990s likely fell into the above-mentioned category of bringing obsolete or inadequate infrastructure to baseline. Finally, half of the cities in the top tier grew rapidly in the 1990s (as well as prior) because of population influx, territorial expansion, or both (Fayetteville, Orlando, San Antonio, Anchorage, Denver). These cities likely invested in infrastructure as

[30] In both the panel and the OLS models, generalized versions of the capital outlays variable and measures of outlays in individual categories (transportation; sanitation and sewerage) differed very little from the "infrastructure" variable in terms of their observed impact on the dependents. Moreover, results for the variable representing outstanding debt per capita (LDEBTOS4PC_R) tracked the results for capital outlays.

much in response to burgeoning growth as to spark it.[31] Thus, while these results demonstrate some association between larger-than-average municipal capital outlays and positive labor market outcomes in the 1990s, the direction of causality in the relationship between one and the other remains unclear.[32]

Table 11 Cities with the Highest and Lowest Capital Outlays Per Capita (1990–1993 average)

City, State	Amount per capita	Rank	Annual unemployment rate, 1990	Employment growth, 1990–2000 (%)
Orlando, FL	2,254	1	6	20
Denver, CO	1,801	2	5.6	24
Fayetteville, NC	1,113	3	5	54
New York, NY	1,003	4	6.9	11
San Francisco, CA	835	5	3.8	16
Minneapolis, MN	788	6	4.3	10
Anchorage, AK	745	7	5.1	15
San Antonio, TX	718	8	8	27
Richmond, VA	700	9	5.7	−5
Atlanta, GA	682	10	7.2	9
⋮				
Oxnard, CA	177	74	8.3	10
Madison, WI	169	75	2.1	16
Laredo, TX	167	76	11.9	37
Pittsburgh, PA	160	77	4.5	−5
Modesto, CA	155	78	10.6	15
Omaha, NE	154	79	2.9	21
Newark, NJ	142	80	10.7	−13
Bakersfield, CA	130	81	8	43
Fort Wayne, IN	79	82	6	19
Stockton, CA	62	83	11.7	18

[31] Arguably the consequences of failing to provide both basic infrastructure and amenities to the college-educated migrants to these places could have slowed or arrested growth.

[32] The group of cities that spent the least on capital outlays during the 1990s (Table 10) includes three distinct types as well: 1) slow-growing but stable cities (Pittsburgh, Omaha, Madison); 2) rapidly growing cities that annexed areas where infrastructure already existed or where new public goods were paid for by tax increment financing or impact fees (the central California cities); and 3) poor cities in which officials did not have the wherewithal to invest in public capital stock (Newark, Laredo).

In the OLS equations for the 2000s, public capital expenditure at the municipal level has no observable effect on either employment growth or unemployment. Likely explanations include the fact that debt service burdens increasingly haunted municipal borrowing activity in this decade, and the fact that the housing market crash in 2007 fiscally overwhelmed many cities through direct and indirect losses of revenue. Especially where recent growth had been driven by housing expansion, public officials who had invested in infrastructure at the start of the 2000s in anticipation of continued growth found themselves both indebted and, with the collapse of the housing market, facing significant operating budget deficits.

That municipal-level public capital would not register an impact in this anomalous decade—or in the fixed effects models covering the entire panel—is expected. However, the infusion of intergovernmental funds represented by the ARRA does show an impact. In Table 4, the results of both fixed effects models indicate a small but positive impact of stimulus funding on unemployment rates. Each $500 per capita of ARRA funding in a city's home state is associated with a city unemployment rate that is lower by approximately one percentage point.[33] Further, the ARRA variable is consistently significant in Table 9, which reports the results of models in which the "resiliency" measure serves as a dependent variable. While municipal-level public capital expenditures, then, are relatively unreliable as predictors of labor market health, Tables 4 and 10 offer evidence that incrementally greater federal fiscal stimulus funding promoted both lower unemployment and (even in high-unemployment cities) smaller increases in the unemployment rate during the recent recession and its aftermath.

[33] As described above, rather than estimate ARRA spending by city, this paper uses an estimate of spending at the state level as calculated by Wilson (forthcoming). In constructing the variable, each city was assigned a value equivalent to the non–Department of Labor spending per capita announced *in that city's state* between August 2009 and February 2010.

Other Predictors

Population Density

Higher density cities in the panel were consistently less likely to experience either employment growth or low unemployment. For example, in Table 4, the models indicate that a density increase of 1 percent predicts an unemployment rate that is one-tenth to four-tenths of a percentage point higher than in otherwise comparable cities. While theory suggests that dense places—in providing large, concentrated markets for goods and services and concentrated pools of labor and suppliers—are a driver of prosperity, empirical evidence has long highlighted the contemporary growth disadvantages experienced by high-density cities, which tend to be older, poorer, and more congested, with higher development costs for vacant property (see Glaeser and Shapiro [2001]).[34]

Wages and taxes

The real value of household wages is associated with lower job growth and higher unemployment in some cases (Table 3, column A and B, and Table 4, column B), but with positive outcomes in others (Table 4, column A, and Table 9, column C). Taxes are significantly associated with negative labor market outcomes in the OLS specifications but not in the panels. In a traditional industrial location framework, firms would be expected to gravitate toward cities where labor is less costly and taxes lower, but these results serve as a confirmation that employment rose during this period in many "high-skilled" cities where high labor costs and high taxes were likely not a major discouragement to firms (see Tables 6 and 7). Though wage and tax costs undoubtedly continue to affect firms' location decisions on the margin, the

[34] As explained in Note 22, population at time t= 0, combined with a measure of change in land area to capture annexation, was tried as an independent variable in place of the density figure. However, the joint significance of this second model was weaker, indicating that population density was the superior variable. High population and high population density are highly correlated (0.678), such that the density variable captures population size to some extent.

ambiguous impact of wages and taxes on labor market health in these models highlights the limits of a purely factor cost–oriented firm location model in a knowledge-based economy.

CONCLUSIONS AND POLICY IMPLICATIONS

This paper empirically tests several theories and assumptions about the causes of employment growth and unemployment in U.S. central cities over the past two decades. This is an important exercise because while labor markets are regional in nature, central cities remain politically autonomous—some might say isolated—within metropolitan areas. Over the past 20 years, there has been a marked shift in much of the literature from cities to metropolitan regions as units of analysis. While this shift usefully highlights increases in economic distress in the suburbs as well as the urban core, it also clouds the lens through which policy is contemplated. This is due to the fact that policy action at the metropolitan scale is possible, largely only in concept (see Goetz, Chapple, and Lukerman 2003; Hollenbeck and Hewat 2010; Niedt and Weir 2010; Wolf-Powers 2012).

Because efforts to improve employment and other economic development outcomes at a metropolitan regional level have encountered barriers, there remains an ongoing need for insight into what municipal officials in distressed cities can do to address unemployment. Economic development incentive packages, which typically combine local and state tax expenditures, have been extensively studied. But other tools with significant local geographic components have received less attention. In testing the impact of human capital and public capital, respectively, on local employment and unemployment trends between 1990 and 2010, this paper sheds light on additional practical tools that city governments have at their disposal.

Because of the endogeneity of many of the variables in the model, the policy conclusions to be drawn from this research are tentative. Nevertheless, the results constitute a starting point for policy discussion and for further research, especially on individual policies and programs designed to attract educated workers to cities. My results suggest, echoing the work of other scholars, that growth in educational attainment is a major factor driving the health of urban labor markets. They also indicate that high rates of growth in educational attainment (human capital "flows") are a more reliable contributor to growth than initial levels of educational attainment in the population ("stocks"). In the aggregate, cities in which the number of bachelor's degree holders grew had higher employment growth and lower unemployment rates across this time period than did their peers.[35]

The implication is that policymakers' deliberate and aggressive policies to increase the number of bachelor's degree holders within their cities' populations are not misplaced. Initiatives to harness the capabilities and resources of academic institutions, efforts to create amenity-rich neighborhoods that attract and retain college-educated professionals, and investments in increasing college attainment among incumbent residents all have the potential to reduce joblessness in places where unemployment rates remain in the double digits nearly four years after the official end of the recession. (The findings also suggest a need for more work to discern the efficacy of policies targeted at attracting, retaining, and "home-growing" college graduates.) Operationalizing variables associated with such interventions, and measuring outcomes as a function of them, is challenging, but this project deserves the same kind of attention that has been paid to the evaluation of tax incentives to firms. Neighborhood-based investments in the amenities such as parks and greenways, street trees, and restored historic sites could increase

[35] It is also obvious from close scrutiny of the results that housing price appreciation is not a sustainable foundation on which to build a skill-rich economy (see Panel A in Table 5).

cities' capacity to draw skilled labor. Researchers need to determine which among these policies work best and to elaborate the conditions for their successful implementation.[36]

Public capital is a potential additional lever, but one that should be viewed more cautiously. In the 1990s, variations in municipal capital outlays for infrastructure appear to explain some portion of the variation in city-level employment outcomes, with higher infrastructure outlays associated with higher employment growth and lower unemployment (though causality potentially operates in either direction). This result is not sustained in the OLS models for the 2000s. Moreover, in models holding city fixed effects constant, local-level infrastructure investment appears to be associated with adverse labor market outcomes: low employment growth and high unemployment. This suggests that the phenomenon identified by Eberts and Fogarty (1987) may prevail in this data set: a dynamic in which incremental local public capital investments in cities already possessing a high ratio of public to private capital do little to induce growth. As noted above, in some cities, capital spending may have helped cities simply to bring older infrastructure to baseline. It is also possible that the data are registering conditions in cities that grew quickly in the 1990s and early 2000s and increased capital spending in anticipation of future growth, only to be hard hit by the collapse of the housing market in 2007 and 2008.

[36] The use of limited city-level fiscal capacity to improve conditions primarily in the affluent or gentrifying neighborhoods of poor cities is nevertheless controversial, and there is reason to be skeptical about their likely success in many of the cities that appear in Panel B in Table 5. These are high-poverty cities subject to cumulative employment losses that will be difficult to arrest with incremental local human capital-based interventions, even those centered on human capital attraction. Initiatives to raise the level of educational attainment among nonmigrants deserve more comprehensive investigation. There appears to be little appetite at the moment in Congress or in state legislatures for comprehensive initiatives such as universal pre-K or inexpensive public postsecondary education. Nevertheless, human capital development efforts that originate at higher governmental scales are likely to be necessary if policymakers hope either to mitigate the devastating effect of long-term unemployment on people in severely distressed municipalities or to strengthen the fiscal positions of those places.

The impact of exogenous government investment is much less ambiguous: higher per capita amounts of ARRA funding in 2009 and 2010 are associated with lower unemployment and greater resiliency in the 83 central cities examined. This result follows on the work of other researchers who conclude that the increase in effective demand represented by the national-level stimulus appears to have prevented much greater instability and unemployment over the past four years than would otherwise have occurred. It suggests that federal infusions of infrastructure spending going forward—such as those proposed in the current American Jobs Act initiative—could help cities to reduce unemployment and its long-term consequences for individuals, households, and places. There is increasing evidence that state and local austerity have inhibited job growth even as private sector employment begins to recover (see Bivens and Sheirholz 2012, Looney and Greenstone 2012).

Markets continue to be the chief driver of the spatial distribution of economic opportunity in the United States, and in this context it is useful to bear in mind that household migration choices—more so than government policies—will continue to bear the major burden of adjustment to changes in city and regional growth paths. This paper, however, offers insights into the prospects of strategies that government might pursue to improve outcomes in cities where slow job growth, high unemployment rates, and fiscal crisis hamper well-being long after the official end of the 2007–2009 economic recession.

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Appendix A: Summary Statistics on 83 Primary Cities

	Mean (Range)		Average change (%)	
Variable	1990	2010	1990–2010	2000–2010
Population	555,724 (75,695 – 7,322,564)	644,111 (193,524 – 8,175,133)	15.9	5.5
Population density (persons per square mile)	4,301 (133.3 – 23,705.3)	4,604 (171.9 – 26,954.0)	7.0	−1.1
Total nonfarm employment	261,578 (30,399 – 3,105,799)	285,377 (78,285 – 3,588,288)	9.1	1.4
Annualized unemployment rate (%)	6.2 (2.1 – 15.3)	10.4 (4.1 – 23.1)	67.7 (point change: 4.2)	126.1 (point change: 5.8)
Bachelor's degree attainment rate (%) (residents over 18 with BA or higher)	22.4 (8.1 – 42)	29.7 (12 – 56)	32.6 (point change: 7.3)	14.2 (point change: 3.6)
Four-year average public capital outlays per capita ($)	454 (62 – 2,254)	587 (33 – 2,322)	29.3	15.1
Four-year average public debt outstanding per capita ($)	3,273 (0.339 – 11.027)	4,223 (0.322 – 16.054)	29.0	14.1
Average earnings per household ($)	55,827 (42,666 – 83,438)	61,822 (39,139 – 106,198)	10.7	−3.0
Average taxes collected per employee ($)[a]	1,633 (0.470 – 8.264)	2,220 (0.930 – 10.128)	35.9	20.3
Index of average annual change in housing prices	n/a	n/a	3.7	4.7
Poverty rate (%)	17.9 (5.9 – 37.3)	21.5 (7.5 – 37.6)	20.1 (point change: 3.6)	24.2 (point change: 3.9)

NOTE: All monetary figures reported in 2010 $.

[a] Average over four year-period beginning in Year T0.

SOURCE: Population, land area, Bachelor's degree attainment, average earnings per household, and poverty rate data for 1990 and 2000 from U.S. Census Bureau, Decennial Census. Total nonfarm employment by residence and annualized unemployment rate data from the Bureau of labor Statistics, Local Area Unemployment Statistics program. Four-year averages for public capital outlays, debt outstanding, and total taxes from the U.S. Census Bureau, Census of State and Local Government, editions 1990–2010. Index of average annual change in housing prices from the Federal Housing Finance Agency, City/MSA HPI Data.

Appendix B: Independent Variables of Interest

Variable name	Definition	Source/calculation
EDUT0	Percent of population, age 25 and over, that have received at least a Bachelor's degree	U.S. Census Bureau, 1990 and 2000 Decennial Census. 2010 one-year American Community Survey
BACHCHG	Percent change in the number of individuals 18 and older who have received a Bachelor's degree at time t=10, where t=0 is the baseline.	U.S. Census Bureau, 1990 and 2000 Decennial Census. 2010 one-year American Community Survey. Measure calculated by dividing the change in the number of individuals who have received a Bachelor's degree at time T+10 from the number of individuals who held Bachelor's degrees at time T=0.
LCAPOUT4YRPC_R	Average annual total capital outlay spending at time T=0, T+1, T+2, and T+3, per capita, logged. In 2010 constant dollars.	U.S. Census Bureau. Census of State and Local Government, editions 1990–1993 and 2000–2003. Measure calculated by summing four year total capital outlays spending and dividing by summed population over the same period, then dividing the resulting figure by four to calculated annual average. Resulting figures adjusted for inflation.
LTDEBTOS4PC_R	Average annual total debt outstanding at time T=0, T+1, T+2, and T+3, per capita, logged. In 2010 constant dollars.	U.S. Census Bureau. Census of State and Local Government, editions 1990–1993 and 2000–2003. Measure calculated by summing four year total debt outstanding and dividing by summed population over the same period, then dividing the resulting figure by four to calculated annual average. Resulting figures adjusted for inflation.
LTRCAPOUT4YRPC_R	Average annual transportation capital outlay spending at time T=0, T+1, T+2, and T+3, per capita, logged. In 2010 constant dollars.	U.S. Census Bureau. Census of State and Local Government, editions 1990–1993 and 2000–2003. Measure calculated by summing four year transportation capital outlays spending and dividing by summed population over the same period, then dividing the resulting figure by four to calculated annual average. Resulting figures adjusted for inflation.
LSCAPOUT4YRPC_R	Average annual sewerage capital outlay spending at time T=0, T+1, T+2, and T+3, per capita, logged. In 2010 constant dollars.	U.S. Census Bureau. Census of State and Local Government, editions 1990–1993 and 2000–2003. Measure calculated by summing four year sewerage capital outlays spending and dividing by summed population over the same period, then dividing the resulting figure by four to calculated annual average. Resulting figures adjusted for inflation.

Appendix B (Continued)

Variable name	Definition	Source/calculation
LHCCAPOUT4YRPC_R	Average annual housing and community development capital outlay spending at time T=0, T+1, T+2, and T+3, per capita, logged. In 2010 constant dollars.	U.S. Census Bureau. Census of State and Local Government, editions 1990–1993 and 2000–2003. Measure calculated by summing four year housing and community development capital outlays spending and dividing by summed population over the same period, then dividing the resulting figure by four to calculated annual average. Resulting figures adjusted for inflation.
LAGGCAPOUTPCR	Average annual transportation, housing and community development, and sewerage combined capital outlay spending at time T=0, T+1, T+2, and T+3, per capita, logged. In 2010 constant dollars.	U.S. Census Bureau. Census of State and Local Government, editions 1990–1993 and 2000–2003. Measure calculated by summing four year transportation, housing and community development, and sewerage capital outlays spending and dividing by summed population over the same period, then dividing the resulting figure by four to calculated annual average. Resulting figures adjusted for inflation.
ARRA	The actual dollar amount, on a per capita basis at the state level, estimated to be received from the American Recovery and Reinvestment Act.	Calculations performed by Wilson in the forthcoming paper, "Fiscal Spending Job Multipliers," in Table 2 of the document.

Appendix C: Control Variables

Variable name	Definition	Source/Calculation
LAWAGET0_R	Average household wage of wage-earning households at time t=0, logged. In 2010 constant dollars.	U.S. Census Bureau. 1990 and 2000 Decennial Census. 2010 one-year American Community Survey. Figure was adjusted for inflation (2010 constant dollars) and logged.
LTXPEREMP4_R	Average of annual total taxes received, per employee, at time T=0, T+1, T+2, and T+3, logged. In 2010 constant dollars.	U.S. Census Bureau. Census of State and Local Government, editions 1990–1993 and 2000–2003. Measure calculated by summing four year total tax receipts and dividing by employment at time t=0, then dividing the resulting figure by four to calculated annual average. Resulting figures adjusted for inflation, then logged.
LPOPDENS0	Persons per square mile at time t=0	U.S. Census Bureau. 1990 and 2000 Decennial Census. Measure calculated by dividing total population at time t=0 by land area in square miles.