SHOULD SUBURBS HELP THEIR CENTRAL CITY?

by

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ABSTRACT

Should suburbs help finance the core public services of their central city? Previous arguments for such assistance have stressed spillovers from city services to suburban residents or the fact that suburban residents (should?) care about their city's poor. We explore the validity of a third possible argument for such assistance, one now stressed by many large city mayors. Suburban residents – even those who never use city services nor care about the city's poor – may wish to support the city's budget *if* that budget contributes to the productive efficiency of the city's private economy and *if* suburban residents consume directly or indirectly the output of city firms. The analysis here presents first-difference regressions of city and suburban home values, city and suburban population, and city and suburban incomes for 217 MSA's for the decade 1980-1990. We find that weak city fiscal institutions and increases in the rate of city poverty depress both the city's and the suburb's private economies. The econometric results are replicated in a general equilibrium model of an open MSA economy, calibrated to the Philadelphia MSA. Our results suggest each suburban family in an average MSA will find it in their economic self-interest to pay from $100 to $250 per year to their central cities to facilitate the reform of weak central city fiscal institutions.

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Should The Suburbs Help Their Central City?

by

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Should the suburbs surrounding a central city help finance their city's core public services? This is a long-standing policy question in U.S. urban public finance and an issue of no less importance in other developed and developing federal public economies. Toronto has recently merged its financing and governance with its surrounding suburbs, and in configuring its new fiscal system, South Africa has opted for a form of metropolitan financing which "twins" wealthy suburbs with less wealthy central cities.[1] What are the arguments for such suburb-to-city fiscal assistance, or stronger still, suburb *plus* city fiscal mergers?

Perhaps the most familiar argument for suburban-to-city assistance is to correct for the under provision of a city produced public good which benefits suburban residents. An arguably complete list of such city services would include zoos, museums, research libraries, airports, sports stadiums, city subways and buses, and city streets; the spillovers benefits to suburban residents from city education, city police and fire protection, recreation, and trash removal services are likely to be small.[2] When spillovers are significant and suburban residents benefit from a city provided public

[1] For an important early analysis of this question for the United States, see Neenan (1970). For a valuable overview of the current arguments for regional financing of city services, see Pack (2002), particularly Chapters 1 and 6.

[2] Acemoglu and Angrist (1999) find that the returns from education accrue almost exclusively to the benefit of the individual student. Even if there were significant social returns in the form of higher wages for other workers, given the high mobility of U.S. workers, suburban residents today would be unlikely to benefit significantly from helping to educate children in their particular city. Similarly, there is no convincing evidence that increased city police protection offers

infrastructure, then they should contribute to the financing of such infrastructures. Efficient financing favors user fees and average cost pricing, however, not intergovernmental transfers.[3] The possible exception to this rule might be financing of city streets where for administrative reasons intergovernmental transfers to fund infrastructure might be appropriate; see Small (1992). But even here, parking fees might serve be a useful "third-best" policy; see Arnott, de Palma, and Lindsey (1991). While the spillover argument is often made for general suburban-to-city fiscal transfers, city spillovers are not pervasive. When they do occur, average cost pricing or targeted capital grants rather than general transfers are the appropriate policy responses.

The second familiar argument is that city poverty is a metropolitan wide concern and suburban residents ought to contribute towards meeting the needs of their city's poor residents. Mark Pauly (1973) has made such an argument, noting that individual's redistributive preferences may give added weight to lower income households in close geographic proximity. National

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significant benefits to suburban residents. Capitalization studies which finds a significant effect of increased police services on home values – the best market measure of a city's public service benefits – find a positive effect only at the neighborhood level; see Thaler (1978) and Hellman and Naroff (1979). Another often mentioned "spillover" from the city to the suburbs is the movement of people and resulting suburban "sprawl." Increased suburbanization may create inefficient congestion of suburban roads and infrastructure and may lead to excessive development of open space, but suburban aid to cities is not an appropriate policy for correcting these problems. Brueckner (2001) provides an excellent discussion of the causes and cures for suburban sprawl.

[3] When city services are "congested enough," an appropriate fee designed to cover production and congestion costs will also provide the appropriate signal to set the efficient scale of the public service; see Mohring and Horwitz (1962) and Oakland (1972) more generally. Further, average cost pricing implemented through city user fees is often the efficient "tax" for funding city services. Average cost pricing will be preferred when the service in question is a consumption "complement" to the user's leisure time and/or if the service is consumed disproportionately by upper income households; see Saez (2002). City zoos, museums, sports stadiums, and airports are public services which meet both criteria; again, suburban-to-city intergovernmental transfers will not needed.

programs should define a common floor for income support, above which state and local governments can make supplemental contributions. In the presence of redistributive spillover benefits, however, city transfers will be too low relative to the efficient level of redistribution. While theoretically compelling, the Pauly argument needs a credible mechanism to reveal suburban preferences for redistribution to the inner city poor. To the extent we rely upon the political process to provide a measure of these redistributive preferences, current state funding for city poverty may be efficient, at least from the perspective of the median, most likely, suburban resident. There may be a problem, but an appropriate fiscal institution – state government ! is already in place to correct it.[4]

Sensing perhaps the limited force of the usual spillover and redistribution arguments, U.S. mayors have recently embraced a third argument for suburb-to-city fiscal assistance. The mayors argue that suburban residents need an economically vibrant central city if their own real incomes are to remain high and grow: "Economies don't stop at the a city's edge."[5] The mayors cite as evidence for this argument the now well-documented positive correlation between the average income of city and suburban residents in U.S. metropolitan areas. Their argument moves beyond correlation to causation, however. For the mayors, a weak city economy *causes* a weak suburban

[4] An additional argument for suburban aid for city poverty is to neutralize the fiscal advantage to city poor families of relocating to a fiscally richer suburb. The suburbs might pay money to keep the poor from moving into their community. For most suburbs, however, fiscal zoning is a far more cost effective strategy for keeping the poor out of your town. Under the *Mt. Laurel* decisions, New Jersey suburbs have been denied this option, so here wealthy suburbs have given transfers to their central cities to limit poor mobility; see Inman and Rubinfeld (1979).

[5] Robert Lang of the Fannie Mae Foundation commenting on the recent United States Conference of Mayors meetings in Washington, D.C. See, "Cities and Their Suburbs Are Seen Growing as Units," *New York Times*, July 10, 2001.

economy; one of the central causes of a weak city economy is weak city public finance. A fiscally weak city has high tax rates and low public services which induces mobile firms and households to leave the city undermining the city's private economy and thus, the mayors argue, the economy of the region as a whole.[6] Suburbanites lose economically *because* of weak city finances. Suburban-to-city transfers which strengthen city finances will therefore strengthen the city's economy which enhances, in turn, suburban residents' private incomes. This paper seeks to evaluate the economic validity of this argument.

Section II presents evidence which documents the close interdependencies between central city and suburban economies for 252 U.S. metropolitan statistical areas (MSA's), an interdependency which seems to have grown closer over the past three decades. We then seek to provide an economic foundation to the mayors' intuition that weak city finances *cause* the correlations by suggesting one path through which weak city finances might depress the economic performance of both the central city and its surrounding suburbs. What links the central city economy to suburban resident welfare in our analysis is a production advantage enjoyed by center city firms from private sector agglomeration economies plus a location advantage for suburban residents from their proximity to the low cost central city. Weak city finances, which we specify here by inefficient and redistributive city fiscal institutions and regulations, leads to high city tax

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[6] The United States Conference of Mayors meeting in the summer, 2001, stressed first the documented interdependency between city and suburban economies and then pressed the idea that correlation was causation running from city services to metropolitan economic performance:

> Beginning in September, Mr. Morial aid he and other mayors would tour *the cities* to highlight the features, including a skilled work force, affordable housing, strong infrastructure and low crime rates, that they say *make the metropolitan areas economically competitive* (italics added). "Cities and Their Suburbs Are Seen Growing as Units," *New York Times*, July 10, 2001.

rates and low city public services, both of which drives firms and households from the central city, thereby undoing some or all of the city's agglomeration advantages. Production costs will rise and city firms will produce less output. Suburban residents must then pay for more for their private goods and services, either because of higher production costs (in the city or the suburbs) or because of the need to import more goods from other more distant production centers. Real incomes of city and suburban residents decline and city and suburban wealth measured by land values falls as well. Weak city finances is the problem; for the mayors, suburb-to-city fiscal assistance is the solution.

Section III provides initial econometric evidence testing the plausibility of the mayor's argument. Here we examine whether inefficient and redistributive central city fiscal institutions in conjunction with central city agglomeration economies might provide a causal link between the city and suburban economies. Cities are considered fiscally weak if their budgetary institutions – in particular, strong public employee unions, weak mayors, poverty obligations, redistributive tax structures – impose high tax rates and/or low public services on mobile firms and households. Not surprisingly, we find that such institutions do reduce the growth of city incomes and populations and depress city home value appreciation. More telling, we find those same *city* fiscal institutions also slow the growth of *suburban* incomes and population and depress *suburban* home value appreciation. The effects of weak city finances on the suburban economy are statistically significant and quantitatively important. Our estimates imply suburban households might be willing to pay from $100 to $250 per year to remove the adverse fiscal consequences of such fiscal institutions.

Section II argues the benefits of such transfers would come from protecting the agglomeration economies in center city production from the burdens of weak fiscal institutions. The

econometric analysis of Section III does not provide a direct test of this hypothesis, however. For that we need a structural model. Section IV provides the needed analysis. Using the best available micro-econometric evidence of firm, household, and government behaviors we construct a general equilibrium model of an "open" metropolitan economy with central city agglomeration economies and fully mobile firms and households and then simulate the effects of each weak central city fiscal institution on equilibrium city and suburban incomes, populations, and land values. For plausible specifications of firm technologies, household utilities, and local politics, we are able to replicate the estimated adverse effects of each weak institution on city and suburban incomes, populations, and land values. These results do not "prove" the model of Section II is the true explanation for the empirical results of Section III, but they do suggest the claim that inefficient and redistributive city fiscal institutions can adversely impact suburban welfare must be taken seriously.

We conclude that when city agglomeration economies are important and city fiscal institutions lead to inefficient allocations or require significant fiscal redistributions, there is a plausible case for suburb to city aid. Section V offers some suggestions for how such assistance might be given. It should be closely regulated, targeted aid, directed at removing the underlying causes of each of the city's fiscal weaknesses: transition assistance for losers from bargaining and governance reforms, aid to ensure full financing of poverty mandates, and tax-base sharing assistance to remove the cumulative effects of redistributive taxation on city firm and household relocations.

II. Should Suburbs Help Their Central Cities: A New Argument

Familiar arguments for suburban fiscal assistance to central cities to correct public sector

fiscal spillovers are unlikely to provide a compelling case for significant new funding for city services. Current evidence suggests the extent of city spillovers are modest or that fiscal institutions are already in place to provide adequate funding for such spillovers. If a case can be made for significant new suburban fiscal support for city government it must rest upon a new argument. We offer such an argument here. Inefficient or redistributive city finances, which we define more precisely below, undermines central city agglomeration economies which in turn raises the price of city goods consumed by suburban residents. City *and* suburban residents' real incomes declines.

Table 1 presents strong evidence that city and suburban economic fortunes are tightly linked. Correlations between the levels of city and suburban populations, incomes, and home values for U.S. metropolitan areas for 1970, 1980, and 1990 are all positive and statistically significant as are correlations of the rates of growth of city and suburban population, income, and home values over the two decades for which we have data.[7] There is no question there is a tight connection between city and suburban economic fortunes. What is particularly striking is the increase in the correlation of city and suburban home values over the three decades. We argue below that home values are probably the best single indicator of fiscally induced changes in residents' welfare. It is suggestive that city and suburban home values are becoming more closely linked over the same period that industries with agglomeration economies have grown in economic importance.

There are two potential links from the city economy to suburban residents' economic

[7] Ideally we would have included city and suburban employment in our analysis, but data on the spatial location of employment is only available on a county basis. Since our focus is on city fiscal policies and possible reasons for suburban financial support, employment for cities, not counties, is required. Brooks and Summers (n.d.) have created a city-suburban employment series from U.S. Census *Journey to Work* files for 60 metropolitan areas. Their work shows the same strong positive correlations between city and suburban jobs as we find for our larger sample for city and suburban populations, incomes, and home values.

TABLE 1: City and Suburban Correlations

Correlations Between Levels of City and Suburban:			
	Home Values	Populations	Incomes
1970	.202**	.775**	.559**
1980	.537**	.760**	.344**
1990	.740**	.757**	.352**

Correlations Between Growth Rates of City and Suburban:			
	Home Values	Populations	Incomes
1970 to 1980	.712**	.493**	.678**
1980 to 1990	.849**	.420**	.600**

"City" corresponds to the largest central city in each MSA, while "Suburban" corresponds to the balance of the MSA not in the central city. There are 252 MSA's in the full sample. Correlations denoted with an ** are significantly different from zero at the .99 level of confidence.

welfare: commuter jobs and wages (Voith, 1993) and the market price for city-produced goods and services purchased by suburban firms and residents. The percent of suburban residents who commute into the central city was 32.percent of all suburban households in 1990; see *U.S. Census, 1990 Journey to Work Files*. While potentially important, suburban-to-city commuting has declined over the past thirty years, the same period over which the links between city and suburban economies appear to have grown tighter. For a typical suburban resident who does not commute into the city, the primary economic advantage of a strong city economy will lie in the ability of city firms to provide valued goods and services at prices lower than (or equivalently, at a quality higher than) what might be available from suburban firms or from firms outside the metropolitan region. Two conditions must be met for city firms to be low cost suppliers of goods and services to suburban residents. First, city firms must have an economic advantage not easily replicated by suburban firms. Second, if that advantage can be replicated by firms in other cities, or on the suburban fringe, then those competitors to city firms must face a transportation cost disadvantage.

Do cities have an economic advantage in the production of goods and services, and if so, what goods and services are likely to be favored? If an advantage exists, it will arise from either a natural advantage such as the city's proximity to an important production input (e.g., power, public infrastructure, or raw materials) or an agglomeration advantage facilitated by firm or household density within the city. For most U.S. cities, the most likely source of a today's production advantage is an agglomeration economies arising from firm and household densities. High firm density within the same industry – called Marshallian agglomeration in honor of Alfred Marshall's (1890) initial analysis of this advantage – leads to lower shipping costs for firm inputs when there are economies of scale in transportation (e.g., iron ore for steel production). Firm density may also

lower labor costs in industries where there is firm-specific demand uncertainty but labor is easily transferable between firms (e.g, the fashion, entertainment, and "dot.coms" industries). Having many firms in the same local labor market reduces the unemployment risk to workers with unique talents and therefore allows all firms to pay a lower wage. For much the same reason, high firm density in the same industry may also encourage supplier innovation and specialization, again lowering firm production costs. Low cost production technologies are likely to be more quickly copied when firms and workers are in close proximity. These idea "spillovers" may occur across industries as well as within industries, an advantage called Jacobian agglomeration for Jane Jacob's (1969) insightful analysis of growing city economies.

Household density within cities also may give rise to agglomeration advantages, now in the provision of consumer services. Restaurants, theater, and music entertainment are commonly mentioned examples, and each needs a minimal number of consumers of similar tastes. When city residential density provides sufficient numbers of like-minded consumers to sustain active center city dining and entertainment alternatives, suburban residents then benefit from their proximity to these city-produced services. With this argument in mind, Edward Glaeser (2000) has suggested that the long-run economic future for many U.S. cities may lie in their ability to become successful providers of consumer services to city and suburban residents.

A growing body of empirical research now demonstrates the presence and importance of agglomeration economies in regional economies. Perhaps the most direct and convincing evidence comes from the micro-econometric study by Mark Beardsell and Vernon Henderson (1999) relating the output of computer manufacturing plants to plant-specific inputs and to current and lagged levels of computer industry employment in the plant's metropolitan area. The research finds a statistically

significant and quantitatively important effect of MSA industry employment on plant productivity; doubling industry employment density raises overall plant (total factor) productivity by 6 percent during the first year of the increase and by as much as 17 percent after four years. Using county level data, Antonio Ciccone and Robert Hall (1996) find that doubling aggregate employment density increases the productivity of all workers by an average of 6 percent. Ciccone and Hall estimate that at least half of the variation in average labor productivity across states can be attributed to differences in industry density and the resulting advantages of agglomeration. Ciccone (2002) has replicated the Ciccone-Hall analysis for small economic regions in Europe and has found results consistent with his work U.S. research; doubling employment densities increases worker productivity by 5 percent.

Not only will increased firm density lead to higher output in the near term for all firms in the affected region, it may stimulate higher outputs in the long-run as well. Edward Glaeser, Hedi Kallal, José Scheinkman, and Andrei Shleifer (1992) and Vernon Henderson, Ari Kuncoro and Matt Turner (1995) find evidence that increased employment density today leads to growing employment levels; the effects of employment density on growth are strongest in such high tech industries as electronic components, medical instruments, and computers. James Rauch (1993b) provides compelling micro-economic evidence in favor of knowledge spillovers as the source of these market-wide gains in productivity and growth. Using a large national sample of individual workers and house values, Rauch finds that after controlling for all relevant worker and house characteristics both the average worker's wage and the average home's value are higher in those MSA's with higher average levels of education and higher average levels of work experience. Land markets capitalize these long-run gains of worker quality into current land prices.

It is important to know not only that agglomeration matters for productivity and growth but also to know the spatial reach of any favorable firm interactions. The best current evidence suggests that most significant agglomeration economies can be achieved within modest spatial boundaries, probably no further than the geographical distance of a typical U.S. county. U.S. employment is becoming increasingly decentralized within metropolitan areas and the spread of employment is smooth throughout the region, much as water spreads across a tabletop. The important exception to this pattern are "idea-intensive" industries, ones whose workforce is biased towards employees with college and professional degrees and whose production process involves significant "face-to-face" interactions. Examples include the creative arts, entertainment and tourism, finance and business services, science and technology, health care, and government; see Edward Glaeser and Matthew Kahn (2001). These industries are disproportionately located within central cities. These are also the industries where agglomeration advantages are most important. More direct evidence on the spatial reach of agglomeration is provided by Stuart Rosenthal and William Strange (2001) who find that the locational advantages of agglomeration are strongest within one mile of the center of current firm concentration and are exhausted within five miles.

The gain to suburban residents of living near a productive central city will be their ability to buy city produced goods and services at comparatively low prices. If x_s^c is suburban consumption per resident of the goods and services produced by central city firms, then suburban residents or retailers save the difference between their costs of buying these goods from city producers rather than from a less efficient suburban or "outside" producer. When k^o and k^c denote the production costs of a unit of the good provided by non-city and city firms respectively, and t^o and t^c denote the corresponding transit costs for non-city and city firms to ship to (or to travel from) the suburbs, then the income savings to suburban

residents or retailers from an economically efficient central city will be:

$$Z_s = x_s^c[(k^o + t^o) - (k^c + t^c)].$$

Z_s measures the direct economic benefits enjoyed by suburban residents/retailers of being near an efficient central city.[8] Changes in the city economy which either reduce x_s^c or raise k^c or t^c will reduce Z_s and make suburban residents worse off economically.

A potentially important determinant of x_s^c, k^c, and t^c will be the efficiency of the central city's public sector. Just as firms may be drawn to a central city to be part of its efficient, private-sector production network, they may be repelled from that same city by an offsetting, inefficient or redistributive

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[8] Suburban households purchasing the good x_s will face a kinked budget constraint, where the amount purchased from city firms will cost $(k^c + t^c)$ and the amount purchased from non-city firms will cost $(k^o + t^o)$ and where $(k^c + t^c) < (k^o + t^o)$. Suburban households will first purchase all they can from city firms, denoted as x_s^c. The remainder of their demand for x_s, denoted as x_s^o, will be supplied by non-city firms. For suburban households, x_s^c is assumed to be exogenous and defined by the profit-maximizing decisions of city firms. If I equals the typical suburban household's after tax income, y the consumption of nationally produced goods and services, and x_s $(= x_s^c + x_s^o)$ is the total consumption of goods and services for which the city's economy has a potential competitive advantage, then the suburban household's budget constraint is specified as:

$$I = y + x_s^c(k^c + t^c) + x_s^o(k^o + t^o), \text{ or,}$$

$$I = y + x_s(k^o + t^o) - x_s^c[(k^o + t^o) - (k^c + t^c)], \text{ which equals,}$$

$$I + x_s^c[(k^o + t^o) - (k^c + t^c)] = I + Z_s = y + x_s(k^o + t^o).$$

The expression on the left is often referred to as the household's "full income" which is allocated to goods and services generally (y) and to those goods and services where the central city has a competitive advantage (x_s). The gains to the typical suburban household of being close to an efficient central city will be the added income they enjoy from being able to buy city produced goods and services at prices lower than those available from either suburban firms or firms outside the region: $Z_s = x_s^c[(k^o + t^o) - (k^c + t^c)]$. This income gain from lower prices is an exact income equivalent measure of the welfare benefits of being close to a productive central city when at least some of x_s is purchased from non-city suppliers in equilibrium – that is, when $x_s^o > 0$. Z_s is no longer an exact measure of the welfare gain of being near a productive central city when $x_s^o = 0$, but it does provide a reasonable income equivalent approximation to this gain when the price advantages are not too large; see Varian (1978; pp 212-213).

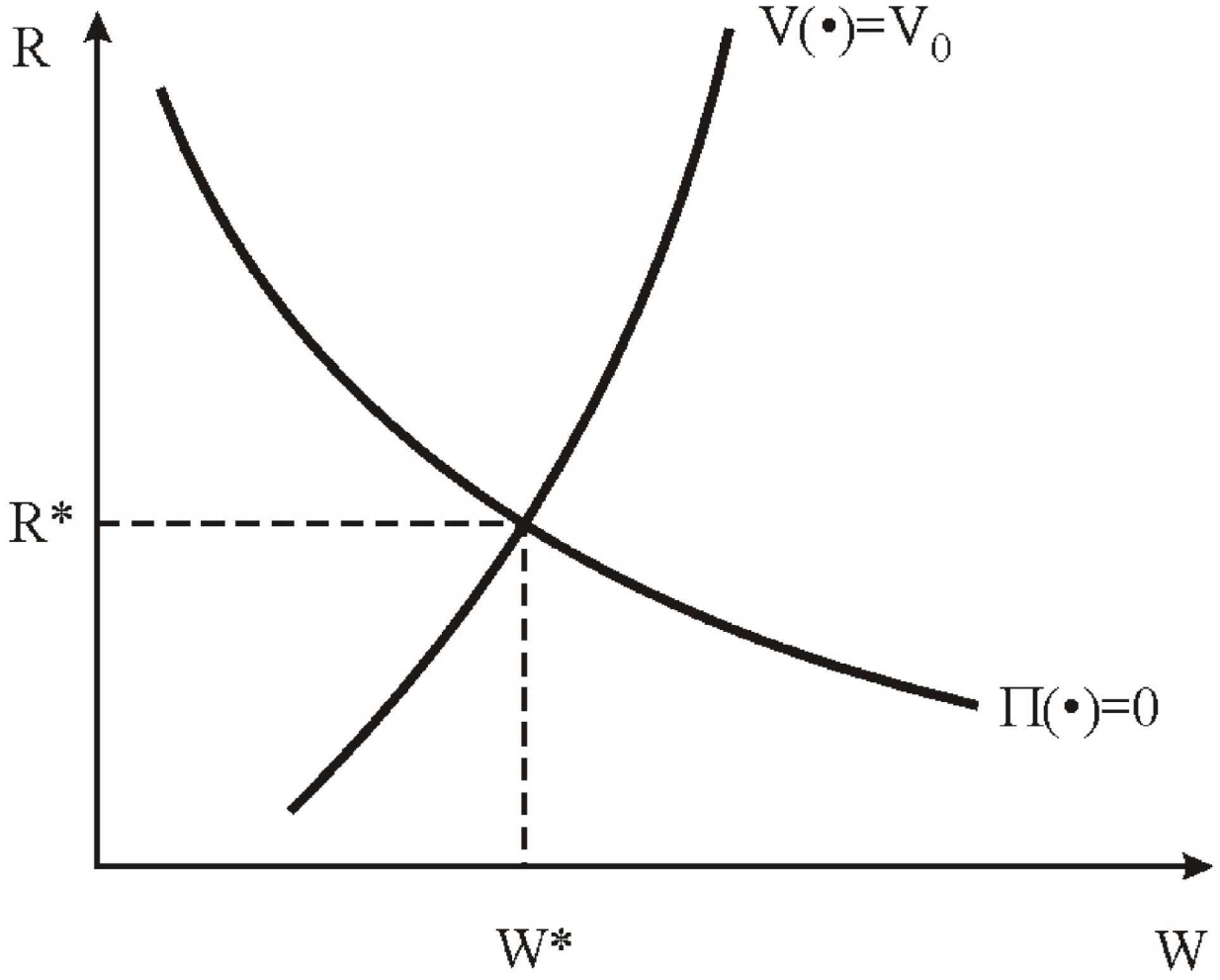
public sector. City taxes unmatched by compensating city public services will drive firms and households from the city to locations where taxes are lower and/or services are higher. The final effect will be smaller city, lower city home values, and most likely lower city incomes. The smaller city economy means less exports to the suburbs (x_s^c 9) and possibly higher production and transit costs (k 8 and t 8). The locational advantage of being in the suburbs is thereby reduced (Z_s9) and suburban population and employment, home values, and suburban incomes decline. Declining cities mean declining suburbs. The cause here is inefficient and redistributive central city public finances.

Figure 1 summarizes this argument more formally.[9] The profit curve denoted as A(q) / 0 and the utility curve denoted as V(q) / V_0 show all the combinations of local land rents and local wages in each economic location, here cities and suburbs, sufficient to hold local firm (excess) profits and resident utilities at their outside, next best options. Firms and households are freely mobile between the local jurisdiction and other locations, both within and outside the MSA. In any city or suburb, firms must earn 0 excess profits and households must receive the utility of V_0, both available in alternative locations. These two equilibrium conditions jointly hold only when the A(q) / 0 and the V(q) / V_0 curves cross. This joint equilibrium defines local land values (R*) and local wages paid to resident workers (W*) which are sufficient to keep firms and households within the city or suburb. Exogenous changes in the fiscal and economic environments of the city and its suburbs will shift their A(q) and the V(q) curves and lead to equilibrium changes in city and suburban land rents and wages. For example, inefficient or redistributive city finances will lead to higher taxes and/or lower public services for mobile firms and households. Firms

[9] The formal specification of the model is provided in Section IV and Appendix B. The analysis here was first presented in Rosen (1979) and then developed fully by Roback (1982) and Gyourko and Tracy (1991b). See Haughwout and Inman (2001) for an application of this model to a wide range of city fiscal policies.

Figure 1

Rent-Wage Equilibrium in an Open Jurisdiction



will only stay within the city if their rents and wages fall to compensate for weak city finances, represented in Figure 1 by a downward shift in the city firms $A_c(q) / 0$ curve. If all the adverse effects of weak city finances fall only on city firms, then only the $A_c(q) / 0$ curve shifts downward and in the new equilibrium rents and wages both fall. If the burden of weak city finances falls on city households, then a fall in rents or a rise in wages will be needed to hold residents within the city, represented by a downward shift in the residents' utility $V_c(q) / V_0$ schedule in Figure 1. If all the adverse effects of weak finances fall only on city residents, then only $V_c(q) / V_0$ falls and equilibrium city rents fall but now equilibrium city wages rise. Most likely, the city will share the burdens of weak finances across firm and households; thus both $A_c(q) / 0$ and the $V_c(q) / V_0$ shift downward. In this case, city land values unambiguously decline but we cannot predict whether city wages will rise or fall.

Figure 1 also applies to any suburb, but now $A_s(q) / 0$ and the $V_s(q) / V_0$ are specified for each suburban community. The smaller and now more expensive city economy will mean less city output and therefore higher average prices for city produced goods and services for suburban residents and firms. Suburban retail firms costs rise and profits fall; thus $A_s(q) / 0$ must shift downward. Also, suburban residents who shop directly within the city must now buy more goods from expensive non-city suppliers; thus $V_s(q) / V_0$ must fall. The downward shifts in $A_s(q) / 0$ and/or $V_s(q) / V_0$ imply an unambiguous decline in suburban land values and a possible fall in suburban resident wages too. *If* weak city finances matters, then we expect to see lower suburban land rents, fewer suburban residents, and possibly lower suburban wages and incomes. As in the central city, the clearest footprints for the adverse effects of inefficient or redistributive city finances will be seen in lower suburban land values and perhaps lower suburban populations.

Four city fiscal institutions seem particularly important for determining the overall fiscal

performance of city governments: the size of the city's poverty population and the magnitude of state and federal mandates to provide services to poor residents, the bargaining rules for setting local public employee wages and work rules, local electoral rules which define budgetary incentives, and the redistributive structure of local taxation.

First, city poverty is likely to have one important fiscal effect and one important non-fiscal consequence for mobile middle class households and businesses within the city. While much of the financing for redistributive public spending comes from the federal and state governments – though this may change with the new fiscal incentives following the Welfare Reform Act of 1996 (Inman and Rubinfeld, 1997) – city governments do make contributions to the economic welfare of poverty households. Anita Summers and Lara Jakubowski (1997) have done a careful accounting of unreimbursed poverty expenditures for the City of Philadelphia. They find city spending for state mandated health and foster childcare services increased city taxes by 7.6 percent in 1995, up from 6.7 percent in 1985. Thomas Downes and Thomas Pogue (1994) provide comparable estimates of the budgetary consequences of poverty ! from 2 to perhaps as much as 25 percent of school spending ! for maintaining test score performance in the average urban school district. The important non-fiscal consequence of poverty is crime (see Glaeser and Sacerdote, 1999); higher rates of city crime discourage household and firm location (see Cullen and Levitt, 1999).

Second, a labor bargaining environment which favors city public employees imposes additional fiscal burdens on city taxpayers without compensating benefits. Introducing public employee unionization into a previously non-union city means a sizeable increase in public employee wages, never lower than 5 percent and often as large as 15 percent; see Freeman (1986; Table 7). Just as important are the effects of unionization on worker benefits, where the increase

in benefits with unionization is often as large as 20 percent; see Freeman (1986; Table 10). Further, there is no convincing evidence that unionization has improved public employee worker productivity; Freeman (1986; Table 11). Most of these large spending effects are now behind us, however. By 1980, public employee unionization was in place in most large cities. The issue today is how well the city's labor budget can be managed in this union environment. Key here are the state rules which govern local labor bargaining. Richard Freeman and Robert Valletta (1988) find that in states which explicitly require cities to bargain with their public employees, public employee wages are from 3 to 8 percent higher than in states which allow unionization but do not require bargaining; see also Gyourko and Tracy (1991a). Since payrolls constitute about 60 percent of most city budgets and strong union rules increase labor budgets from 3 to 8 percent, strongly unionized cities will see an increase in current accounts city spending, and therefore city taxes, of about 2 to 5 percent.

Third, how city taxpayers elect their local representatives has important implications for city budgets. When budgetary powers are diffused, as will be the case in city governments run by neighborhood elected city councils and institutionally weak mayors, coalitions of representatives will be required to make any budgetary choice. Such coalitions are inherently unstable, however; one majority can always be undone with small side payments to a marginal majority member. One often used solution to this instability is to form a "universal" coalition in which each coalition member is allowed to select a preferred level of spending for all projects which benefit directly his or her constituents. When each representative defers to the local choices of all other members ! "you scratch my back, and I'll scratch yours" – a stable coalition for public spending can emerge. Unfortunately, when benefits are localized but costs are shared among taxpayers throughout the city

! the city tax base becomes the "common pool" ! there will be a strong tendency for all representatives to select inefficiently large city projects. Within city budgets, such spending will be concentrated on neighborhood services: recreation, libraries, streets, building and school maintenance.[10] In the Philadelphia budget, for example, these services received $162 million in FY2002 or about 8 percent of the City's own source revenues. How much of this spending is too much? For a reasonable price elasticity of demand for neighborhood services, overspending may be as much as 40 percent of current neighborhood services or about 3 percent of the city's own source revenues.[11] The solution for controlling these fiscally inefficient spending and tax increases is to centralize fiscal powers, either in the hands of a directly elected mayor or a city council elected in at-large (not ward) elections.

Fourth, the city's tax structure and its inherited tax base are important determinants of fiscal redistribution among city households and between the city's business and residential sectors. Though city tax rates are freely chosen by city politicians, city tax structures are set by state law; see Inman and Rubinfeld (1979). That tax structure defines the redistributive nature of local

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[10] This argument has been formalized and applied to budgetary politics at the federal level by Inman and Fitts (1990), at the state government level by Gilligan and Matsusaka (1955), and at the local level for Los Angeles by Cox and Tutt (1984) and for Philadelphia by Inman (1995). Each study shows a clear upward bias to government spending as the problems of diffused budgetary powers become more pronounced.

[11] A reasonable price elasticity of demand for neighborhood services is -.40; see Inman (1979). The marginal cost (efficient price) for $1 of services is $1. The residential "tax price"defined as the ratio of resident's own tax base to the average tax base in the city (=b/B) is •.50 for middle class city residents; see Appendix A. Common pool budgeting reduces this tax price still further to approximately .03 (= 1/17q(b/B), where 17 is the number of district-elected city council representatives whose constituents share city taxes). This is a 94% fall in the price of residential services. This 94% fall in price implies a 38% increase in government spending: 38% = -94% x -.40. In Philadelphia, this 38% increase in spending is approximately 3% of the City's own source revenues.

taxation; see Inman (1989). Typically, a city resident or firm contributes to each dollar of city spending according to the ratio of their tax base (b) relative to the city's average tax base (B): b/B. This ratio is known as the city's "tax price." Low income residents with low tax bases have lower than average tax prices and are therefore subsidized in their consumption of city services by richer middle class residents and firms with higher than average tax prices. The cost of this cross-subsidy to richer taxpayers will be greater, the greater the percentage of the city's population who are poor. In our sample of U.S. central cities, a one standard deviation *increase* in the share of city residents who are poor will increase the tax payments for our sample's average middle class city resident by 2 percent.[12] Also important is the redistribution from city firms to residents; see Ladd (1975). The most beneficial business properties are capital intensive manufacturing properties. Again for our sample of U.S. cities, a one standard deviation *decrease* in the share of city jobs which are manufacturing increases city middle class tax payments by about 2 percent.[13] Increasing rates of city poverty and declining shares of city manufacturing employment will shift more of the cities' tax burdens onto their middle and upper income households and the remaining firms, most likely in the service and technology sectors.

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[12] The city resident's tax burden is defined as the product of the resident's tax price times city spending: Tax Burden = (b/B)•Spending. Appendix A provides a useful approximation for b/B:(b/B) • 1/[1 - .6(CPOV + COLD) + (1.02 + .58•CMAN)]. Evaluated at mean values for the rate of city poverty (CPOV = .18), percent elderly (COLD = .13), and percent of jobs in manufacturing (CMAN = .14) implies a value of b/B = .52. Average city plus school spending in our sample is about $5000 per household. Thus the typical resident's tax burden will be $2600. A one standard deviation increase in CPOV to .24 implies a new tax price of b/B = .53 and new tax burden of $2650, or an increase of 2 percent.

[13] Using the specification above (fn. 12) for resident tax burden, reducing the share of city jobs in manufacturing from its mean of .14 by one standard deviation to .07 changes the typical city resident's tax price from .52 to .53 and the resident's tax burden from $2600 to $2650 – again a 2 percent increase.

Taken together, the increase in a typical middle class city household's total tax burden from poverty spending mandates on city and school budgets (7 percent), public employee unions with strong bargaining powers (2 to 5 percent), weak mayoral control over budgets (3 percent), and redistributive tax structures coupled with declining economies (2 percent plus 2 percent) may be as much as 15 to 20 percent. The percentage added tax burden on city businesses is likely to be as large. Andrew Haughwout, et. al. (2000) have estimated the elasticity of city jobs with respect to increases in city tax rates at -.2 to -.5; see also the survey by Timothy Bartik (1991). A 20 percent rise in city taxes implies a 4 percent to perhaps as much as a 10 percent fall in city jobs. If the jobs which exit the city are in the industries where production and consumption agglomerations are important, then there will be a significant loss in production efficiency, city output, and a corresponding rise in the average price of city-produced goods and services consumed by suburban residents.

Summary: The correlations of Table 1 leave little doubt that the economic fortunes of U.S. cities and suburbs are tightly linked. But in what direction does the causation run and what exactly might be the cause? One theory, favored by the U.S. city mayors since it provides an economic rationale for suburb-to-city aid, is that weak city fiscal institutions – poverty mandates, strong unions, weak governance, redistributive tax structures – cause a weak city private economy which in turn harms suburban residents and their private economy. Conversely so, when the central city has efficient fiscal institutions. The path of causation runs from weak city finances to resident and firm exit and, because of city agglomeration economies, to less efficient city and suburban private economies. Available micro-econometric evidence suggests that inefficient and redistributive city fiscal institutions can cause higher city taxes, firms and households exit, and as a result less efficient

city production. Conceptually at least, and on the basis of the best available micro-evidence, the mayors have an argument. In Section III we provide a more direct test of their conjecture.

III. City Finances and The Suburban Economy: Any Connection?

If there is a compelling case for suburban fiscal support for its central city, it must come from the economic spillovers to the suburban economy created by central city public finances. Table 1 presented strong evidence that the city and the suburban economies are tightly linked, and Section II outlined one possible causal path which might tie the two economies together. Here we look for direct empirical evidence of this linkage.

Our empirical analysis seeks to explain changes within the MSA private economy over the decade 1980 to 1990 as a consequence of city poverty, strong city public unions, inefficient city budgeting, and redistributive city tax structures. Table 1 correlations suggests it is in this decade that the city-suburb economic linkages are likely to be the strongest; required data for the year 2000 are not yet available. City and suburban average home values (measured in 1982 dollars), populations, and resident average incomes (measured in 1982 dollars) (denoted by the vectors Y_{crt} and Y_{srt} respectively for city c or suburb s in year t and region r) will be regressed on vectors of exogenous city (X_{crt}), suburban (X_{srt}), and metropolitan-wide (X_{mrt}) determinants of metropolitan area economic performance. The specification will allow for city and suburban fixed effects unique to each of seven national economic regions (New England, Mid-Atlantic, Midwest, Southeast, Plains, Mountain, and West Coast). We specify the model in first differences between 1980 and 1990 to remove from the analysis all variables which we cannot measure directly but which may impact the city and suburban economies and which are correlated with our included variables of interest:

(1) $\ln Y_{cr90} - \ln Y_{cr80} = \Delta Y_{cr} = \Delta\mu_{cr} + (\beta_c)X_{cr} + (\beta_s)X_{sr} + (\beta_m)X_{mr} + \Delta\varepsilon_{cr}$;

(2) $\ln Y_{sr90} - \ln Y_{sr80} = \Delta Y_{sr} = \Delta\mu_{sr} + (\beta_c)X_{cr} + (\beta_s)X_{sr} + (\beta_m)X_{mr} + \Delta\varepsilon_{sr}$.

Remaining unmeasured effects which might influence city and suburban populations, incomes, and home values are specified by the vector of error terms $\Delta\varepsilon_{cr}$ and $\Delta\varepsilon_{sr}$ which we assume are uncorrelated with our included independent variables and which have means of zero and uniform constant variances unique to each dependent variable. We will allow the error terms to be correlated across each of the six dependent variables (changes in city and suburban home values, populations, and incomes). We have chosen a logarithmic specification for our independent variables Y_{crt} and Y_{srt} so that when estimated as first differences, we will measure the effects of changes in our independent variables on the rates of growth of population and income and on the rate of appreciation in home values – that is, $\Delta \ln Y = \Delta Y/Y$. The constant term in each of the first difference equations measures the common, or average, effect of the economic events of the decade 1980 to 1990 on city and suburban economies generally and in each of our seven national regions.

We define changes in city finances (ΔX_{cr}) through four measures of the central city's fiscal institutions. The fiscal consequences of poverty mandates is measured by changes in the percent of the city's population below poverty. Detailed information on state and federal mandates for city and school district poverty spending are not available, but our first difference specification should remove the fixed effects of federal and state mandates while the constant term controls for the effects of changes in federal mandates over the decade. First differencing also controls for level effects of having a differentially large city poverty population. Our specification provides estimates of the average effect of mandates on city and suburban economies because of additional poverty households. Given mandates, an increase in the *city's percent poverty* will increase aggregate

redistributive city and school spending and thus taxation within the city. We expect increases (decreases) in the rate of city poverty to adversely (favorably) affect the rate of growth in city population, the rate of city home value appreciation, and perhaps the rate of growth in city incomes.

We measure the strength of public employee unionization in the city by an indicator variable equal to 1 if the city is located within a state with an explicit "duty to bargain" for police, fire, and blue collar employees, and 0 otherwise. State rules creating *strong city unions* apply state wide, but the rules have important budgetary consequences only for central cities. Unionization of public employees in the suburbs, other than for teachers (see below), is very limited. Most suburbs contract out services provided by blue collar workers. Suburban police forces are generally small and not worth unionizing. Suburban fire departments are also small and, further, frequently voluntary organizations. Using state duty to bargain rules for police, fire, and blue collar employees to identify a city union fiscal effect requires that these rules have their primary fiscal impact only on city governments; see Ichniowski (1988) and Brown and Medoff (1988) for evidence on this point. Empirical analysis by Freeman and Valletta (1988) shows strong city unions as defined by strong duty to bargain laws do result in relatively high city wages and benefits and thus higher city taxes on residents and firms. In our analysis, the strong union indicator variable will measure the differential rates of income and population growth and home value appreciation in strong union as opposed to weak union cities. We expect the presence (absence) of strong city unions to have negative (positive) effects on city economies.

We measure weak city budgetary institutions by an indicator variable called *weak governance* defined by whether the city government budget is set by a city council with a majority of members elected from neighborhood wards and whose mayor is elected directly from city council.

If so, *weak governance* assumes the value of 1. If the majority of city council or the mayor is elected in city-wide, at-large elections then *weak governance* is assigned to value of 0. City governments focused on neighborhoods will tend to fall prey to the problems of "common pool" budgeting leading to inefficiently large spending for neighborhood projects. Such projects typically favor low and moderate income residents over middle and upper income residents and businesses; see Inman (1995). The weak governance indicator variable measures the differential rates of income and population growth and home value appreciation in weak as opposed to strong governance cities. We anticipate the presence (absence) of weak city governance to have a negative (positive) effect on the city economy.

The redistributive structure of city taxation is measured through an approximation to the city's middle class residents' *tax price* for property taxation defined as the ratio of a middle class resident's home value (b) to the average value of property in the city (B):

$$(b/B) \bullet 1/[1 - .6(CPOV + COLD) + (1.02 + .58\P CMAN)],$$

where CPOV is the percent of the city's population who live in poverty, COLD is the percent of the city's population who are 65 or older, and CMAN is the percent of the city's workforce employed in the manufacturing sector. Data Appendix A provides the derivation of this approximation. In this specification, the middle class taxpayer's burden per dollar of public services rises with city poverty and the share of city residents who are elderly (and assumed retired) and declines as more of the city's job base is employed in the relatively more capital intensive (and presumably property tax rich) manufacturing sector. An increase in a city's tax price raises the cost of public services and drives middle class residents and, for an analogous specification for businesses, firms from the city. We expect increases (decreases) in the city property tax price to have adverse (favorable)

effects on city economies.

The four measures of inefficient and redistributive city finances – growing city poverty, strong unions, weak governance, rising tax prices – are included in each of the six separate regressions explaining changes in metropolitan economic performance. The analysis of Figure 1 implies that each measure of weak city finance should depress the city economy, unambiguously lowering the rate of home value appreciation and the rate of city population growth and perhaps reducing the rate of city income growth as well. What will happen to the suburban private economy is not obvious. If there is no direct economic link between the city and the suburban economies and if the suburban economy is one of many alternative locations for mobile city firms and households, then suburban home values, population, and average income should be only marginally affected, if at all. Again, if there are no direct economic linkages, but the suburbs are the primary alternative location for exiting city firms and households, then suburban home values, population, and incomes should all rise as city finances become less efficient and more redistributive. However, if there is a direct beneficial link between the city and suburban economies – agglomeration economies plus a suburban transit cost advantage as suggested here – and city firms and residents have many locational alternatives, then redistributive city finances which depress the city economy should depress the suburban economy as well. As we argued in Section II, suburban home values are the most likely place to look for evidence of a direct city-suburban economic connection. If we find that suburban home values decline in the presence of weak city fiscal institutions, then we have prima-facie evidence in favor of our hypothesis and the mayors' case for suburban-to-city aid.

A final but crucial methodological consideration for establishing causation from city finances *to* suburban economies is the exogeneity of each of our four measures of inefficient or redistributive

city fiscal institutions. Changes in the rate of city poverty are potentially endogenous; we control for this endogeneity through the use of instrumental variable estimation (detailed below, Table 3). The legal institutions creating strong city unions and weak city governance are well-established and have been in place for decades before our sample period, 1980 to 1990. Changes in resident tax prices are re-specified to remove the effect of changes in city poverty and the percent of city residents who are elderly, leaving changes in the percent of jobs in manufacturing as the remaining source of variation in resident tax prices. City declines in manufacturing jobs is a historical trend based on past employment histories of the cities; we assume changes in this component of tax price are exogenous.

While our primary focus will be on the effects of city finances on city and suburban private economies, it is necessary to also control for other possible determinants of that economic performance. We therefore include in each regression changes in suburban (ΔX_{sr}) and metropolitan-wide (ΔX_{mr}) fiscal and economic variables which might impact upon the city and suburban economies.

Included in ΔX_{sr} are the changes in the rate of *suburban poverty* and the number of *suburban school districts* within the MSA. Included in ΔX_{mr} are changes in the MSA's state-wide ratio of state-to-local general revenue aid divided by all local governments' own source revenues as a measure of *state aid* support for local governments; an indicator variable of *suburban support* for county services equal to 1 if the city shares the financing of county services (primarily poverty, courts and prisons, roads) with surrounding suburbs and equal to 0 if, because the city is legally designated a city-county, the city funds county services solely from city tax base; an indicator variable equal to 1 if the state enforces an explicit duty to bargain for local teachers creating *strong*

teacher unions, 0 otherwise; the number of *airline hubs* at the MSA's airport(s); an indicator variable equal to 1 if the MSA contains both East-West and North-South *interstate highways*, 0 otherwise; 1980 *city population density* and *suburban population density* as controls for the availability of residential land in the city and its surrounding suburbs; and finally, the MSA's average annual number of *heating days* and *cooling days* as controls for climatic attractiveness.[14]

For this analysis we will define each city-suburban metropolitan area to include the counties of each central city's MSA for the year 1970. The use of the 1970 MSA definition is important for two reasons. First, it holds MSA land area fixed in our analysis, allowing us to use a maintained hypothesis of full market capitalization to interpret our coefficients in the home value equations as measures of city and suburban resident welfare changes. Second, our results should be interpreted as applying to central cities and their current inner ring suburbs only. In many MSA's there has been significant growth in the counties beyond the 1970 MSA, areas now known as "ex-urbia." These residents and properties are not included in our empirical analysis. Data Appendix A lists the means, standard deviations, and sources for all variables included in X_{crt}, X_{srt}, and X_{mrt}.

Finding negative effects of city fiscal variables $)X_{cr}$ in the city *and* suburban home value, population, and income equations ($(_c < 0$; $J_c < 0$) suggests city and suburban economies are more than simply fiscal competitors. Were fiscal competition the whole story we should see negative effects of $)X_{cr}$ on the city economy but positive effects for these same variables on the suburban

[14] In addition we also include in each city and suburban regression the level of each *dependent variable lagged* (1980) from which changes for the decade are measured. A positive (negative) coefficient of the lagged dependent variable suggests high and low growth cities diverge (converge) over time. The inclusion of the lagged dependent variable in the estimation introduces a possible correlation between that lagged variable and the error term, however. When we correct for this possible endogeneity using 1970 or 1960 lagged dependent variables as instruments or by omitting the variable entirely, our results are virtually identical to those reported in Tables 2-5.

economy to the extent some or all of the middle class households and businesses who leave the city relocate in surrounding suburbs. If the effects of $)X_{cr}$ on the suburban economy are negative, however, then the fiscally-induced decline in the city private economy must have an adverse economic spillover on the suburbs which more than offsets the positive stimulus of any relocating households and businesses. Section II has suggested that the private sector spillover might occur through lost city agglomeration economies with the loss of city firms and middle class households. We test this hypothesis by including three additional indicator variables in our city and suburban home value, population, and income growth equations. The first two variables are assigned a value 1 if there is a *city research university*, 0 otherwise and value 1 if there is a *suburban research university*, 0 otherwise. Research universities are incubators of ideas and a potential stimulus, if there is sufficient complementary industrial capacity, to Jacobian agglomeration economies. The third indicator variable assumes the value 1 if the city's *cultural rank* from the *1985 Places Rated Almanac* places the city within the top quarter of a national ranking of all cities. The top quartile ranking ensures that the city's cultural institutions involve significant fixed costs – museums, theaters, orchestra halls !and are thus not endogenous to contemporary economic growth or declines.[15] If city agglomeration economies are important then we expect city research universities and the city's cultural rank to have positive effects on both the city and suburban economies. In our

[15] Institutions included in the rankings are museums, colleges and universities for the performing arts, symphony, theater, opera, and dance, and public libraries. The rankings include all cultural institutions in the city's metropolitan area, but reading the details for individual areas suggest the overwhelming majority of the rated institutions are located within each area's central city. The top ranked city in our sample is New York City; the lowest ranked city to qualify for inclusion in the top quartile is Portland, Oregon. Portland contains the state Museum for Science and Industry, two universities with major performance arts programs, a professional symphony orchestra, and an opera association with four separate productions a year.

model, a suburban research university will have jointly positive effects only when there are significant suburban agglomeration economies.

Table 2 summarizes our estimates of equations (1) and (2), our core specification without agglomeration effects, for the complete sample of 217 U.S. metropolitan areas.[16] Estimation is by seemingly unrelated least squares, allowing for correlations of error terms across all six equations. The results in Table 2 show the four city fiscal variables are jointly significantly and negative in city ($(_c < 0$) and suburban ($J_c < 0$) home value appreciation, population growth, and income growth equations; see the F tests reported in Table 2 . The effects are particularly strong in the home value equations, just where the equilibrium analysis of Figure 1 predicted they should be found if weak city finances has adverse effects on city and suburban economies. The elasticities of city and suburban home values with respect to changes in the *city's* tax price equal -2.95 and -1.44, respectively, while the elasticities of city and suburban home values with respect to changes in the *city's* rate of poverty equal -.15 and - .09, respectively. (All elasticities reported here and throughout the paper are evaluated at sample means.) City home values also fell by 11 percent over the decade in the presence of an explicit duty to bargain for non-teacher city employees and by 4 percent because of weak city governance. Strong city unions and weak city governance also have statistically significant negative effects on the suburban economy, both reducing suburban home value appreciation by 6 percent. These estimated negative effects for our measures of weak city finances on the suburban economy would only be observed if they undermined an economically valuable structural connection between the city and suburbs. We have conjectured this link is due

[16] Table 1 results use our full sample of 252 MSA's. Several of our MSA's were missing data for key independent variables and this fact reduces our sample for estimation of Tables 2-5 to 217 MSA's.

TABLE 2: City Finances and the Suburban Economy[†]

	Home Value Appreciation		**Population Growth**		**Income Growth**	
	City	Suburban	City	Suburban	City	Suburban
Δ City Percent Poverty	-0.807* (0.450)	-0.489 (0.389)	-0.173 (0.279)	0.684** (0.293)	-1.027** (0.173)	-0.304 (0.205)
Strong City Unions	-0.111** (0.034)	-0.063** (0.029)	-0.032 (0.021)	0.042* (0.022)	-0.003 (0.013)	0.004 (0.015)
Weak City Governance	-0.044** (0.021)	-0.059** (0.019)	-0.008 (0.013)	0.012 (0.014)	-0.012 (0.008)	-0.024** (0.010)
Δ City Tax Price	-5.681** (1.741)	-2.765* (1.506)	-4.400** (1.089)	-4.110** (1.141)	-1.871** (0.671)	-0.956 (0.795)
Δ Suburban Percent Poverty	-0.345** (0.153)	-1.364** (0.133)	-0.017 (0.095)	-0.588** (0.104)	-0.305** (0.059)	-1.231** (0.070)
Suburban School Districts	0.0003 (0.004)	-0.0003 (0.0004)	-0.0001 (0.0002)	-0.0001 (0.0002)	-0.0004** (0.0001)	-0.0002 (0.0002)
Δ State Aid	0.536 (0.338)	0.599** (0.292)	0.418** (0.211)	0.288 (0.220)	0.054 (0.130)	0.020 (0.154)
Suburban Support	0.179** (0.058)	0.0436 (0.050)	0.066* (0.034)	0.033 (0.036)	-0.015 (0.023)	0.024 (0.027)
Strong Teacher Unions	0.050 (0.042)	-0.036 (0.036)	0.067** (0.026)	-0.012 (0.027)	0.033** (0.016)	0.027 (0.019)
Airline Hubs	0.004 (0.025)	0.033 (0.022)	-0.006 (0.016)	0.036** (0.017)	0.024** (0.010)	0.015 (0.011)
Interstate Highways	0.038 (0.023)	0.025 (0.020)	-0.002 (0.015)	-0.0005 (0.016)	-0.003 (0.009)	0.005 (0.011)
Psuedo R^2	0.726	0.783	0.571	0.710	0.897	0.915
F-stat for city fiscal variables (p-value)	13.77 (~0)	6.21 (~0)	10.15 (~0)	3.71 (0.002)	32.00 (~0)	4.03 (0.001)

[†]Estimation is by seemingly unrelated regression. Also included in each equation above, with sign and significance indicated within parentheses, are the following: New England (+**;+**;-; +;+**;+**), Middle Atlantic (+**;+**;-;+;+;+), Midwest (+;+;-;+;-;+), Plains (+;+;-;+;+;+), Southeast (+;+;-;-;+;+), Mountain (+;+;+;+;-;+), West Coast (+**;+*;+*;+;-;+),1980 City Population Density (-;+;+*;-;-;+), 1980 Suburban Population Density (+**;+**;-**;-;+;+), Heating Degree Days (-**;-**;+;-**;-**;+), Cooling Degree Days (+;-;+**;+;-**;-), and the 1980 log value of the dependent variable (-;+;-;+**;+**;+**).

[*] Coefficients marked by * (**) are significantly different from zero with 90% (95%) confidence.

to city agglomeration economies, a link we test for directly in Table 4.

The negative impacts of weak city finances on city and suburban incomes are not quite as strong, but when statistically significant, they are important. The elasticity of city mean city income with respect to city tax price is - .97 and with respect to city poverty is -.19. Weak city governance lowers suburban mean income growth by 2.4 percent. The effects of city tax price, strong city unions, and the rate of city poverty are negative but statistically insignificant in the suburban income equation, but these effects are strengthened in Tables 3-5 after correcting for possible simultaneous equation bias in our Table 2 estimates.

We test the sensitivity of our results in Table 2 to three extensions. First, in Table 3 we examine the consequences for our estimates of allowing for the potential endogeneity of the rate of city poverty and, by extension, the city's tax price, both of whose estimated effects are likely to be biased towards zero without estimation by instrumental variables. To accommodate the endogeneity of the rate of city poverty, we first re-define the city tax price to omit CPOV from the specification:

$$(b/B)_{/CPOV} \bullet 1/[1 - .6(COLD) + (1.02 + .58¶CMAN)].$$

We then provide for instrumental variables estimation of the change in the rate of city poverty, using as instruments the seven regional indicator variables, the percent of the city's population in 1980 who are Black, the percent of the city's 1980 housing stock built before 1939, and the change in the Cutler-Glaeser-Vigdor index of racial segregation (1999) over the decade 1980 to 1990. As a group the identifying instruments (other than the seven regional variables) are jointly statistically significant ($F = 3.17$ $p = .02$). The single most important instrument is the percent of city housing built before 1939; its effect is positive and highly significant($p = .006$). On the power of this instrument generally, see Glaeser and Gyourko (2001).

TABLE 3: City Finances and the Suburban Economy[†]

	Home Value Appreciation		**Population Growth**		**Income Growth**	
	City	Suburban	City	Suburban	City	Suburban
Δ City Percent Poverty, Predicted	-6.536** (1.680)	-2.953** (1.394)	-3.250** (1.000)	-0.925 (0.942)	-2.141** (0.738)	-1.329** (0.597)
Strong City Unions	-0.124** (0.039)	-0.083** (0.032)	-0.026 (0.023)	0.051** (0.021)	-0.008 (0.017)	-0.021 (0.014)
Weak City Governance	-0.039* (0.023)	-0.054** (0.019)	-0.014 (0.014)	-0.001 (0.013)	-0.013 (0.010)	-0.021** (0.008)
Δ City Tax Price, ex-City Poverty	-8.037** (2.081)	-5.065** (1.721)	-4.839** (1.250)	-4.565** (1.166)	-2.929** (0.912)	-2.364** (0.734)
Δ State Aid	0.808** (0.386)	0.707** (0.319)	0.625** (0.232)	0.294 (0.215)	0.342** (0.169)	0.171 (0.136)
Suburban Support	0.125** (0.061)	0.017 (0.050)	0.050 (0.035)	0.035 (0.033)	-0.038 (0.027)	0.016 (0.022)
Psuedo R^2	0.703	0.758	0.571	0.759	0.854	0.940
F-stat for city fiscal variables (p-value)	11.03 (~0)	6.74 (~0)	17.19 (~0)	5.91 (0.0001)	5.25 (0.0003)	5.59 (0.0002)
Strong City Unions	-0.116** (0.036)	-0.065** (0.030)	-0.035 (0.022)	0.042* (0.022)	-0.007 (0.016)	-0.003 (0.016)
Weak City Governance	-0.034 (0.023)	-0.053** (0.019)	-0.003 (0.014)	0.011 (0.014)	-0.005 (0.010)	-0.022** (0.010)
Δ City Tax Price, ex-City Poverty	-8.173** (2.033)	-3.972** (1.690)	-5.677** (1.253)	-4.654** (1.246)	-3.368** (0.926)	-1.477* (0.890)
Δ State Aid	0.867** (0.357)	0.779** (0.296)	0.587** (0.220)	0.288 (0.216)	0.307* (0.162)	0.108 (0.155)
Suburban Support	0.158** (0.062)	0.032 (0.051)	0.054 (0.036)	0.030 (0.036)	-0.029 (0.028)	0.019 (0.027)
Psuedo R^2	0.685	0.770	0.525	0.712	0.835	0.910
F-stat for city fiscal variables (p-value)	8.81 (~0)	5.43 (0.001)	7.51 (0.0001)	6.34 (0.0003)	4.47 (0.004)	2.50 (0.058)
	City	Suburban	City	Suburban	City	Suburban

	Home Value Appreciation		Population Growth		Income Growth	
Δ City (% Old + % Poverty), Predicted	-5.627** (1.562)	-2.392* (1.270)	-0.096 (0.938)	0.146 (0.858)	-1.060 (0.673)	-0.829 (0.543)
Strong City Unions	-0.135** (0.040)	-0.086** (0.032)	-0.031 (0.024)	0.052** (0.022)	-0.013 (0.017)	-0.014 (0.014)
Weak City Governance	-0.041* (0.024)	-0.055** (0.020)	-0.015 (0.015)	-0.001 (0.013)	-0.013 (0.011)	-0.021** (0.008)
Δ % City Employment in Manufacturing	0.006 (0.004)	0.004 (0.003)	0.006** (0.002)	0.005** (0.002)	0.004** (0.002)	0.003** (0.001)
Δ State Aid	0.893** (0.401)	0.749** (0.326)	0.637** (0.243)	0.309 (0.221)	0.366** (0.173)	0.189 (0.139)
Suburban Support	0.123** (0.064)	0.016 (0.052)	0.065 (0.037)	0.041 (0.034)	-0.029 (0.028)	0.020 (0.022)
Psuedo R^2	0.680	0.748	0.530	0.745	0.847	0.937
Strong City Unions	-0.110** (0.038)	-0.062** (0.030)	-0.031 (0.023)	0.047** (0.023)	-0.004 (0.017)	0.004 (0.016)
Weak City Governance	-0.031 (0.024)	-0.052** (0.019)	-0.002 (0.015)	-0.004 (0.014)	-0.004 (0.011)	-0.021** (0.010)
Δ State Aid	0.896** (0.370)	0.795** (0.300)	0.592** (0.229)	0.305 (0.223)	0.319* (0.167)	0.113 (0.157)
Suburban Support	0.140** (0.064)	0.022 (0.052)	0.040 (0.037)	0.019 (0.037)	-0.036 (0.029)	0.016 (0.028)
Psuedo R^2	0.661	0.734	0.481	0.693	0.825	0.909
F-stat for city fiscal variables (p-value)	4.82 (0.01)	5.24 (0.01)	0.91 (0.40)	2.37 (0.09)	0.08 (0.92)	2.34 (0.10)

†Estimation is by seemingly unrelated regression, instrumenting for Δ City Percent Poverty in the first panel and Δ City (% Old + % Poverty) in the third. Also included in each equation, with sign and significance in the first panel's equations indicated in parentheses, are the following: Δ Suburban Percent Poverty (-**;-**;-;-**;-**;-**), Suburban School Districts (+;-;-;-;+;-), Strong Teacher Unions (-;+;+;-;+;+**), Airline Hubs (+;+**;+;+**;+**;+**), and Interstate Highways (+;+;-;+;-;-), New England (+**;+**;-;-;+;+*), Middle Atlantic (+**;+**;-;-;+;+), Industrial Midwest (+*;+;+;+;+;+), Plains (+;+;+;+;+;+), Southeast (+;+;-;-;+;+), Mountain (+;+;+;+**;+;+), West Coast (+;+;+**;+;-;+), 1980 City Population Density (-;+;+;-;-;+*), 1980 Suburban Population Density (+**;+**;-**;-;+;+), Heating Degree Days (-**;-**;+;-**;-**;-), Cooling Degree Days(-;-**;+;+;-**;-), and the 1980 log value of the dependent variable (+;+**;+;-;+**;+**).

* Coefficients marked by * (**) are significantly different from zero with 90% (95%) confidence.

From the Table 3 estimates, the elasticities of city and suburban home values with respect to the rate of city poverty now equal -1.20 and -.55 respectively, while the elasticities of city and suburban incomes with respect to city poverty are -.40 and -.25, respectively. All estimates are strongly statistically significant. The elasticities of home values with respect to the re-specified city tax price are now -4.18 for cities and -2.63 for suburbs, while the new elasticities for incomes with respect to adjusted city tax price excluding CPOV are -1.52 for city income and -1.23 for suburban income. In all cases the effects are individually and jointly statistically significant. Strong city unions and weak governance remain negative and individually and jointly significant in the home value equation; the magnitudes of their effects are similar to those reported in Table 2. Table 3 also reports estimates of our model omitting city poverty from the analysis, decomposing city tax price into its respective changes in the poor and elderly populations and in the share of city employment in manufacturing, and finally, omitting city poverty and the components of tax price altogether. In this last specification, the only city fiscal variables which remain to explain city and suburban economic performance are strong unions and weak governance. We view these last estimates in Table 3 as perhaps the strongest test of our hypothesis. Both strong unions and weak governance continue to have negative and statistically significant effects on suburban home values. The negative effects are similar in magnitude to previous estimates. We conclude that inefficient and redistributive city finances hurts the economic performance of both the central city and its surrounding suburban economy.

Our second extension examines directly the role of city agglomeration economies as the channel through which city finances might impact the economic well-being of suburban residents. The specification reported in Table 4 adds the indicator variables for the presence of city and

TABLE 4: City Finances, Agglomeration, and the Suburban Economy[†]

	Home Value Appreciation		**Population Growth**		**Income Growth**	
	City	Suburban	City	Suburban	City	Suburban
Δ City Percent Poverty, Predicted	-5.934** (1.615)	-2.610* (1.384)	-2.831** (0.979)	-0.699 (0.934)	-1.858** (0.705)	-1.203** (0.587)
Strong City Unions	-0.117** (0.037)	-0.082** (0.032)	-0.026 (0.023)	0.055** (0.021)	-0.004 (0.016)	-0.010 (0.013)
Weak City Governance	-0.045** (0.022)	-0.058** (0.019)	-0.019 (0.014)	-0.003 (0.013)	-0.015 (0.010)	-0.022** (0.008)
Δ City Tax Price, ex-City Poverty	-6.605** (2.012)	-4.301** (1.720)	-4.461** (1.243)	-4.098** (1.176)	-2.364** (0.877)	-1.973** (0.727)
Δ State Aid	0.959** (0.373)	0.792** (0.319)	0.628** (0.228)	0.330 (0.214)	0.390** (0.162)	0.219 (0.135)
Suburban Support	0.129** (0.058)	0.018 (0.050)	0.043 (0.034)	0.036 (0.032)	-0.039 (0.026)	0.017 (0.021)
City Research University	0.088** (0.030)	0.054** (0.025)	0.048** (0.018)	0.024 (0.017)	0.035** (0.013)	0.021* (0.011)
Suburban Research University	0.114 (0.073)	0.036 (0.062)	0.082* (0.044)	0.057 (0.042)	0.076** (0.032)	0.024 (0.026)
Cultural Rank	0.076** (0.034)	0.030 (0.029)	-0.004 (0.021)	0.027 (0.020)	0.032** (0.015)	0.024** (0.012)
Psuedo R^2	0.732	0.767	0.596	0.767	0.870	0.944
F-stat for city agglomeration variables (p-value)	8.83 (~0)	3.46 (0.03)	3.53 (0.03)	2.34 (0.10)	7.73 (0.001)	5.01 (0.007)

[†]Estimation is by seemingly unrelated regression, instrumenting for Δ City Percent Poverty. Also included in each equation, with sign and significance in the above equations indicated in parentheses, are the following: Δ Suburban Percent Poverty (-**;-**;-;-**;-**;-**), Suburban School Districts (+;-;-;-;-;-*), Strong Teacher Unions (-;+;+;-;+;-), Airline Hubs (-;+;-;+;+;+), Interstate Highways (+;-;+;-;-;-), New England (+**;+**;-;-;+;+), Middle Atlantic (+**;+**;-;-;+;+), Industrial Midwest (+;+;-;+;+;+), Plains (+;+;-;+;+;+), Southeast (+;+;-;-;+;+), Mountain (+;+;+;+*;+;+), West Coast (+;+;+*;+;-;-), Heating Degree Days (-;-**;+;-*;-**;-), Cooling Degree Days (-;-;+*;+;-**;-),1980 City Population Density (-;+;+;-;-**;+), 1980 Suburban Population Density (+**;+**;-*;-;+*;+), and the 1980 log value of the dependent variable (+;+*;+;+*;+**;+**).

[*] Coefficients marked by * (**) are significantly different from zero with 90% (95%) confidence.

suburban research universities and the indicator variable for city cultural rank to the core specification just reported in Table 3, again allowing for endogenous city poverty and cross equation error correlations. An implication of the semi-logarithmic specification used here is that the adverse effects of redistributive city finances on city and suburban economies will be greater in the presence of positive agglomeration economies than when agglomeration effects are absent.[17] The presence of a city research university and an important city cultural center will, all else equal, add 8 to 9 percent to the decade's rate of appreciation of city home values and 3 to 4 percent to the decade's rate of growth in the city's average real incomes. City research universities also add 5 percent to decade's rate of growth of city population; though a strong arts infrastructure has no significant effect on city population. Most importantly for the argument here, a city research university and a strong city cultural presence enhance suburban home value appreciation and income growth as predicted by suburban proximity to center city agglomeration economies. Interestingly, there is no significant cross-effect on city home values and incomes of having a suburban research university. This is what we would expect if cities, not suburbs, were the primary centers of idea and production agglomerations. Our measures of weak city finances continue to have strong negative effects on the city and suburban economies.[18]

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[17] With the logarithmic specification for Y_{cr}, we have $\partial Y_{cr}/\partial X_{cr} = (\beta)Y_{cr}$. When agglomeration effects are positive, then Y_{cr} is larger and the marginal effect of weak city finances is larger as well.

[18] We have also repeated the analysis in Table 4 by adding interactions between the indicator variables for a city research university and strong cultural centers and each of the four fiscal variables, tested one fiscal variable at a time. If agglomeration effects are the important channel through which fiscal variables impact on the suburban economy, then these interaction effects should be negative and significant. The effects are negative but generally not statistically significant. The one exception is the interaction of city poverty and the arts infrastructure which is negative and significant in both the city and suburban home value appreciation equations; the estimates imply that when the rate of city poverty is greater than only 5 percent, the original positive effects on city

Our final extension follows the lead of Richard Voith (1998) and examines whether the economies of large MSA's ! defined here as those metropolitan regions whose regional population was equal to or greater than 250,000 residents in 1970 ! reacted differently to changes in city fiscal variables than did the economies of smaller MSA's. The smallest central city in one of our large MSA's is New Brunswick, N.J.. We extend the results in Table 4 by now adding an indicator variable for a *large MSA* (= 1, if 1970 MSA population $ 250,000, 0 otherwise) and *large MSA* interacted with changes in the rate of city poverty.[19] Estimation again allows for endogenous rates of change of city poverty and for cross equation error correlations. Results are presented in Table 5. Our four measures of weak city finances and our two measures of city agglomeration retain their joint statistical significance in each of the home value, population, and income equations, but now both *large MSA* and the interaction of *large MSA* with the change in city poverty prove statistically significant and economically important as well. All else equal, the larger MSA's show differentially higher rates of city and suburban home value appreciation, suburban population growth, and city and suburban income growth in the decade of the 1980's. More importantly it is in the large MSA's where center city poverty has its strongest negative effects on city and suburban home values and incomes. From Table 5, the implied elasticity of city home values with respect to the rate of city poverty is -.66 in the small MSA's but -1.57 in the large MSA's; the corresponding suburban home value elasticities with respect to city poverty are - .15 and statistically insignificant in the small

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home values of having a strong city cultural center are lost.

[19] We also tested for the significance of the interactions of *large MSA* with changes in the city's tax price and with the indicator variables for the presence of strong unions and weak governance. Those additional interactions were jointly insignificant in each of our six equations.

TABLE 5: City Finances, MSA Size, and the Suburban Economy[†]

	Home Value Appreciation		**Population Growth**		**Income Growth**	
	City	Suburban	City	Suburban	City	Suburban
Δ City Percent Poverty, Predicted	-3.553** (1.719)	-0.820 (1.490)	-2.631** (1.075)	-0.249 (1.014)	-1.237 (0.773)	-0.299 (0.632)
[Δ City Percent Pov. Predicted] * Large MSA	-4.896** (1.323)	-3.592** (1.144)	-0.402 (0.830)	-1.019 (0.777)	-1.192** (0.593)	-1.615** (0.482)
Strong City Unions	-0.113** (0.036)	-0.079** (0.031)	-0.026 (0.023)	0.057** (0.021)	-0.002 (0.016)	-0.007 (0.013)
Weak City Governance	-0.043* (0.022)	-0.056** (0.019)	-0.019 (0.014)	0.001 (0.012)	-0.015 (0.010)	-0.022** (0.008)
Δ City Tax Price, ex-City Poverty	-7.469** (2.000)	-4.878** (1.725)	-4.509** (1.267)	-4.532** (1.180)	-2.464** (0.894)	-1.966** (0.726)
Δ State Aid	0.953** (0.360)	0.792** (0.311)	0.626** (0.228)	0.320 (0.212)	0.392** (0.161)	0.227* (0.131)
Suburban Support	0.131** (0.056)	0.021 (0.049)	0.042 (0.034)	0.044 (0.032)	-0.039 (0.025)	0.017 (0.021)
City Research University	0.079** (0.029)	0.047* (0.025)	0.047** (0.018)	0.023 (0.017)	0.033** (0.013)	0.018* (0.010)
Suburban Research University	0.096 (0.070)	0.022 (0.061)	0.081* (0.044)	0.049 (0.042)	0.071** (0.031)	0.016 (0.026)
Cultural Rank	0.059* (0.034)	0.019 (0.029)	-0.005 (0.021)	0.019 (0.020)	0.030** (0.015)	0.024** (0.012)
Large MSA	0.188** (0.048)	0.132** (0.042)	0.014 (0.031)	0.067** (0.030)	0.038* (0.022)	0.043 (0.018)
psuedo R^2	0.750	0.778	0.597	0.773	0.872	0.947
F-stat for ΔPoverty*Large MSA and Large MSA (p-value)	7.77 (~0)	5.49 (0.004)	0.13 (0.85)	2.76 (0.06)	2.05 (0.13)	5.71 (0.003)

[†]Estimation is by seemingly unrelated regression, instrumenting for Δ City Percent Poverty. Also included in each equation, with sign and significance in the above equations indicated in parentheses, are the following: Δ Suburban Percent Poverty (-**;-**;-;-**;-**;-**), Suburban School Districts (+;+;-;-;-;-), Strong Teacher Unions (+;+;+;-;+;+**), Air Hubs (-;-;-;+;+;+), Interstate Highways (-;-;-;-;-;-), New England (+**;+**;-; +;+;+), Middle Atlantic (+**;+**;-;+;+;+), Industrial Midwest (+*;+;-;+;+;+), Plains (+*;+;-;+;+;+), Southeast (+;+;-;+;+;+), Mountain (+;+;+;+**;+;+), West Coast (+*;+;+*;+;-;+),1980 City Population Density (-;+;+;-;-**;+*), 1980 Suburban Population Density (+**;+*;-*;-;+;+), Heating Degree Days (-**;-**;+;-*;-**;-), Cooling Degree Days (-;-**;+**;+;-**;-), and the 1980 log value of the dependent variable (-;+;+;+;+**;+**).

[*] Coefficients marked by * (**) are significantly different from zero with 90% (95%) confidence.

MSA's but -.82 and statistically significant in the large MSA's. A similar pattern holds for the elasticities of city incomes.

Table 2 also provides estimates of the effects of the suburban fiscal variables and the common MSA variables on city and suburban home value appreciation and population and income growth. (The estimated coefficients for these variables for the specifications in Tables 3-5 are very similar to those reported in Table 2; they are available upon request.) There are no particular surprises in these results.

Since we are studying the case for, and ultimately the effects of, suburban-to-city fiscal assistance on the metropolitan economy, the effects on the city and suburban economies of the two metropolitan-wide aid variables, *state aid* and *suburban support*, are of particular interest. Both variables have significant positive effects on the city and suburban economies; see Tables 2-5. Using the estimates from Table 5, the sample's mean rate of increase in the ratio of state aid (= .01) mean a $400 to $460 increase in average suburban and city home values, respectively.[20] For our sample, a change in the ratio of state aid to own local revenues of .01 is fiscally equivalent to an average increase in annual real state aid of about $25/family. A $25 increase in annual state aid would imply, all else equal, an increase in home values of about $625 using the decade's real rate of interest of .04 (= $25/.04), a result plausibly close to the estimated increased in city and suburban home values.

While increases in state aid benefit both city and suburban residents, the presence of

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[20] From the logarithmic specification of the city home value (HV_c) equation: $\Delta HV_c/HV_c = .95\Delta$ (State Aid) or $\Delta HV_c = .95\Delta$ (State Aid)$\Delta HV_c = .95\Delta.01\Delta\$48,706 = \$462$ when evaluated at the 1980 mean city home value of $48,706. For suburban home values (HV_s): $\Delta HV_s/HV_s = .79\Delta$ (State Aid) or $\Delta HV_s = .79\Delta$ (State Aid)$\Delta HV_s = .79\Delta.01\Delta\$50,589 = \$400$ when evaluated at the 1980 mean suburban home value of $50,589.

suburban support measured by county government through which cities and suburbs share spending will involve a fiscal redistribution from suburban to city residents. The most important expenditures of counties are poverty spending and the costs of courts and prisons. Cities which can share these costs with their suburbs (e.g., Pittsburgh) will enjoy a fiscal advantage over cities which must meet these costs from city tax base only (e.g., Philadelphia). Thus we would expect these favored cities to have higher rates of home value appreciation, and perhaps higher rates of population and income growth as well. This is what we find. Using the estimates from Table 5, we find suburban aid in the form of county cost sharing has a strong positive effect on *central city* home values worth about $6380.[21] Interestingly, while suburban residents in the city's county help pay these costs, their home values appear to be unaffected by the transfer, and may actually rise by a small amount.[22] What does this mean? The fiscal transfer paid to the city by the suburbs must provide a compensating benefit to offset the cost of the transfer.[23] The possibility we are suggesting here is

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[21] From the logarithmic specification of our home value equations: $\Delta HV_c/HV_c = .138 \cdot$(Suburban Aid = 1), or $\Delta HV_c = .131 \cdot$(Suburban Aid = 1)$\cdot HV_c = .131 \cdot (1) \cdot \$48{,}705 = \$6380$ for a city home with our sample's average 1980 value of $48,705.

[22] For an average suburban home in our sample: $\Delta HV_s/HV_s = .021 \cdot$(Suburban Aid = 1), or $\Delta HV_s = .021 \cdot$(Suburban Aid = 1)$\cdot HV_s = .021 \cdot (1) \cdot \$50{,}589 = \$1062$, though the estimated effect of suburban aid on suburban home values is not statistically significant.

[23] Consider an MSA with 500,000 center city families, 20 percent of whom are poverty households, and with 800,000 suburban families, 10 percent of whom are poverty households, and where the state imposes mandated spending of $1000/poor family and where center city poor families require an additional $1000/family in added city spending (e.g., for education, health care, housing). If the city and the suburbs were to meet its poverty spending on their own, then middle class city residents would have to spend $500/middle class family (= $2000/poor x .25 poor families/middle class family) while middle class suburban families would have to spend only $111/middle class family (= $1000/poor x .111 poor families/middle class family). If the city and suburbs were to share these costs of poverty then the common expense would $250/middle class family. Thus city residents receive an annual net transfer of $250/family while suburban residents would lose $139/family annually with the shift to shared support for poverty. Discounting these gains and losses at the decade's real interest rate of .04 implies a gain in city home values of $6250

that suburban aid allows the city to hold the line on city taxes and/or to invest in city infrastructure, both of which protect city agglomeration economies thereby making the city's private economy more productive and the suburban location more valuable. If so, then suburban aid targeted to solving specific city fiscal weaknesses – here, poverty mandates – can be a "win-win" for firms and households in both the city and the suburbs.

How much money might suburbanites be willing to contribute to such assistance? Based on the parameter estimates reported in Table 5, Table 6 reports the estimated decline in suburban home values for our sample's average MSA because of adverse changes in the central city's finances over the decade of the 1980's. The estimates are based on our sample's mean change over the decade 1980-1990 in the city's tax price (from .50 to .51) and in the rate of city poverty (from .20 to .23) and for the estimated effect over the decade from having strong public employee unions or weak governance. The estimated change in suburban home values (ΔHV_s) provides a direct measure of the change in suburban resident welfare because of weak city finances; see Haughwout (2002b). Amortizing the loss in suburban home values at the decade's real interest rate of .04 gives a direct estimate of the average suburban resident's annual willingness to pay (WTP_s) to remove each of the city's adverse fiscal changes: $WTP_s = -.04\Delta HV_s$. For comparison we also report estimates of changes in city resident home values and estimates of what an average city resident might pay to

(=$250/.04) and fall in suburban home values of -$3475 (-$139/.04). The $6250 gain in city home values is very close to what is estimated for our sample cities from shared suburban support. To match the observed suburban home value *gain* of $1062, there must have be a compensating benefit of $4537/family to offset the fiscal loss of $3475/family. This gain of $4537/family is consistent with the estimated benefits to suburbanites from reduced city poverty spending; see Table 6.

TABLE 6: Weak City Finances and Resident Home Values[^]

	ΔHV_s	WTP_s	ΔHV_c	WTP_c
Δ City Tax Price = .01:	-$2468	$99	-$3638	$146
	(873)	(35)	(974)	(39)
Δ City Percent Poverty = .03				
Large MSA:	-$6696	$268	-$12345	$494
	(2212)	(88)	(2460)	(98)
Small MSA:	-$1244	$50	-$4997	$208
	(2261)	(90)	(2512)	(100)
Strong City Union = 1:	-$4047	$162	-$5358	$214
	(1563)	(63)	(1739)	(70)
Weak City Governance = 1:	-$3035	$121	-$1948	$78
	(946)	(38)	(1052)	(42)

[^] Estimates of $\Delta HV_{s,c}$ and $WTP_{s,c}$ and associated standard errors are based upon coefficient estimates and standard errors reported in Table 5.

remove the same city fiscal disadvantages.[24]

Our estimates suggest our average suburban resident might be willing to pay from $102 per homeowner ( ) Tax Price) to perhaps as much as $267 per homeowner ( ) City Poverty, Large MSA's) to reduce the adverse effects of weak city fiscal institutions on their suburban economy. Not surprisingly, city landowners will also be willing to contribute to reform the same weak city fiscal institutions. Each institution – strong unions, weak governance, tax structures, and most importantly, the tax base and mandate effects of urban poverty – redistributes income from middle class and upper income city homeowners and businesses to lower and moderate income city residents and public employees. Because of the usual inefficiencies of local taxation and further, the importance of lost city production and consumption agglomeration economies, this redistribution is not zero-sum. Within city fiscal redistribution imposes efficiency losses which reduce the value of both city *and* suburban properties.[25] Fiscal redistributions will be greater and city and suburban

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[24] Table 6 estimates of home value changes for the suburbs and the city are computed for the average suburb and city in our sample using the reported estimates in Table 5. Thus) HV_s/HV_s = - 4.88( ) City Tax Price = .01) = -.0488 or an absolute change for the mean suburban home worth $50,589 in 1980 of) HV_s = - 4.88( ) City Tax Price = .01)(\$50,589) = - $2468. This is the result reported in Table 6. Amortized at an annual interest rate of .04, the average suburban resident would be willing to pay up to $99 per year (= -.04(-$2468)) to hold the city's tax price at its 1980 value of .50; see WTP_s in Table 6. For city residents,) HV_c/HV_c = - 7.47( ) City Tax Price = .01) = -.0747 or an absolute change for the mean city home worth $48,705 in 1980 of) HV_c = - 7.47( ) City Tax Price = .01)(\$48,705) = - $3638. This is the result reported in Table 6. Amortized at an annual interest rate of .04, the average city resident would be willing to pay up to $146 per year (= -.04(-$3638)) to hold the city's tax price at its 1980 value of .50; see WTP_s in Table 6. Other estimates reported in Table 6 are computed similarly.

[25] These losses are likely to be larger for city than suburban residents, and this is what we find in Table 6. The one exception to this pattern is for weak governance, where our estimates imply WTP_c = \$78 while WTP_s = \$121. *If* the suburbanites' WTP_s reflects only losses from higher private good prices and *if* a city resident's losses from higher city prices are at least as large as a suburbanite's losses – as would be the case if city goods are a larger share of city residents' budgets than of suburban residents' budgets – then our estimates imply weak city governance confers a *fiscal*

land value losses larger, the less able are the city's fiscal institutions to control rich to poor and taxpayer to public employee transfers. City and suburban homeowners have a joint interest in reforming or at least minimizing the adverse economic impact of these weak city fiscal institutions.

Summary: Three conclusions emerge from our empirical analysis. First, the fiscal institutions of our central cities offers one potentially important causal explanation for the observed correlations between U.S. city and suburban economies. Metropolitan areas whose city fiscal institutions allow significant redistributions from city taxpayers to poor households and city employees will see lower city *and* suburban home value appreciation and lower income and population growth. Metropolitan areas whose cities control these fiscal redistributions will enjoy higher metropolitan-wide home value appreciations and income and population growth. Second, our estimates suggest suburban residents may be willing to make significant annual financial contributions to reform or at least ease the burden of redistributive tax structures, strong unions, weak governance, and most importantly, rising rates of city poverty. Third, there is evidence that general fiscal assistance in the form of greater state aid and targeted suburban-to-city support will enhance the overall economic performance of both the city and suburban economies. The results here provide evidence for suburban-to-city fiscal assistance.

Our empirical analysis in Tables 2-5 establishes a link from city finances to suburban welfare for an *average* U.S. MSA, but an important question remains: Does this link hold in a particular

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benefit on city residents of at least $43 per year (-$78 = +*$43* (+) -$121). Does this make sense? Yes, if weak governance favors city residents over city business by lowering resident taxes (or raising resident services) and by raising business taxes (or lowering business services) and if city zoning leads to separate residential and commercial property markets. Businesses still leave the city lowering city agglomeration economies but city residents now get a fiscal transfer which offsets, at least in part, the resulting rise in private goods prices. Suburban residents suffer only the burden of higher private good prices.

MSA, and if so, how big a check should those suburban residents write? To provide an answer we must understand the exact nature of the fiscal link between city and suburbs. For this we need a structural model tying city finances to suburban economic welfare. In particular, can weak city finances and lost agglomeration economies account for the suburban losses reported in Table 6? Section IV provides the required structural analysis, calibrated to the Philadelphia metropolitan economy.

IV. City Finances and the Suburban Economy: A Structural Analysis

In today's mobile society, any individual central city is only one of many competitive locations for firms and households. In open MSA economies, capital must earn the world's competitive rate of return, goods and services must sell at competitive world-wide prices plus transportation costs, and residents must receive an overall level of utility comparable to that available in all other MSA's. Here we specify a structural model for how such an open MSA economy might work. The analysis extends our earlier study of fiscal policy in an open central city economy (Haughwout and Inman; 2001) by first allowing for agglomeration economies among city firms and then second, by including a fringe of fiscally competitive suburbs located next to the central city.

Firms within our MSA are price-takers. They need to earn the competitive after tax rate of rate of return on their capital, and they sell their output in a competitive world market at an exogenous world price plus transportation costs. Households in the MSA are "utility-takers," needing to receive the exogenous level of resident utility available in alternative world locations. Our MSA contains one central city and one suburb (or many identical suburbs). City firms produce

the world commodity using city land, city resident workers, corporate managers (who all live in the suburbs), and firm capital. Total workers within the city provide an agglomeration advantage to city firms specified here as a Hicks-neutral shift in firm productivity; see Ciccone and Hall (1996), Ciccone (2002), and Beardsell and Henderson (1999). The elasticity of city firm output with respect to the density of city workers is set at a very modest value of .01 to reflect the fact that not all of city output benefits from agglomeration economies; for comparison, Ciccone and Hall and Ciccone find aggregate elasticities of output with respect to worker density of .05. There are no agglomeration economies in city consumption in our model.

Suburban firms provide only retailing services combining the single consumption good with suburban land, suburban resident workers, and firm capital. There are no agglomeration economies in suburban retailing. Suburban residents buy all their private good consumption from suburban "retailers" even though they might actually consume the good within the central city (entertainment; hospital services; legal services).[26] City firms have a transportation cost advantage over non-MSA firms in meeting suburban residents' demand for the common consumption good. It is this proximity to low cost central city production which makes suburban locations attractive. In specifying our model, the transportation cost advantage for city firms is set at $.15/dollar of suburban imports, chosen to replicate actual Philadelphia suburban land values in our baseline simulations. It is possible that in equilibrium city firms may not be able to supply all suburban demand. In this case the consumption good is imported by suburban retailers from outside the MSA; transportation costs are necessarily higher for these marginal units. City and suburban households

[26] City residents receive their retailing services directly from city firms as a by-product of city firm production.

have a common utility function defined over this single consumption good, housing structures, land, and the locally produced public good.

In our MSA, there is one public good provided separately by the city and by the suburbs. The public good is paid for by local taxes and consumed jointly by firms and households within the jurisdiction. The good is a pure (Samuelsonian) public good specified as a stock (e.g., roadways; tenured teachers and schools) which provides an annual flow of benefits to firms and households within the local jurisdiction. Households pay the annual interest costs and depreciation needed to purchase and maintain this stock. There are no public good spillovers across jurisdictions. For city producers and suburban retailers, the public good acts as a Hicks-neutral shift in output which improves the firm's total factor productivity; see Haughwout (2002a). The public good provides direct utility to each jurisdictions' residents.

There are poor and elderly families residing in both the central city and the suburbs of our MSA. Poor residents receive a federal and state funded income transfer; elderly households receive social security benefits. Both the poor and the elderly purchase the private consumption good, housing, and residential land. They also benefit from the locally provided public good. Both the poor and the elderly receive mandated services from their local city or suburban government, services paid for through local taxation. Once located, poor and elderly families do not move between the city and the suburbs nor will they exit or enter the MSA; see Meyer (1998). Poor families pay taxes on their housing, land, and goods consumption but not on their transfer income. To the extent there are mandated services for these households and the cost of these services exceeds the poor and elderly's tax payments, poor and elderly families will be a net fiscal burden on city and suburban firms and working households. The net burden will be greater, the greater is the share of

the jurisdiction's population who are poor and elderly. Residents do not care about the welfare of the poor and elderly; there are no redistributive preferences within the MSA.

Determined within the model's private economy are: city and suburban populations; city and suburban employment including corporate managers needed to run city firms; city and suburban firm capital; city and suburban wages; city and suburban land prices; city and suburban production and sales; and finally, city and suburban consumption including the purchase of residential land and housing services. The equilibrium of the MSA's private economy defines the tax bases available to city and suburban governments. Governments can tax the property of firms and households, the wages and consumption of residents, and the sales of city firms. Tax revenues *plus* exogenous (lump-sum) state and federal intergovernmental transfers *minus* the mandated costs of services for poor and elderly residents are allocated to purchase a single public good which benefits both firms and households within the taxing jurisdiction. In the MSA's public economy, city and suburban tax rates and thus the level of the city's and the suburb's public goods are chosen by city and suburban politicians. City politicians are assumed to be revenue maximizers and therefore to always select those tax rates which maximize city aggregate revenues – that is, city politicians go to the top of their city's revenue hill.[27] We assume suburban politicians are responsive to the public goods demand of suburban residents, selecting that tax rate which gives the median resident household their preferred level of the suburban public good. We assume the suburban government uses only the property tax to pay for suburban public services.

[27] We adopt this specification of city politics based upon the results in Haughwout, et. al.(2000) which estimates revenue hills for four large U.S. cities – Houston, Minneapolis, New York City and Philadelphia – and finds that with the possible exception of Minneapolis each city has selected tax rates which (almost) maximize city revenues.

The private and public economies are linked. Tax rates and public goods will affect the after tax rates of return for city and suburban firms and the final utilities received by city and suburban residents. After tax rates of return and resident utilities coupled with our assumption that our MSA is one of many competitive MSA's defines the location of firms and households in the MSA's city and suburbs. The location of households and firms determines city and suburban population, employment, wages, land rents, and consumption which together define city and suburban tax bases. We solve for the equilibria of the MSA's private and public economies jointly. The model is calibrated to approximate the spatial, demographic, and fiscal structure of the Philadelphia MSA for the year 1990. Appendix B provides a brief description of the model's formal structure and outlines our solution algorithm.

If there is an income loss for suburban residents from weak city finances then in this simulated metropolitan economy it will have to come from the higher cost of consuming private goods and services. By construction there are no direct public good spillovers from the city to the suburbs, all suburban residents except commuting city managers work in the suburbs, and suburban residents have no altruistic motives towards central city low income households. Weak city finances means higher city taxes and lower city public goods, both of which encourage firms and households to leave the central city. Fewer city firms means less efficient city production because of lost agglomeration economies *and* less aggregate city output. Both effects raise the cost to suburban residents of buying the private consumption good. The model here formalizes the intuitions of Section II for how weak city finances can jointly depress city and suburban economic activities.

The direct economic benefits to suburban residents from locating near the central city are measured as in Section II by the income savings from living near an economically efficient central

city: $Z_s = x_s^c[(k^o + t^o) - (k^c + t^c)]$. Weak city finances has the potential to lower these suburban economic gains by reducing the availability of low-cost output coming from a now smaller central city ($\partial x_s^c < 0$), by raising the production costs of city output because of lost agglomeration economies ($\partial k^c > 0$), or finally, by raising the cost of shipping goods from the city to the suburbs ($\partial t_c > 0$). Generally,

$$\partial Z_s = \partial x_s^c[(k^o + t^o) - (k^c + t^c)] + x_s^c[-(\partial k^c + \partial t^c)] \# 0.$$

In our model, the most important of these effects is the loss in city output ($\partial x_s^c < 0$) and the resulting need for suburbanites to purchase goods from other, more distant and perhaps less efficient cities.[28] Table 7 provides estimates of ∂Z_s and the related economic consequences for the suburban economy which arise with each of the four inefficient or redistributive central city fiscal institutions.

Table 7 first shows the baseline equilibrium of the city and suburban economies before changes in city fiscal institutions. The baseline is calibrated to correspond to the Philadelphia MSA and provides a reasonable approximation to the actual 1990 Philadelphia MSA economy, except that aggregate city output and city population are both somewhat smaller than actual 1990 city output and population. The reason for this difference is that we have computed the baseline economy assuming city politicians set the city property tax rate to maximize aggregate city revenues. Actual 1990 Philadelphia property tax rates were in fact slightly below this revenue maximizing rate; see Haughwout and Inman (2001). Raising city property tax rates to the peak of the city's revenue hill

[28] Our model assumes constant costs of shipping, so $\partial t = 0$. Our model is an open economy model in which city firms not only ship output to the suburbs, but potentially compete with other cities' firms in a world market. If so, then city firms must be as efficient as other firms and thus k^c – the average cost of firm output – must be constant. This is achieved by capitalizing all fiscal and production inefficiencies into an offsetting decline in the price of land or labor for city firms. Because of this specification, $\partial k^c = 0$ as well. This leaves $\partial Z = \partial x_s^c[(k^o + t^o) - (k^c + t^c)]$.

TABLE 7: Weak City Finances and the Private Economy: Philadelphia MSA

BASELINE

	Output (X billion)*	*Z (Z*, $ per hh)*	*Land Value (R*, $ per hh)*	*Wages (W*, $ per worker)*	*Earned Income ($ per resident hh)*	*Households (N*)*
City:	$15.8b	$2,754	$22,810	$33,120	$33,120	364,197
Suburbs:	$28.3b	$2,134	$19,517	$27,090	$45,000	635,576

CHANGES FROM BASELINE

	*)X**	*)Z**	*)R**	*)W**	*)Y**	*)N**
) City Tax Price, excluding poverty = .01						
City:	- $0.6b	/0	-$420	¶0	¶0	23,535
	(-3.7%)	(--)	(-1.8%)	(--)	(–)	(6.5%)
Suburbs:	- $2.2b	-$162.26	-$2,264	-$90	$-578	-34,333
	(-7.8%)	(-7.6%)	(-11.6%)	(-0.3%)	(1.3%)	(-5.4%)
) City Percent Poverty = .03						
City:	- $1.7b	/0	-$2,269	¶0	¶0	-19,997
	(-11.0%)	(--)	(-9.9%)	(--)	(–)	(-5.5%)
Suburbs:	- $1.9b	-$275.5	-$2,312	-$90	-$763	-35,732
	(-6.8%)	(-12.9%)	(-11.8%)	(-0.3%)	(-1.7%)	(-5.6%)
Strong City Unions = 1						
City:	-$4.3b	/0	-$5,700	$5	$5	-58,917
	(-27.0%)	(--)	(-25.0%)	(0.0%)	(0.0%)	(-16.2%)
Suburbs:	-$1.3b	-$664.1	-$2,410	-$90	-$3,770	-38,665
	(-4.5%)	(-31.1%)	(-12.3%)	(-0.3%)	(-8.4%)	(-4.7%)

	)X*	)Z*	)R*	)W*	)Y*	)N*
Weak City Governance = 1						
City:	-$3.1b	/ 0	-$4,646	-$216	-$216	-104,157
	(-19.6%)	(--)	(-20.4%)	(-0.7%)	(-0.7%)	(-11.0%)
Suburbs:	-$1.5b	-$486.9	-$2,375	-$90	-$3,746	-97,632
	(-5.5.%)	(-22.8%)	(-12.2%)	(-1.2%)	(-8.3%)	(-5.9%)
EXHIBIT						
Full Taxation of Business Property						
City:	-$6.3b	/ 0	-$9,343	-$518	-518	-83,391
	(-40.0%)	(--)	(-40.9%)	(-1.6%)	(–)	(-22.9%)
Suburbs:	-$7.0b	-$995.7	-$7,639	-$315	-$3,746	-132,288
	(-24.9%)	(-46.6%)	(-39.0%)	(-1.2%)	(-8.3%)	(-20.8%)

TABLE 7: NOTES

) **City Tax Price, excluding poverty = .01**: Approximated by raising Philadelphia's initial percent elderly from 22.2% to 26.8%, sufficient to raise the city's tax price (HV_c/B_c) from 0.40 to 0.41.

) **City Percent Poverty = .03**: Approximated by increasing Philadelphia's initial percent poor from 20% sufficient to ensure an equilibrium percent poor equal to 23%, and increasing the mandated local share of transfer income costs from 0.095 to 0.2.

Strong City Unions = 1: Approximated by increasing the production cost of the public good for Philadelphia from 1 to 1.15 to approximate the relative growth in public employee wages in strong union cities during the 1980's.

Weak City Governance = 1: Approximated by increasing the share of the business property subject to the city's property tax from 75% to 85%, implying a balanced budget increase in public goods available for households and firms.

Exhibit: Approximated by increasing the share of the business property subject to the city's property tax from 75% to 100%, implying a balanced budget increase in public goods available for households and firms.

* Denotes equilibrium values; *hh* denotes information presented per household.

depresses city output, employment, and therefore population. In the baseline economy, aggregate production by city firms is $15.8 billion and is sufficient to meet the $6.7 billion in aggregate demand of city residents, leaving $9.1 billion for export to the suburbs. City exports however are not sufficient to meet aggregate suburban demand of $28.3 billion; thus $19.2 billion must be imported to the suburbs from outside the MSA at a transit cost premium of $.15 per dollar of imported goods. The average suburban resident or retailer enjoys a savings of Z_s = $2,134 per household because city exports reduce the need to import from outside the MSA.[29] Table 7 also reports a comparable savings for city residents of Z_c = $2,754; $Z_c > Z_s$ since the typical city household is able to buy all of its output from city producers.[30] The land value for a typical city resident in the baseline is $22,810; the average household buys .05 acres of city land (apartments) valued at $423,317 per acre. The average suburban household consumes .98 acres of suburban land valued at $20,000 per acre. The high value of central city land reflects the attractiveness of a city location to firms because of the cost savings from agglomeration. The low cost of suburban land reflects the relative availability of suburban land in our simulated economy; included in the .98 acres of suburban land per household would be publicly owned land residents "consumed" through local governments as town parks and open space. City workers earn a wage of $33,120 and since all city residents work in the city, the average resident's income is also $33,120. Suburban residents work

[29] Z_s equals imports from the city of $9.1 billion times $.15 per dollar of city imports divided by the equilibrium number of suburban households of 635,576. Only the transit cost difference matters here because in our model the city must be competitive with the world economy in the costs of production so that $k^c = k^o = 1$ always.

[30] Z_c is calculated to equal city consumption of $6.7 billion times $.15 per dollar of city "imports" divided by the equilibrium number of city households of 364,197. Actual city resident savings from being able to consume city produced goods rather than imports from outside the MSA is marginally larger than Z_c because of the extra cost of shipping from the suburbs to the city.

either in the suburban retail sector and earn a wage of $27,090 or work in the central city as a corporate manager and earn the exogenous manager wage of $140,000. The manager wage was chosen to ensure that the baseline suburban income (Y_s) equaled the 1990 average Philadelphia suburban income of $45,000.[31]

Table 7 then reports the effects of four new simulations, each meant to approximate an adverse change in the central city's fiscal institutions comparable to that experienced by the average central city during our sample decade, 1980-1990. To approximate the effects of an average increase in the central city's tax price ( ) Tax Price = .01) we increased the percent of Philadelphia's population who are classified as elderly from 22.2 percent to 26.8 percent; elderly residents own smaller homes, shifting more of the city's tax obligation onto firms and wealthier homeowners as a higher tax price. To approximate the fiscal consequences of our sample's average increase in the rate of city poverty (= .03) we first increased Philadelphia's poverty rate from .20 until the rate rises in equilibrium to .23 ( ) City Poverty = .03). The increase in the poverty rate increases the fiscal costs of current poverty mandates and lowers city tax prices, but these effects alone have only modest adverse effects on city and suburban home values. To more closely approximate the empirically estimated changes reported in Table 6 following increases in city poverty, it was necessary to also double the mandated budgetary costs of poverty. This result suggests the empirically observed adverse effects of poverty are likely due to more than simply the direct fiscal effects of having more poor families drawing city budget dollars. The fiscal consequences of having strong public employee unions (Strong Union = 1) are approximated by a decade long increase in

[31] In the baseline economy there are 406,036 suburban retail workers earning $27,090 and 76,483 corporate managers employed by city firms earning $140,000. The resulting average suburban income is $45,000.

the production costs of city public goods of 15 percent, or equivalent by a 1.4 percent annual rate of increase in city worker real wages. Finally, the fiscal consequences of weak budgetary institutions (Weak Governance = 1) are approximated by a shift in the Philadelphia tax burden from residents to business by reducing the exemption of business capital (machines) from property taxation from a 100% to a 50% exemption; the resulting additional business taxes are allocated to provide more of the city's public good which benefits both residents and firms.

Table 7 reports the effects of these four adverse fiscal changes on city and suburban output, Z_c and $Z_{s,}$ city and suburban land values, city and suburban resident wages and incomes, and city and suburban population. Each change is measured from its value in the baseline economy; change as a percentage of the baseline is reported in parentheses. In this economy, the only route through which these city fiscal changes can impact suburban residents is through the final average price they pay to consume city-produced goods and services. Weak city fiscal institutions lead to higher fiscal costs for mobile city firms and households which leads in turn to the exit of firms and residents from the city. As a result city output is smaller and so too is city population. With the exit of city firms and residents, city land values and city resident wages (= incomes) fall. City firms sell their new output levels first to city residents, saving on transportation costs. Since there is enough city output to still satisfy city residents' demands, there will be no change in Z_c for the remaining city households; thus $) Z_c / 0$. Suburban residents will see a fall in their value of Z_s, however. Since the city economy is smaller, there are fewer goods and services available to export to suburban residents. Suburban residents must now import more of their consumption from outside the MSA, leading to a fall in Z_s and an initial worsening of suburban resident welfare or suburban retailing profits. Suburban residents and firms exit the MSA. The equilibrium result will be an economically

smaller suburban economy and a fall in suburban land values, wages, and incomes; see Table 7.[32] This structural model of an open economy MSA provides an economic foundation for the intuitions of Section II and the reduced form econometric results of Section III. Weak city fiscal institutions can *cause* declining city and suburban economies.

Finally, in this setting how much will Philadelphia suburbanites be willing to pay to prevent the introduction of these weak city fiscal institutions? The values of ΔZ_s^* reported in Table 7 measure the initial burden on suburban resident incomes (fall in $V_s = V_0$ in Figure 1) or suburban retailing profits (fall in $A_s = 0$ in Figure 1) from increases in city tax prices, rates of poverty, union wages, and business taxation. The final, equilibrium effect on suburban resident welfare is measured by the fall in suburban land values in Table 7 (ΔR_s^*) ! that is, by what people will pay to live in the suburbs. The amortized cost of these land value losses give a measure of suburbanites' annual willingness to pay (WTP_s) to remove, or to offset the adverse fiscal effects of, these weak city fiscal institutions in our simulated economy. At an annual interest rate of .04, these annual WTP_s's are \$91/household (= .04¢ΔR_s^* = .04¢\$2264) for a .01 increase in Philadelphia's tax price, \$92/household for the .03 increase in the equilibrium rate of city poverty, \$96/household for the added labor costs from strong city unions, and \$95/household because weak governance shifts city

[32] The only exceptions are ΔN_c and ΔY_s in the simulations of Δ City Tax Price = .01. Here we exogenously increased the number of *immobile* elderly sufficient to reduce the ratio of b/B for the typical working city resident. The necessary increase in the elderly population means that total population in equilibrium rises ($\Delta N_c > 0$), though the number of worker residents does decline. The city is economy is smaller, but not by very much because the increase in the elderly population sustains demand for city goods. But exports to the suburbs falls significantly and this has an associated large negative effect on the suburban economy. Thus suburban employment in the retail sector falls. However, because the city economy has declined only slightly the number of corporate managers earning the fixed corporate wage of \$140,000 falls only slightly. Thus the distribution of income in the suburbs moves in favor of the wealthier residents. This fact explains the rise in average suburban income ($\Delta Y_s > 0$) seen in Table 7.

property taxation from residents to firms. These simulated WTP_s for the Philadelphia suburbanites are comparable in magnitude to (i.e., within one standard deviation of) the estimated results for the U.S. sample as a whole as reported in Table 6.

Table 7 includes a final simulation as an Exhibit to illustrate the importance of city business taxes for the economic performance of the MSA economy. The Exhibit shows what happens in our simulated MSA economy when Philadelphia removes completely its current exemption of business capital from property taxation. The effect is to increase the equilibrium tax rate on business property from .02175 to .029. This is a 33 percent increase in the effective rate of business property taxation and it leads to a 40 percent decline in the equilibrium size of the city economy and a 25 percent decline in the equilibrium size of the suburban economy. City and suburban land values decline by the same percentage. City and suburban populations both decline by a bit more than 20 percent. In a city with just a modest degree of agglomeration, taxing business can have very large negative effects on MSA economic performance and on the welfare of current residents, as measured by changes in city and suburban land values. If suburban residents wish to give fiscal assistance to their central cities, then assistance should be targeted towards tax relief for central city businesses, particularly those businesses where production and consumption agglomeration economies are important.

Summary: Two conclusions follow from the analysis presented here. First, a structural political economy model of the MSA economy whose three key features are fully mobile firms and households, inefficient and/or redistributive city fiscal institutions, and city-specific agglomeration economies can explain both the direction and magnitudes of the city-suburban interdependencies found in our reduced form econometric analysis for U.S. MSA's over the 1980's. The elasticity of

city agglomeration economies used to specify the structural model and the level of fiscal redistribution imposed by each weak city fiscal institution are both at the conservative end of current micro-econometric evidence. One does not need to work very hard within our structural model to rationalize current MSA correlations. Second, the structural model clearly reveals the importance of business taxation to the overall economic performance of cities and suburbs. City business taxation which undermines the productive advantage of central city locations has large negative effects on the city economy and, because of the importance of city-to-suburban trade, nearly as large negative effects on the suburban economy. Protecting these center city production advantages from the consequences of redistributive local politics is in the interest of most all city and suburban residents.

V. How Should Suburbs Aid Their Central Cities?

Because of natural competitive advantages or simply economic history, U.S. central cities are today important production and consumption centers potentially favored by significant agglomeration economies. Unfortunately, our current institutions of local public finance impose redistributive burdens on the city firms and middle and upper income households which undermine the efficiency advantages of city production. State laws setting unfunded poverty mandates, creating monopoly unions, allowing redistributive local taxation, and imposing weak structures of city governance each strengthen the ability of lower income households, public employees, and neighborhoods to extract fiscal resources from productive but mobile firms and households. The exit of firms and households undermines city agglomeration economies. The average city resident loses from this redistribution game – remember the declines in city land values in Tables 6 and 7 – and

so too does the typical suburban resident. The question now becomes: Can we reorganize central city public finance so that all parties to the city's redistribution game – city and suburban landowners *and* the current winners from city redistribution – might be made better off? The answer is, potentially yes. Comparing our estimates in Section II of the average transfer paid per city resident by each redistributive fiscal institution to the maximal gain to suburbanites as reported in Table 6 of removing those institutions suggests that sufficient compensation can be found to facilitate institutional reform. The work here suggests suburbanites will gain annually $2 to $4 for every $1 of suburban aid paid to compensate those city residents potentially harmed by institutional reform.[33] Suburban aid must be tied to successful institutional reforms, however. Four reforms seem particularly promising.

First, poverty mandates should be fully funded and revenues lost through poverty's direct effect on average city tax base should be replaced through a residential tax base equalization grant.

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[33] For example, an explicit duty to bargain imposes a 2 to 5 percent increase in city taxes to for increased pay and benefits to city public employees. Removal of the duty to bargain will presumably harm those same employees by a comparable amount. In our sample, city households pay an average $2500 a year in city taxes; a 5 percent increase in city taxation due to duty to bargain rules implies a $125 per city household transfer from city taxpayers to city public employees. Removing duty to bargain rules removes this transfer. If suburbanites were to compensate city public employee for their losses, then in our sample each suburban family would need to contribute $62.50; there are two suburban households for each city household. If this aid ensured the passage of duty to bargain reform, suburban households would benefit by increased home values of $4047 which has an annual value of $162 per year; see Table 6. The implied benefit to cost ratio for suburban residents of paying compensation to ensure reform will be $162 to $62.50 or 2.6 to 1. The source of surplus is the improved private sector economic efficiency following fiscal reform. Note that city residents (who also benefit) cannot pay this annual compensation through the current structure of city taxation since this would simply return the city to the original fiscal status quo. For full benefits, funding must come from outside the city -- for example, from the suburbs or from the state. Similar calculations can be done for reform of each of the other weak city fiscal institutions. In all cases suburban benefits exceed compensation costs by at least a factor of 2: Poverty relief for mandates and lost tax base, 2.2 to 1; Reform of weak governance, 3.2 to1; Tax structure reform, 4 to 1. Calculations available upon request.

Second, efforts should be made to encourage the competitive provision of city services, either by relaxing strong duty to bargain rules or equivalently by passing laws which allow cities to contract out for the provision of city services. The state of Pennsylvania's recent takeover of city school management requiring the city to accept bids from private providers to manage the city's worst performing schools is an example of such reform. Third, cities losing tax base because of demographic shifts and structural declines in their manufacturing job base should be given transition aid tied to business tax relief to prevent further declines in the business tax base. Even more aggressive reforms would replace the city's general property tax by a resident-based property tax or a resident-based income tax, with cities allowed access to user fees to fund city provided business services. To the extent city businesses use city infrastructure which cannot be priced through user fees ! roads are the prime example ! the city should be given matching infrastructure grants tying funding to new construction or maintenance. Fourth, ward-based city politics should be replaced by at-large politics by requiring cities to elect an at-large mayor; the elected mayor should be given broad agenda setting and veto powers.

Each of these institutional reforms may require compensation of the reform's losers if passage at the state or metropolitan level is to be achieved. Here is where suburban-to-city aid plays a useful role. First, suburban aid should be given to fully fund state poverty mandates. Further, a city-suburban tax base equalization aid program equalizing the residential component of local tax bases should be adopted to remove the adverse tax price effects of large poverty concentrations in central cities. Second, suburban aid can be made available to local governments who adopt competitive bidding for core city services. Such aid should be sufficient to compensate the current median-aged public employee, paid perhaps through targeted pensions or early retirement

payments; once that worker retires with her fully funded pension, however, aid should stop. Third, suburban funded transition aid should be given to cities for their loss of revenues from the taxation of business property, perhaps most easily done as part of a general reform of local property taxation. We would recommend the reform restrict local property taxation to the taxation of resident property only or perhaps go further and simply restrict local taxation to resident income or wage taxation. Fourth, suburban aid should be given, as above for private contracting reforms, to current city workers released by cutbacks in neighborhood services because of the adoption of more efficient strong mayoral politics. Each of these four aid program can be financed and administered at either the state or metropolitan level.

As economists, we stress the virtues of competition. As Charles Tiebout (1956) first noted and as much recent evidence confirms, those virtues are clearly present in large metropolitan public economies. As economists, we also note the virtues of cooperation. As Paul Samuelson (1954) has argued, when there are significant economic spillovers or increasing returns to scale – of which city agglomeration economies is one important example – then cooperative behavior is appropriate. This paper suggests that in city agglomeration economies there might be a compelling *new* reason for our cities and suburbs to work together to reform inefficient central city fiscal institutions.

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Appendix A: Descriptive Statistics for Key Variables

	1980		1990		
	City	**Suburbs**	**City**	**Suburbs**	**Source**
Dependent Variables					
Average House Value	48,705.76 (17,061.46)	50,588.61 (19,352.93)	53,146.24 (27,482.17)	57,740.93 (37,268.31)	Voith (1998)
Population	216,033.80 (540,339.60)	380,820.80 (584,602.00)	226,504.40 (561,303.10)	440,103.90 (678,963.70)	Voith (1998)
Per Capita Income	8,350.57 (1,233.39)	8,777.52 (1,363.02)	9,694.51 (1,691.45)	10,694.30 (2,338.34)	Voith (1998)
City and Suburban Fiscal and Economic Environment					
Percent Poverty	15.72 (5.55)	19.97 (20.82)	18.52 (6.42)	22.29 (25.62)	Decennial Censuses, Standard Tape File 3, 1980 and 1990
Percent Employment in Manufacturing	18.79 (9.06)	--	14.50 (6.98)	--	County Business Patterns, 1980 and 1990
Percent Elderly	12.24 (3.15)	--	13.21 (3.20)	--	Decennial Censuses, Standard Tape File 3, 1980 and 1990
Strong City Unions	0.13 (0.33)	--	0.13 (0.33)	--	Valetta & Freeman (1986)
Weak City Governance	0.68 (0.47)	--	0.68 (0.47)	--	International City Manager's Association, *Municipal Yearbook*
City Tax Price*	0.51 (0.02)	--	0.52 (0.02)		See below
City Tax Price, excluding City Poverty	0.48 (0.02)	--	0.49 (0.02)		See below

Research University	0.22 (0.51)		0.22 (0.51)		US News and World Report, 2000
Cultural Rank	0.25 (0.43)	--	0.25 (0.43)		Places Rated Almanac, 1985
1980 Population Density	3,766.59 (2,779.01)	250.26 (339.46)	--	--	Voith (1998)

Metropolitan Area Fiscal and Economic Environment			
	1980	**1990**	Source
State Aid	0.04 (0.04)	0.05 (0.05)	Census of Governments, 1982 and 1992
Suburban School Districts	25.77 (39.96)	25.77 (39.96)	Census of Governments, 1982
Strong Teacher Unions	0.09 (0.29)	0.09 (0.29)	Valetta & Freeman (1986)
Suburban Support	0.06 (0.23)	0.06 (0.23)	See text
Airline Hubs	0.17 (0.48)	0.17 (0.48)	*Air Traveler's Handbook* website; URL: http://www.faqs.org/faqs/travel/air/handbook/part2/section-13.html
Interstate Highways	0.40 (0.49)	0.40 (0.49)	Authors' calculation (map inspection)
New England	0.06 (0.24)	0.06 (0.24)	Authors' calculation (map inspection)
Middle Atlantic	0.12 (0.33)	0.12 (0.33)	Authors' calculation (map inspection)
Midwest	0.21 (0.41)	0.21 (0.41)	Authors' calculation (map inspection)

Plains	0.21 (0.41)	0.21 (0.41)	Authors' calculation (map inspection)
Southeast	0.23 (0.42)	0.23 (0.42)	Authors' calculation (map inspection)
Mountain	0.06 (0.24)	0.06 (0.24)	Authors' calculation (map inspection)
West Coast	0.11 (0.31)	0.11 (0.31)	Authors' calculation (map inspection)
Large MSA	0.49 (0.50)	0.49 (0.50)	See text
Heating Degree Days	4,675 (2,160)	4,675 (2,160)	Census Bureau, *City-County Data Book*; National Weather Service
Cooling Degree Days	1,308 (896)	1,308 (896)	Census Bureau, *City-County Data Book*; National Weather Service

* This specification of TAXPRICE is for a middle class household and defined as b_m/B. The average tax base in the city is defined as:

$$B = b_m(1 - CPOV - COLD) + b_{pov}\cdot CPOV + b_{old}\cdot COLD + CI,$$

where b_m, b_{pov}, and b_{old} are the tax bases of middle class, poor households, and old households, respectively, and CI is the commerical-industrial tax base per household. Alternatively:

$$B = b_m[(1 - CPOV - COLD) + (b_{pov}/b_m)\cdot CPOV + (b_{old}/b_m)\cdot COLD + (CI/b_m)].$$

Assuming poor households and older families live in older housing (Glaeser and Gyourko (2001)), then the ratios (b_{pov}/b_m) and (b_{old}/b_m) can be approximated by $(1 - *)^{)T}$, where * is the rate of depreciation of housing and) T is the difference in the age of the housing stocks occupied by middle class households and poor/elderly households. Following Katz and

Herman (1997), we assume * = .02 and) T = 45 years, so that (b_{pov}/b_m) = (b_{old}/b_m) • .40; that is, the elderly and the poor live in homes roughly 40% the value of the homes occupied by the middle class. We specify CI as:

$$CI = 6_{nman}¶(1 - CMAN) + 6_{man}¶CMAN = 6_{man}¶[(6_{nman}/6_{man}) + (1 - (6_{nman}/6_{man})¶CMAN], \text{ and:}$$

$$CI/b_m = (6_{man}/b_m)¶[(6_{nman}/6_{man}) + (1 - (6_{nman}/6_{man}))¶CMAN],$$

where 6_{nman} and 6_{man} are the capital-land to labor ratio's for the non-manufacturing and manufacturing sectors, respectively. (We assume here that city employment approximately equals city households.) If production is Cobb-Douglas and the capital plus land share is .4 in the manufacturing and .3 in the non-manufacturing sectors, then in for profit-maximizing firms in the two sectors: $6_{nman}/6_{man}$ • .64 (Varian (1978), p. 15). Haughwout and Inman (2001; Table 3) estimate ($6_{man}/b_m$) • 1.6. Thus CI/b_m = [1.02 + .58CMAN]. Finally, since (b_{pov}/b_m) = (b_{old}/b_m) • .40, we have:

$$B = b_m[1 - .6¶(CPOV + COLD) + (1.02 + .58¶CMAN)],$$

from which the specification of TAXPRICE as b_m/B follows. TAXPRICE can be defined for businesses within the city simply by multiplying the middle class TAXPRICE as defined here by the ratio (b_{firm}/b_m), a constant for each firm. Thus, for any individual business property, we have the same positive covariance between (CPOV + COLD) and the firm's TAXPRICE and the same negative covariance between CMAN and its TAXPRICE. Each individual firm within the city, even a manufacturing firm, will prefer to have more capital-intensive manufacturing firms in the city's tax base. Thus TAXPRICE as defined above carries the essential information regarding the city's fiscal structure as that structure impacts on the fiscal costs to mobile households and firms of remaining within the city.

APPENDIX B

Specifying an "Open" City-Suburban Economy: The Philadelphia MSA

Household Sector: The populations of the city and its suburbs consist of three groups:[34]

1. Resident workers ($N_{c,s}$), who work, live, and consume in the either the city (c) or the suburbs (s);

2. Dependent households ($D_{c,s}$), who do not work but live in either the central city (c) or the suburbs (s) and receive an exogenous transfer income of Y paid for in part by their city or suburban government; and,

3. Commuting managers (M_s) who manage city firms but live in the suburbs.

The number of resident workers living and working in the city and the suburbs and the wage paid to these workers ($W_{c,s}$) are both determined endogenously within the model. The number of dependent households is set exogenously; poor households do not relocate in response to changing city or suburban fiscal conditions. The number of commuting managers is determined endogenously within the model; managers receive an exogenously determined managerial wage of S.

All households share a common set of preferences for land (l), housing capital (h), a composite consumption good (x), and a pure public good provided by their city or suburban government ($G_{c,s}$); parameter estimates are from Haughwout and Inman (2001). There are no spillover benefits of the local public good from the city to suburb or in reverse. Household utility for residents of the city (c) or the suburbs (s) is specified as:

$$\text{(B.1)} \quad U_{c,s} = x_{c,s}^{.75} h_{c,s}^{.20} l_{c,s}^{.05} G_{c,s}^{.05}.$$

City households maximize U_c subject to a household budget constraint and a politically decided level of city public goods and tax rates (see *Government Sector* below). The typical city resident's budget constraint is specified as:

$$\text{(B.2)} \quad (1 - J_{w,c}) W_c = (1 + J_{s,c}) x_c + (r + J_{p,c}) h_c + (r + J_{p,c})(R_c/r) l_c,$$

where $J_{i,c}$ represents the local city tax rate on sales (s), property (p), or wage income (w), R_c is the price of land in the city and r is the exogenous interest rate. City worker-residents are fully mobile across locations throughout the country, not just to their suburbs. Equilibrium requires city worker-residents to receive an exogenously set country-wide level of utility (V_0; see Figure 1 in the text).

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[34] All endogenous variables in the model are denoted in *italics*; all exogenous variables are denoted in standard type.

Suburban households maximize U_s subject to a household budget constraint and politically decided level of suburban public goods and tax rates (see *Government Sector* below). The median voter in the suburbs ! also the median income resident since preferences are identical – does a full optimization of U_s since for this household the level of local public goods are endogenous. The budget constraint for suburban residents is the same as in (B.2) except we constrain all $\tau_{w,s} = \tau_{s,s} = 0$; only property taxation is used by suburban governments. Equilibrium requires suburban worker-residents to also receive the exogenously set country-wide level of utility (V_0; see Figure 1 in the text).

Dependent households in the city and the suburbs also maximize their utility as specified by (B.1), but their budget constraint is defined by:

$$\text{(B.3) } Y = (1 + \tau_{s;c,s})\cdot x_{c,s} + (r + \tau_{p;c,s})\cdot h_{c,s} + (r + \tau_{p;c,s})\cdot (R_{c,s}/r)\cdot l_{c,s},$$

where Y is a common level of exogenous transfer income. Suburban dependent households will pay only property taxation ($\tau_{w,s} = \tau_{s,s} = 0$). Since dependent households cannot relocate, their utility levels will be endogenous in model, and specified as a fraction of the V_0; see Huaghwout and Inman (2001). Dependent households participate in all markets except the local labor market.

Manager households also maximize their utility again as specified by (B.1). Their budget constraint is defined by:

$$\text{(B.4) } S = (1 + \tau_{s,s})\cdot x_m + (r + \tau_{p,s})\cdot h_m + (r + \tau_{p,s})\cdot (R_s/r)\cdot l_m,$$

where S is the exogenous manager's wage. Since managers live in the suburbs they pay only the local property tax ($\tau_{w,s} = \tau_{s,s} = 0$). The city's tax on managers' wages is shifted back onto firms under our assumption that the competitive managers' market requires managers to receive their national market wage of S. Managers are assigned by their "corporation" to work in the city with the corporations deciding how many managers to employ in city firms depending upon the profitability of those firms (see *Production Sector* below). Managers participate in all markets except the local labor market.

Production Sector: The production sector of the metropolitan economy consists of:

1. City firms which produce a composite city good (x_c) using land ($l_{f,c}$), a composite input combining firm capital (k_c) and managers (m), city workers (n_c), and the city provided public good (G_c). In addition, city firm productivity is enhanced by agglomeration economies specified by the equilibrium density of city employment (N_c/L_c):

   $$\text{(B.5) } x_c = l_{f,c}^{.05}\cdot[.5\, n_c^{.4} + .5(.5\cdot k_c^{-.5} + .5\cdot m^{-5})^{.4/(-.5)}]^{.95/.4}\cdot G_c^{.04}\cdot (N_c/L_c)^{.01}\ .$$

   Parameter specifications are from Haughwout and Inman (2001) and, for the agglomeration elasticity, from Section IV. City firms choose their inputs so as to

minimize their gross of tax costs specified as:

(B.6) $C_c = (r + \tau_{p,c}) \cdot (R_c/r) \cdot l_{f,c} + W_c \cdot n_c + (r + \tau_{p,c}) \cdot (\delta_c/r) + (1 + \tau_{m,c}) \cdot \sigma \cdot m$,

where $\tau_{m,c}$ is the city tax rate on managers' salaries and assumed shifted back onto the firm, at least initially.

2. Suburban firms provide retailing services (x_s) to suburban residents using "unfinished" output (x_s) purchased from either the central city (x_s^c) or from producers outside the metropolitan area (x_s^o), where $x_s = x_s^c + x_s^o$. Purchased inputs are combined with resident suburban labor (n_s), capital (δ_s), and land ($l_{f,s}$) using a nested Cobb Douglas-CES specification. Suburban retailing also benefits from suburban produced public infrastructure (G_s):

(B.7) $x_s = [.5x_{\cdot}^{\rho} + .5(n_s^{.85} \cdot \delta_s^{.10} \cdot l_{f,s}^{.05})^{\rho}]^{1/\rho} \cdot G_s^{.04}$.

The parameter ρ defines the elasticity of substitution, $\varepsilon = 1/(1-\rho)$, between unfinished output and the labor-capital-land composite input. We set $\rho = -999$ ($\varepsilon = .001$) to reflect our assumption that the unfinished good is essential to suburban retailing. Suburban firms select inputs to minimize the costs of providing retailing services, where costs of retailing are defined as:

(B8) $C_s = (r + \tau_{p,s}) \cdot (R_s/r) \cdot l_{f,s} + W_s \cdot n_s + (r + \tau_{p,s}) \cdot (\delta_s/r) + x_s \cdot (k^c + t^c) + x_s \cdot (k^o + t^o)$,

where we assign per unit costs $k^c = k^o = 1$ as a normalization, per unit transportation costs from city to suburb as $t^c = 0$ as a normalization and per unit transportation costs from outside the metropolitan area to the suburbs as $t^o = .15$. The value $t^o = .15$ was chosen to ensure suburban land values in the simulation model equal actual Philadelphia area suburban land values.

Government Sector: City and suburban governments produce the pure public good $G_{c,s}$ from pre-existing public infrastructure stocks ($G^0_{c,s}$) net of the costs of remaining principal and interest ($r^0_{c,s}$) plus additional infrastructure stock that can be purchased from the aggregate revenues made available from locally-generated tax revenues ($R_{c,s}$), aid from higher levels of government ($Z_{c,s}$), revenues earned from existing local financial assets ($A_{c,s}$) less payments to city and suburban dependent populations (whose population share is $\theta_{c,s}$):

(B.9) $G_{c,s} = [G^0_{c,s} \cdot (r - r^0_{c,s})]/(r + \phi) \cdot c_g + [R_{c,s} + Z_{c,s} + A_{c,s} - R \cdot Y \cdot \theta_{c,s}](N_{c,s} + D_{c,s} + M_s)/(r + \phi) \cdot c_g$

where ϕ is the rate of depreciation of public infrastructures, and c_g is the production costs of local infrastructure, set equal to $c_g = 1$ for the baseline simulations.

Local tax revenues ($R_{c,s}$) are endogenous. In both the city and suburbs the only locally chosen tax rate is the local property tax. City property tax rates are chosen so as to maximize

aggregate revenues, while the suburban median voter chooses the utility-maximizing level of G_s and then sets property tax rates so as to produce that level of public spending. If the city also uses a wage, sales, or commuter tax then aggregate city revenues includes revenues from those taxes as well.

Solution Procedure: Through the government budget constraint, $G_{c,s}$ is a function of local wages and rents, household consumption, and firm production, while wages and rents, household consumption, and firm production depend in turn on $G_{c,s}$. The model is solved by first specifying an initial value for local property tax rates $J_{p,c}$ and $J_{p,s}$. For those rates we then specify initial values of $G_{c,s}$. The algorithm then calculates the private economic outcomes and tax bases and local revenues resulting in new values for $G_{c,s}$. Still holding the initial property rate fixed, new values of $G_{c,s}$ imply new private market outcomes and thus new tax bases, new revenues, and another set of new value for $G_{c,s.}$ We continue to solve the model iteratively until convergence is achieved for $G_{c,s}$. Our convergence criterion requires the levels of $G_{c,s}$ to be within $1 of their previous iteration's values. Convergence occurs typically within 20 iterations for less. This is the public sector and private market equilibrium for the initial values of $J_{p,c}$ and $J_{p,s.}$ The political equilibrium then selects a value of $J_{p,c}$ which maximize central city revenues and that value of $J_{p,s}$ which maximizes the median suburban income resident's welfare, iterating as above to calculate the equilibrium values of $G_{c,s}$ and the private economy for each property tax rate.

Calibration to Philadelphia MSA, 1990: Land available for firm and household locations is set to equal useable land area in Philadelphia and its suburbs. The city and suburbs are assigned exogenous poor and elderly populations equal to their 1990 census values of 112,000 poverty households and 65,000 (non-poor) elderly households for Philadelphia (CPOV = .20; COLD = .12) and 99,000 poor households and 282,000 (non-poor) elderly households for the surrounding suburbs (SPOV = .048; percent non-poor elderly = .13). Poor and elderly households are assumed to receive a transfer income of $13,500/household from the state and federal governments and an additional $1,340/household from their local government as the value of state and federal mandated services on their city and suburban governments (Summers and Jakubowski,1997). Philadelphia receives $3,753/household in intergovernmental transfers while the suburban government(s) are paid $3,777/household in transfers (1992 U.S. Census of Governments). Both Philadelphia and its surrounding counties have inherited stocks of the public good acquired from past investments but not yet fully depreciated. We have estimated the replacement value of these stocks for Philadelphia and its suburbs at $33,840/household in the city and $6,221/household in the suburbs; see Haughwout and Inman (1996). There is an annual cost to maintaining this stock equal to its rate of depreciation of .03 plus the residual interest and principal expenses due on the stock's initial debt. These costs of the inherited stock are paid before additions to the stock are purchased at a current interest rate of .04. In all equilibrium outcomes studied here, the final purchase of the public good by the city and the suburbs exceeds these initial stocks. Philadelphia has four taxes: a property tax, a resident wage tax, a non-resident (commuter) tax, and a tax on gross receipts on city firms. The suburban government can use a property tax or a resident wage tax. To make our simulations for the Philadelphia MSA as representative as possible, we restrict the city to use only the property tax to pay for the added costs of public services under each of the four weak city finance regimes, and similarly, we require the suburbs to use the property tax to buy their additional units of the public

good. City tax rates other than the property tax rate are exogenous and set at their FY 1990 values.