TRADE AND TAX POLICY IN THE PRESENCE OF MARKET FAILURES: LESSONS FROM AMERICAN REGIONS

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Under what conditions does atomistic behavior between competitive governments lead to efficient industrial location patterns? Is there a call for cross-subsidies between countries which impose different tax rates? In this paper, we address these questions, drawing on the large literature on American metropolitan areas. There is compelling evidence that American regions are linked by a substantial degree of intraregional trade. There have been many papers that propose fiscal equalization and/or tax harmonization policies designed to internalize the fiscal externalities that intraregional trade may create. We study an equilibrium model of a single region, whose separate political jurisdictions are linked by trade in intermediate goods. When the trade linkage is strong in the sense that a downstream economy depends heavily on an upstream good, market failures in the upstream economy lead to the possibility of Pareto-improving fiscal redistributions. But not all such plans yield equal benefits, and we conclude by offering a discussion of the economic features that support fiscal redistributions and the coordination of tax policies.

Introduction

The role of tax harmonization and fiscal competition across countries in a monetary and trade union is receiving much recent attention Europe (Lambertini and Peri, 2001; Baldwin and Krugman, 1998). Yet these issues have a long history in the US, where independent fiscal authorities within regions have long competed for a highly mobile tax base. Recently, research has begun to indicate that in this setting, some forms of cooperation might yield benefits to both (all) jurisdictions.

In the US, it is by now widely accepted that city and suburban economies move together over time, and that the connection is not simply the result of positive correlations between exogenous shocks to the two parts of metropolitan area economies. Instead, it appears that negative shocks that are specific to the city also result in reduced well-being in the suburbs (Haughwout and Inman, 2002a). This form of intraregional interdependency in US metro areas has more general implications for fiscal policy-making in economically integrated areas, and these implications are the subject of the present paper.

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It turns out to be difficult to write down a model of regions that is consistent with the observed intraregional competition for economic activity but that also generates the sort of interdependency that has been observed in the data for American regions. Two important features of the model studied here generate intraregional interdependence: non-reproducible production non-convexities in the "core region", and "secondary region" production that relies in a fundamental way on the productivity of the core region's firms. The question we address here is how, and to what extent, these features support fiscal interdependency and fiscal coordination.

The paper is organized as follows: Section I reviews some empirical evidence supportive of the contention that American city and suburban economies tend to move together and briefly discusses some potential structures that could generate these correlations. Taking what we believe to be the essential messages of these studies, and focusing on the one that is most relevant in the regional case, we describe a model of trade-linked regional economies in Section II. Section III discusses the results of a series of fiscal transfer simulations, and Section IV explores the key structural features that generate the benefits we observe. Section V concludes the paper.

Section I
City-Suburban interdependence

We begin by discussing the evidence in favor of fiscal interdependency within American metropolitan regions, and then draw lessons from this experience for the more general problem of fiscal interactions in a world with trade. The notion that American central cities offer something valuable to suburbanites is hardly new; see, for example, Jackson's (1985, chapter 8) review of the arguments in favor of municipal consolidation in the 19th century. The case weakened over time, however, as secondary regions began to develop apparently independent economic bases. By the time that Tiebout's (1956) seminal paper extolling the benefits of fiscal competition was published, the idea that small political jurisdictions' economies were independent of each other was well established. Yet by the Seventies, scholars began to argue that the Tiebout approach obscured some important arguments in favor of metropolitan governance or other forms of financial assistance from suburbs to cities. Among these arguments were three that became particularly relevant.

First, some authors argued that suburbanites "exploited" the city by benefiting from city-produced public goods without contributing to their construction and operation (Neenan, 1970). Theoretically, this kind of direct public good benefit spillover could lead to underprovision of congestible public goods in the city, as city residents equate their own marginal benefit with marginal cost, ignoring the positive externality. Regionalizing public finance could generate contributions for city public goods valued by residents of the suburbs. Yet the solution to this problem is not, in general, intergovernmental transfers: where feasible, user fees and average cost

pricing, charged without regard to residential location, is the most efficient means of allocating congestible public goods.

A second argument sometimes put forward in favor of fiscal transfers in metropolitan areas is based on suburban altruism. If suburbanites value the welfare of the geographically proximate poor, then they might wish higher subsidies to these families than the city chooses to provide (Pauly, 1973). Yet in the US, the primary responsibility for determining the level of transfers to the poor generally resides at the state level and in many states the median voter is a suburbanite. It is not clear that allowing suburbanites directly to choose (and help finance) the level of transfer income received by city poverty households would substantially change the outcomes we currently observe.

Recent research has returned to the theme, albeit from a perspective quite different from those which dominated the academic literature in the Seventies. Whereas the previous literature had emphasized the competition among jurisdictions, leaving equity and altruism as the primary motivations for suburbanites to make financial contributions to their central cities, the recent literature has explored whether doing so may is in suburbanites' own economic self-interest. The foundation of this argument is a series of recent papers documenting positive correlations between city and suburban economic outcomes.[1] Figure 1 and Table 1 provide some evidence of this relationship which, on its face, suggests that suburbanites may care about what happens in their central city because it has important implications for what happens to them.

While it difficult to uncover a structural relationship by examining simple correlations among outcome variables, the patterns in the table and figure provide some insight into the structure of the relationship between cities and their surrounding suburbs. In particular some features of the data rule out, or at least severely undermine, certain structural explanations. First, growth in both incomes and housing values are positively correlated for city-suburb pairs. Were the appeal of strongly growing central cities based on consumption opportunities or aid packages to the poor valued by suburban households, standard compensating variations logic (Rosen 1979) would imply that suburban incomes would fall in response to improving central city economic health. This is because households will demand higher wages to reside in unattractive locations. If a city offered many attractive consumption opportunities, workers would be willing to accept lower wages if they were to locate in its suburbs. Instead, the raw data suggest that firm productivity is playing an important role in connecting cities and their suburbs (Haughwout, 2002a). If the connection between city and suburb were on the production side, then we would anticipate that positive productivity shocks to the city would raise incomes in both city and suburbs, which is what we observe.

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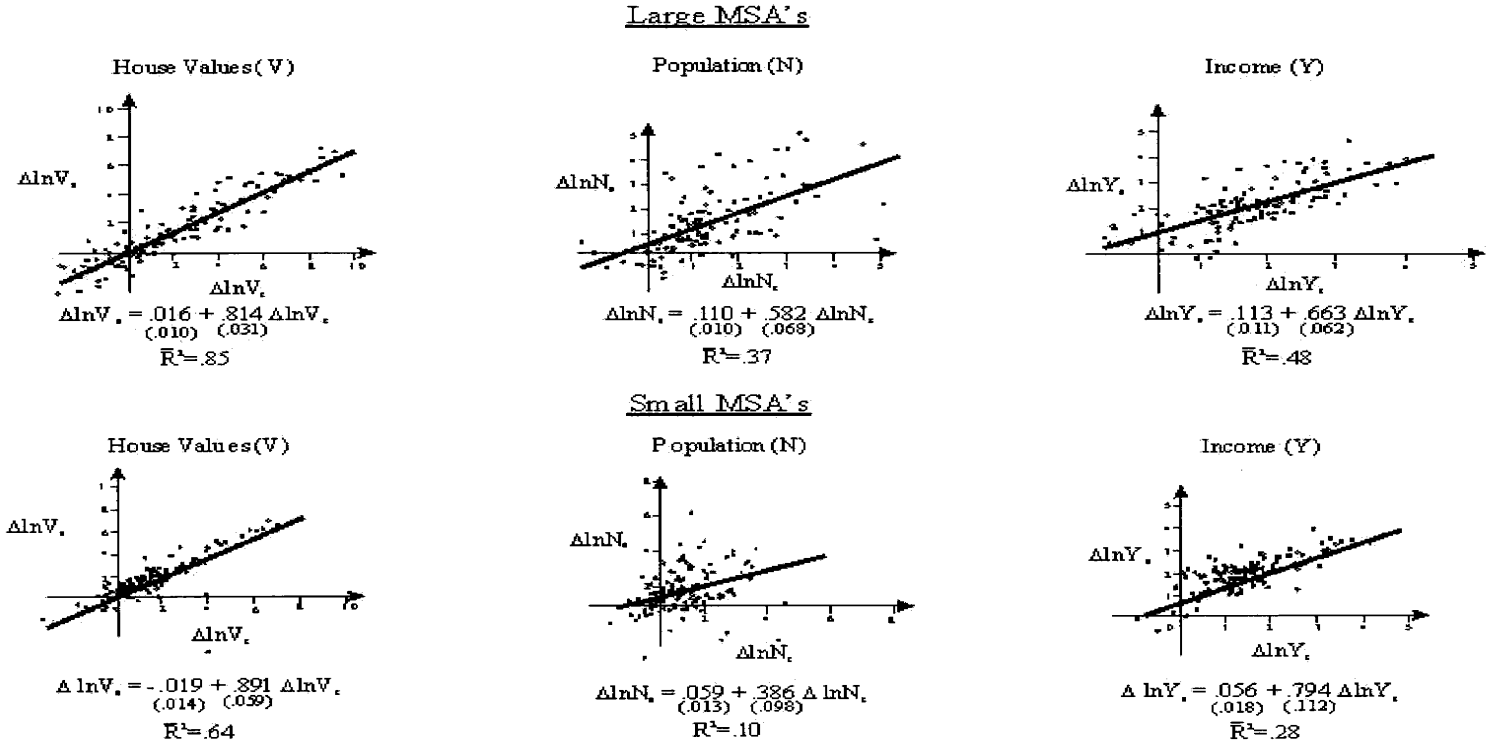
[1] See especially Voith (1993, 1998) and Brooks and Summers (no date). A more complete survey is available in Haughwout and Inman (2002).

Figure 1

City-Suburban Growth Correlations



The panels illustrate the relationship between suburban and city home value appreciation, suburban and city population growth, and suburban and city income growth over the decade from 1980 to 1990, both for large and small MSA's. Large MSA's are defined as MSA's whose 1970 population was greater than or equal to 250,000; our sample includes 116 large MSA's. Small MSA's are defined as MSA's whose 1970 population was less than 250,000; our sample includes 128 small MSA's. Also reported are the OLS linear regressions relating city and suburban rates of population and income growth and city and suburban rates of home value appreciation.

Table 1

City and Suburban Correlations

Correlations Between Levels of City and Suburban:			
	Home Values	Populations	Incomes
1970	.311**	.547**	.559**
1980	.554**	.544**	.345**
1990	.696**	.526**	.353**

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.

Source: Haughwout and Inman (2002).

Second, size matters: the income and house value correlations are strongest in large MSAs, which tend to be those with larger central cities.2 This indicates that the scale at which city production takes place is important in determining how "connected" the city and its suburbs turn out to be. Urban economists have long studied productive agglomeration economies arising from city size or density. Recent work (Rosenthal and Strange, 2001) indicates that the benefits of agglomeration decay rapidly over distance, implying that large, concentrated central business districts of the sort typically found in American central cities may offer distinct productivity advantages over more dispersed geographic patterns of employment.

There are several channels by which stronger growth in a central city could lead to these growth patterns in its suburbs. One is commuting: higher firm productivity in the core of the metropolitan area could raise welfare throughout the area if some workers live outside the center. Voith (1993) shows that this linkage is a significant determinant of suburban housing prices. But we argue that there must

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[2] The role of city size increases when we examine structural or reduced form models. See Voith (1998) and Haughwout and Inman (2002) for more detail.

be more to the story. The importance of suburb-to-city commuting has clearly diminished significantly over time, while the linkages between city and suburb appears to have remained strong, or possibly even strengthened. This is particularly true in house values, which we have argued elsewhere is the best indicator of fiscally induced changes in local welfare in small open economies (Haughwout and Inman, 2002a; Haughwout, 2002b).

A second possible source of the positive correlations, and the one on which we will focus in the balance of this paper, arises from vertical production linkages. Of the potential structures described here, trade is clearly a primary source of interdependency among larger regions and countries. We specify a model in which the central city offers production advantages that are not readily reproducible in the suburbs. Suburban firms buy inputs from city firms and convert them to finished goods that they sell to suburban consumers. This structure generates interdependence that is consistent with the American data.

While intra-regional trade in the US, particularly in services, is poorly measured, there exists modest empirical evidence in support of this structure. Schwartz (1992), analyzing a survey of suburban employers, finds them to rely quite heavily on producer service providers in their own central city. Haughwout and Inman's (2002a) reduced form analysis of the data for MSA growth between 1980 and 1990 find that indicators of the strength of agglomeration benefits in the core of metropolitan areas are statistically and economically significant determinants of growth in suburban incomes and house values.

We thus propose a structural model of regional economies that incorporates two critical features: a core economy externality that gives it an advantage in production of basic goods and services, and a core-secondary linkage through trade. This structure is, of course, applicable to more general settings than the US metropolitan context. Around the world, many regions and countries are increasingly linked by trade relationships, at least some of which spring from comparative advantage. While in our model the size of the city's advantage is endogenous, it is also inherent in the nature of the city economy. A similar phenomenon might arise from industry-specific skills among a country's labor force, or another form of "built" comparative advantage. The next section provides an overview of the model.

Section II
Model

Our model treats the region as a small, open economy occupying a fixed land area, and facing perfectly elastic supplies of private capital and workers. The land area is broken into two parts with exogenously given boundaries: city (core) and suburban (secondary) areas. We treat each as an independent political jurisdiction housing producers, workers and dependent households. Both jurisdictions provide local public goods, and the core offers an agglomeration externality to producers

located there; there is no agglomeration available in the secondary region. Details of the model are described in Haughwout and Inman (2002a, 2002b).

Private economy

A. City

City firms buy capital, land, and labor from resident workers and non-resident commuter managers to produce a common consumption good to be sold at constant world price. The composite good may be consumed within the city, by its residents, or exported to the secondary or the wider world market. These firms also benefit from a locally provided all-purpose public good and a positive externality from city employment density. Both are assumed to influence firm production as beneficial Hicks-neutral shifters of the marginal productivities of private inputs. Long run equilibrium requires that firms locating inside the city earn the same profit as those locating elsewhere. Firms pay taxes on the value of their land and capital stocks, on the wages of their managers (see below) and on their revenues.

Working residents living in the city consume three private goods – an all-purpose consumption good, housing structures, and residential land – and the all-purpose pure public good. Work effort by working residents is exogenous; there is no labor-leisure choice in our model. Working residents pay a sales tax on their purchases of the composite consumption good, property taxes on the value of housing capital and land, and a wage tax on their earnings. The long-run equilibrium requires that residents or households living within the city achieve the same level of utility as available to them outside the city.

Commuting managers consume private goods, housing, and land at suburban residential locations. We assume that commuters are able to buy private goods and housing at suburban prices. As noted, to attract these workers into city jobs requires city firms to pay a wage equal to the commuters' suburban wage inclusive of compensation for all (assumed exogenous) disamenities of working within the city – e.g., the city's taxation of commuters' labor income.

The city is assumed to contain a fixed, immobile population of poor and elderly *dependent households* who each receive an exogenous income transfer paid for by the central government and perhaps in part, through local taxation, by the city government as well. Dependent households consume the composite private good, housing, and land and pay taxes on their consumption. They do not pay taxes on their exogenous income transfer. Dependent households also consume the pure public good provided by the city government. We assume dependent households do not move from the city.[3] Since dependent households cannot escape the city, their equilibrium level of utility is endogenous.

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[3] For evidence that the average welfare household is not very sensitive to fiscal incentives in its location decisions, see Meyer (1999). Epple and Romer (1991) allow for mobile rich and poor households in their model of an open city in a metropolitan economy, but in their model all household incomes are exogenous.

B. Suburbs

Like the city, the suburbs host a single type of firm, and several different kinds of residents. *Suburban firms* provide retailing services to suburban residents using "unfinished" output purchased from either the central city or from producers outside the metropolitan area. Purchased inputs are combined with resident suburban labor, capital, and land using a nested Cobb Douglas-CES specification. Suburban retailing also benefits from suburban produced public infrastructure.

All suburban residents (including commuters to the city) 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).[4] City firms have a transportation cost advantage over non-MSA firms in meeting suburban residents' demand for the common consumption good. In our model, it is this proximity to low cost central city production that makes suburban locations attractive. It is possible that in equilibrium city firms may not be able to supply all suburban demand. In this case the unfinished consumption good is imported by suburban retailers from outside the MSA; transportation costs are necessarily higher for these marginal units. Figure 3 displays the suburban product market under (a) low city exports and (b) high city exports.

All suburban households share city residents' common utility function defined over this single consumption good, housing structures, land, and the locally-produced public good. There are three types of households resident in the suburbs: mobile resident-worker households, who reside in the suburbs and work at suburban retailers at the endogenously determined suburban wage, immobile dependent households, who receive the same exogenous transfer income as city dependent households, and city managers, who work in the city (see above), but consume in the suburbs.

Equilibrium of the private economy

An equilibrium for the private sector of the urban economy requires that several conditions be met:

- Utility of city and suburban mobile resident-workers is the equilibrium level $V_{0,}$
- City and suburban firms earn zero economic profits,
- Both the city and suburban land markets clear,
- Both city and suburban labor markets clear.

Our equilibrium concept envisions mobile firms and households submitting "bids" – local land and labor price combinations that would make them willing to locate in the city or suburbs – based on the net fiscal and agglomerative benefits

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

available to them in each location. In this, we follow the literature on urban quality of life, pioneered by Rosen (1979) and Roback (1982) and summarized in Gyourko, Tracy and Kahn (1999).

For firms, the zero profit condition yields a downward-sloping iso-profit curve in the local price space, depicted as $\Pi(\cdot)= \Pi_0$ in Figure 2. Household bids, conditional on the relevant local fiscal characteristics are represented by the upward sloping function $V(\cdot) = V_0$ in Figure 2.

The equilibrium local price vector is given by the intersection of the two curves – the land price/wage combination for which both firm and household equilibrium conditions are met. Individual firms and households then take these equilibrium prices, local fiscal policies and employment densities as given. Solutions of firms' problems yield per-unit-output demands for resident labor, managers, land and private capital. City households choose consumption of the composite good, housing capital and land.

Public sector

City and suburban governments produce the pure public good from preexisting public infrastructure stocks net of the costs of remaining principal and

Figure 2

Wage and Land Rent Equilibrium

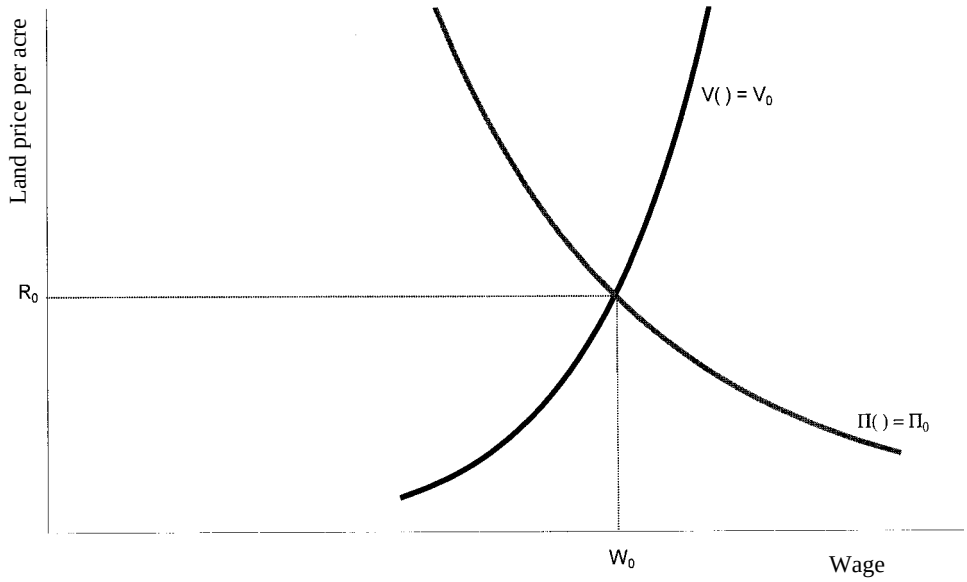


Figure 3(a)

The Suburban Product Market

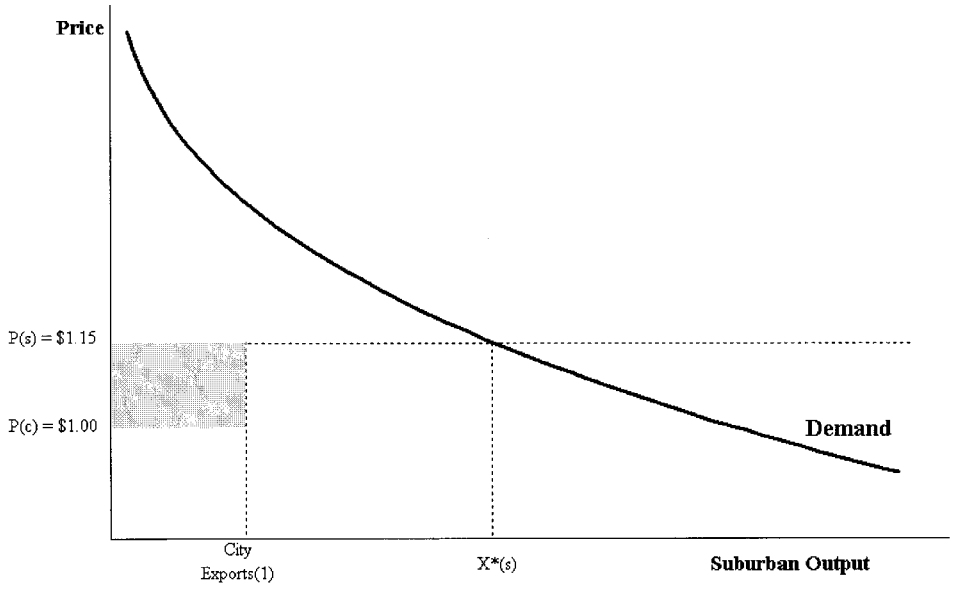
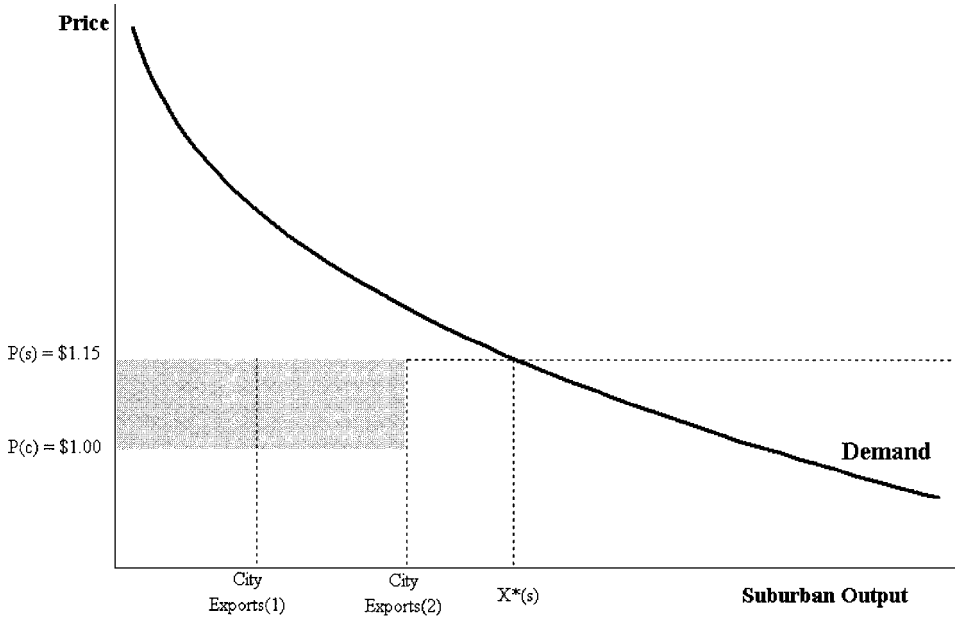


Figure 3(b)

The Suburban Product Market with Expanded City Output



interest plus additional infrastructure stock that can be purchased from the aggregate revenues made available from locally-generated tax revenues, aid from higher levels of government, revenues earned from existing local public financial assets less payments to city and suburban dependent populations.

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 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 at pre-determined rates.[5]

Section III
Simulating fiscal distributions in a metropolitan area

The model is calibrated to Philadelphia metropolitan area in 1990. Philadelphia City uses a tax on city land and capital, wage tax, a tax on commuters, a sales tax and a tax on firm gross receipts. Suburban governments tax only suburban land and capital.

The solution to the model under the baseline parameters is shown in Table 2.

Note that the starting point for our analysis is the equilibrium defined by the property tax rate that maximize city revenues, and that which maximizes the median (resident-worker) household's welfare. Since Philadelphia's actual 1990 property tax rate was somewhat below the revenue-maximizing rate (2.9 per cent), the city and suburban equilibrium values reported in Table 2 are smaller than the actual data for that year. Haughwout and Inman (2001) report detailed comparisons of the model's results with actual city outcomes.

The model is relatively successful at replicating results from Haughwout and Inman's (2002a) empirical work, as reported in Haughwout and Inman (2002b). In the latter paper, the authors report the results of tests in which the model was used to simulate the effects of changes in city fiscal institutions on the city and suburban economies. These simulations, and their implication that suburban residents have a strong interest in the state of the business climate in the central city, serve as the basis for the analysis that follows.

Here, we offer simulations of a variety of potential suburban aid packages to the City of Philadelphia. These simulations allow us to address two relevant questions. How big is the welfare loss from decentralization when regions are linked by trade? How can it be recovered?

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[5] In most US cities, the property tax is the primary tax under local control. Other tax rates are often strictly controlled by the state government.

Table 2

Baseline Simulation – Top of Philadelphia's Revenue Hill

	City	*Suburbs*
Output (Billion)	$ 15.8	$ 28.3
Consumption (Billion)	$ 6.7	$ 28.3
Land value ($ per acre)	$ 423,317	$ 19,752
Wages	$ 33,120	$ 27,090
Commuter/Manager wage	$ 140,081	-
Population	946,913	1,652,498
Jobs	339,091	406,036
Resident	222,357	406,036
Commuter	116,734	-
Property tax rate	2.90%	1.55%

Since the model is calibrated to a particular set of values, we confine the analysis to modest changes around the baseline described in Table 2. We describe four sets of simulations involving suburban subsidies designed to:

- Relieve the fiscal burden of city poverty,
- Provide general purpose aid to the city government,
- Reduce the burden of capital taxes on city firms,
- Reduce the burden of capital taxes on city households.

In the baseline, Philadelphia pays 9.5 per cent of the annual cost of transfers to city dependent households. This cost raises city tax prices of both firms and households, reducing the equilibrium size of the city (Haughwout and Inman, 2001). In 1990, this mandate cost the city $182 million per year. We simulate the effect of three levels of suburban subsidy for this burden, with the suburbs funding 50, 75 and 100 per cent of its cost. Provision of this subsidy to the city reduces public good availability in the suburbs, taxes constant, by between $1.8 (=$91M/0.05) and $3.6 billion (=$182M/0.05). This reduction in suburban public goods induces an initial decline in suburban land values of about $900 per acre for the case in which suburbanites shoulder 100 per cent of the city's share of the transfer payment. But provision of the subsidy allows the city to provide additional public infrastructure, increasing its steady state employment, output and population. This increase in city size provides benefits to suburbanites by increasing the availability of the

Table 3

Simulating Suburban Aid to the Central City
(Philadelphia, 1990)

	Aggregate annual cost ($ million)	Annual cost per household ($)	Δ Suburban Land value ($ per acre)	Δ Suburban House price ($)	Aggregate suburban benefit (net) ($ million)
1. Reducing city Ψ (Baseline value: 9.5%)					
to 4.75%	91.0	142.5	155.4	365.9	156.7
to 2.38%	136.4	213.1	290.2	664.1	292.5
to 0.0%	181.9	292.4	900.7	1,120.0	908.1
2. Increasing city Z (Baseline value: $2.1 billion per year)					
to $2.205 billion (5% addition)	103.6	161.3	448.3	539.4	452.0
to $2.31 billion (10% addition)	207.2	320.0	778.3	1,218.1	784.7
to $2.62 billion (20% addition)	414.4	628.9	448.3	2,581.7	1,556.1
3. Reducing business capital subject to city p-tax (Baseline value: 75%)					
to 50%	250.7	282.9	22,731.7	13,846.2	22,918.8
to 25%	501.5	351.2	167,781.2	33,915.4	169,161.9
4. Reducing residential capital subject to city p-tax (Baseline value: 100%)					
to 75%	187.3	297.0	–353.3	122.0	–356.2
to 50%	374.6	599.6	–748.1	252.7	–754.3

city-produced export good. These benefits, like the cost of reduced suburban public good availability, are capitalized into suburban land values. The final results, displayed in the first panel of Table 3, indicate that this policy change would result in *net* benefits for suburban residents (measured as changes in the aggregate value of suburban land) ranging from $156 to $908 million, or between $150 and $900 per acre.[6] These land value changes represent about 1 to 5 per cent increases over the baseline value of suburban land.

In our model, aid from other governments is an important source of funding for city and suburban public good provision. Another policy option for suburban residents would thus be to offer general purpose aid to their central city. Essentially, this entails diverting aid from the suburban to the city's treasury. We simulate three sets of general suburb-city aid packages representing 5, 10 and 20 per cent increases over the 1990 level of aid received by the city. The cost of these transfers and their net effect on suburban land values are reported in the second panel of Table 3. The results are strikingly similar to those in the first panel. Both policies allow city government substantial autonomy in how it spends the proceeds of the subsidy provided by suburban residents. Our assumptions about city political economy, that the city always moves to the top of its revenue hill, yield this effect. This means that general or specific suburban subsidies to the city will result in increased spending (public good provision) by city government.

An alternative policy design would be for suburbanites to provide more precisely targeted subsidies to the city. The primary concern of suburban landowners in our model is the city's productive capacity, which affects suburban well-being through trade linkages. Suburban residents might thus choose a policy that directly targets city firms, rather than both households and firms, when designing a subsidy program.

In our baseline simulation, Philadelphia is assumed to tax 75 per cent of the productive capital located in the city. This assumption reflects the fact that machinery and other mobile capital are not taxed under the Philadelphia system, but firm land and structures are. The third panel of Table 3 shows the suburban effects of extending this business property tax abatement to a larger share of the city's productive capital stock. Targeting aid to city firms produces benefits that are far more substantial than those yielded by more general forms of assistance. For similar costs, subsidies to city firms offer benefits that are orders of magnitude larger than those provided by general aid packages. Even a relatively modest aid package of $251 million per year ($283 per family in equilibrium) is simulated to double suburban land values. The source of these increases is, of course, enormous gains in the productive environment of the central city. The initial gains are reinforced by

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[6] Matters are less promising when the suburbs directly subsidize dependent residents' incomes. In this case, city dependent households consume more land, reducing the space available for production and diminishing the size of the suburban "proximity dividend". Such transfers *reduce* equilibrium suburban land values, offering negative returns.

increases in public good availability and agglomeration economies. In equilibrium, city output doubles when suburbanites subsidize city capital formation in this way.

For purposes of comparison, we return the taxation of productive capital to its baseline value, and simulate the effect of a similar subsidy to housing capital. In the baseline, housing capital is fully taxable. The final panel of Table 3 shows the results of allowing households to exempt 25 and 50 per cent from the property tax. The example is instructive, if only about the model we have built. In these simulations, the city is better off: city land values rise 4 per cent when households can exclude 50 per cent of their housing capital from the city property tax. City population and employment rise by similar amounts. Yet suburban residents are made moderately *worse* off. The cost of the program to suburban residents is relatively high ($600 per family per year in the new equilibrium) but its structure does not promote those elements of the city economy that provide benefits to suburbanites. While reducing to 50 per cent the share of *productive* capital subject to the city property tax results in a doubling of city output, doing the same for *residential* capital results in just a 3 per cent increase to the same measure. This is simply not enough of a benefit to compensate potential residents for the lost suburban public services, and bids for suburban land decline.

Section IV
Fiscal allocations in trade-linked regions

Typically, arguments in favor of fiscal and tax harmonization are made on the basis of macroeconomic policy making. Here we have derived a set of microeconomic circumstances in which small open economies, linked by trade, may find it in their interest to engage in some forms of fiscal cooperation.

The results reported above are from a model designed to replicate empirical results from US metropolitan areas. Are they instructive for other kinds of regions? We believe that they are. There are several key features of the above model that generate the possibility of Pareto-improving fiscal redistributions in metropolitan areas. These features include:

- A high degree of production-side interdependence between the core (city) and secondary (suburban) areas.
- A productive externality within the core economy that yields increasing returns to scale at the regional level. In the present model, the two sources of such non-convexities are an agglomeration externality and a fixed preexisting public infrastructure stock.
- Distortionary taxation and redistributive fiscal policy in both areas. These features are particularly costly in the core economy and their costs are transmitted to the secondary economy through the trade linkage.

These features, particularly the fiscal aspects, characterize many kinds of regions other than US metropolitan areas. Durable local public goods and

distortionary taxation, for example, are prevalent features of virtually all economies. The externality described here as an urban agglomeration economy is a form of spatially constrained knowledge and information dissemination (see Glaeser *et al.*, 1992, Rosenthal and Strange, 2001), a general market imperfection described in many contexts (see, for example, Comin and Hobijn, forthcoming).

The trade linkage in the model deserves more attention than is possible in the current paper, but may be important to the results here. As structured, secondary economy firms are completely dependent on trade; without the unfinished good produced in the core region they cannot produce. This feature is formalized by a very low elasticity of substitution (ε=.001) between unfinished output and the labor-capital-land composite input in the secondary region. In addition, we provide the core economy of our region with a significant cost advantage over other producing regions. In the model, this trait is represented by the additional 15 per cent cost of unfinished output imported from other regions. While these assumptions are appropriate in the context of the US, as is evidenced by the ability of the model to replicate empirical results from American metropolitan areas, it is likely that alternative specifications are appropriate for other kinds of regions.

Preliminary experimentation with the substitution elasticity indicates that while the interdependence of the core and secondary economy is *qualitatively* robust to significant increases in the ability of secondary economy firms to produce in its absence, the scope for Pareto-improving fiscal redistributions is somewhat reduced. Further study of this issue, as well as analysis of the sensitivity of the results to the unfinished output cost differential discussed above, are required before more definitive statements about the microfoundations of fiscal policy in the presence of trade linkages can be made.

Section V
Conclusion

The results in Table 3 indicate that a plausible structural model can generate the kinds of city-suburban outcome correlations that have been observed in the Census data for metropolitan areas. They also lend credence to the view that some kinds of modest suburb-city fiscal redistributions could raise welfare in all parts of the metropolitan areas. Three of the four sets of simulations reported in Table 3, for example, result in net land value increases in the suburbs.

In addition, we find that suburban transfers that directly subsidize city productive capital accumulation (or, more precisely, reduce the distortion introduced by city capital taxation) are considerably more effective at raising suburban land values than policies that ultimately result in more city spending or attract more residential capital. Indeed, reducing the effective tax rate by on city productive capital is simulated to double suburban land values, with similar increases for suburban house values. These are large benefits indeed, and contrast sharply with the negative returns produced by reducing residential capital taxation.

These results are, of course, produced by a single model with a very specific structure. While most of the model's features are fairly general, the dependence of the suburban economy on its local central city is perhaps peculiar to American metropolitan areas. Future research might pursue the importance of these assumptions, and study whether alternative structures that are able to replicate empirical correlations across other types of regions will also generate similar policy implications.

Nonetheless, some conclusions are supported by the results reported here. In particular, the presence of trade linkages between regions complicates the case for the decentralization of fiscal responsibilities. The dependence of producers in one region on the productivity of those in another creates a fiscal externality that limits the ability of the Tiebout mechanism to generate socially efficient outcomes. This situation need not require intervention by higher levels of government. Instead, Coasean bargaining among the affected regions, with suitable attention to institutional design so as to eliminate free riding, can achieve significant welfare gains. Such arrangements, as they benefit all parties involved, will likely be more durable than those based on altruism alone.

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