
POLITICAL SUPPORT FOR TAX DECENTRALIZATION

SUSANA PERALTA

Universidade Nova de Lisboa, CORE-UCL and CEPR

Abstract

We present a spatial model of a city with two unequally productive jurisdictions. City residents bear a commuting cost to work in either of the two jurisdictions. Each jurisdiction must finance a public budget with a wage and a head tax. We compare the first best optimum to tax decentralization. From the total welfare viewpoint, tax competition is always inefficient. However, majoritarian local governments may prefer the inefficient tax decentralization to the first best.

1. Introduction

The combination of decision-making decentralization and increased mobility creates interregional spillovers among countries, and within each country among its regions, municipalities and jurisdictions. As observed by Fisher (1996, p. 6) in his study of local taxation in the United States, *many individuals live in one city, work in another, and do most of their shopping at stores or a shopping mall in still another locality*. This paper focuses on spillovers arising from the noncoincidence of residence and workplace, each subject to a different tax authority. These may either be different jurisdictions in one metropolitan area, neighboring cities or counties, or even different states with common

Susana Peralta, Faculdade de Economia, Universidade Nova de Lisboa, CORE-UCL (Center for Operations Research and Econometrics) and CEPR. Campus de Campolide, P-1099-032 Lisboa, Portugal (peralta@fe.unl.pt).

I am indebted to the editor John Conley and two anonymous referees for detailed suggestions. I thank Rabah Amir, Geoffroy de Clippel, Jean Hindriks, Maurice Marchand, Philippe Monfort, Pierre Pestieau, Motohiro Sato, and Jacques Thisse for valuable comments on earlier versions of the paper. I thank Helena Beltran, Gwenael Piaser, Joe Tharakan, Magali Verdonck, and seminar participants at the EDP Jamboree 2003, CORE-UCL, UCP-Lisbon, Universidade Nova de Lisboa, University of Namur, University of Alicante and ZEI-University of Bonn for comments. Financial support from Sub-Programa Ciência e Tecnologia do II Quadro Comunitário de Apoio, Ministério da Ciência e Tecnologia, Portugal, is gratefully acknowledged. This paper was written as a part of my Ph.D. dissertation at CORE-UCL.

Received October 28, 2005; Accepted March 30, 2007.

© 2007 Blackwell Publishing, Inc.

Journal of Public Economic Theory, 9 (6), 2007, pp. 1013–1030.

borders. In all these cases it is conceivable that an individual lives in one place and works in another, i.e., commutes everyday to his workplace. In what follows, we adopt the term jurisdiction to refer to these different local tax authorities and we call the spatial unit that encompasses them a city.

There is extensive evidence of the increasing importance of interjurisdictional commuting, possibly fostered by the improvement in transportation technologies. In Britain, for instance, average commuting distance has gone up by 50% between 1975 and 1995 (The Economist 1998). In the United States, workers crossing county lines to work every day increased to 21% in 1990, from 10% in 1960 (Renkow 2003). Using data from all U.S. metropolitan areas, Glaeser, Kolko, and Saiz (2001, Table 1) found an increase in the number of commuters from the suburbs to the city from 6.6 in 1960 to 15.2 millions in 1990. The number of commuters from the city to the suburbs has also increased from 2 to 6 million people. Commuting is observable at various spatial scales (not surprisingly, more so at smaller scales).¹

At the same time that interjurisdictional commuting has been expanding, local governments around the world seem to be enjoying increasing levels of autonomy. In the United States, local governments' expenditures financed from own sources (i.e., excluding central government grants) represent 10% of the US GDP, slightly less than one half of the federal government figure (Fisher 1996).² In the European Union, the average (across eight European countries) subnational expenditure accounts for about one third of total public expenditure (OECD 2002).³ A recent study by the OECD (OECD 1999) looks in detail at local governments' tax setting autonomy in 19 countries, concluding that there is considerable autonomy, with local governments being free to choose the tax *rate* and/or the tax *base* on most of their tax instruments.^{4,5}

One type of local tax which has not received much attention in the literature is a source-based local wage tax.⁶ Several OECD (OECD 1992) countries

¹In Pennsylvania, 20% of workers commute between counties while more than 75% commute among municipalities (data for 1990, Shields and Swenson 2000). Van Ommeren, Rietveld, and Nijkamp (1999) estimate that 60% of Dutch male workers commute an average of 20 km to work in a different municipality. Cameron and Muellbauer (1998) observe nonnegligible commuting patterns even out of a large scale split of Great Britain into 10 regions.

²In the United States, there were 86,750 local governments in 1992: 50 states, 39,000 counties, municipalities and townships and 47,700 special purpose governments like school districts, even these latter endowed with taxing power in some cases.

³There are 605 local governments in Belgium (of which 589 municipalities), 36,889 in France (36,763 municipalities) and 8222 in Italy (8100 municipalities), for example.

⁴The notable exceptions are Japan, Mexico, and Portugal.

⁵A survey of six EU countries (Belgium, Denmark, Netherlands, Spain, Sweden, and U.K.) reports local governments to choose tax rates (on centrally set tax bases) on almost all taxes (excluding Spanish local governments and Belgian communities, the average is 90% tax rate control). In Belgium, Spain, and Sweden there are locally set tax bases (OECD 2002).

⁶The notable exceptions are Braid (2000, 2005).

have payroll taxes at the state (Australia) or local level (Austria, France, and Greece). Local payroll taxes also exist in Mexico (Amieva-Huerta 1997). In the United States (Braid 1996, 2003, 2005), wages are taxed at the source in the cities of San Francisco, Los Angeles, Newark, and in the states of Alabama and Kentucky (examples of cities include Birmingham, Louisville, and Lexington). In New York city, it has been abandoned by state imposition in 2000 but the discussion to bring it back has gone on.⁷ In Korea, income taxation at the local level is source based (Chu and Norregaard 1997).⁸ Depending on the stage of production at which they apply, value added taxes may fall on the production factors at a given locality, labor included.⁹ This happens in the United States, in Hawaii, Michigan, and Washington (Fisher 1996) and also in Italy (OECD 2002). In Japan, a new VAT with such characteristics is to be introduced soon.¹⁰

This paper fills this gap by modeling local governments which may use a residence-based head tax and a source-based wage tax (i.e., a payroll tax) paid by all the individuals working in the jurisdiction (or, equivalently, by the employer). In this paper, tax revenue is used to finance a fixed local budget, used to pay for a public (or publicly provided private) good that benefits jurisdiction's residents. We have in mind local services linked to residency, like rubbish collection, education, or leisure facilities used by residents in their free time (parks, swimming-pools, or public libraries). This tax structure, combined with interjurisdictional commuting, creates room for tax exporting, i.e., nonresidents bearing a part of the local tax burden, which has been identified as one of the determinants of tax adoption by local governments (Fisher 1996).

We propose a simple model to tackle interjurisdictional tax spillovers in a duo-centric city with commuting.¹¹ There is extensive evidence of interjurisdictional wage differences: we capture this feature by assuming that one of the jurisdictions is more productive than the other and thus offers higher wages.¹² Inman (2003) argues that wage advantages are localized, as *the spatial*

⁷Fisher (1996), Braid (1996), Haughwout et al. (2004), *Budget options for New York City*, <http://www.nyc.gov/html/records/pdf/finan/631options2003.pdf>

⁸The examples provided are based on the available references. I thank an anonymous referee for detailed information on the United States and for calling my attention to the fact that they are to be taken cautiously, in the sense that only a finer knowledge of national legislations ensures that taxes are purely *source-based* and not hybrid arrangements whereby workers and residents are taxed alike.

⁹We refer to VAT paid by the firm producing the good, as a percentage of either its gross sales or its value added (i.e., gross sales minus purchases of intermediate goods).

¹⁰I thank Motohiro Sato for suggesting me this example.

¹¹Jun and Ha (2002) show that the city of Seoul has evolved from (essentially) monocentric (early 1980s) to tri-centric (mid 1990s). Evolution toward policentric structures is widely observed in the United States (Garreau 1991, Bogart and Ferry 1999).

¹²Thimoty and Wheaton (2001) show that wages can vary up to 15% among the 24 employment centers in Boston and up to 18% among the 15 in Minneapolis metropolitan areas, controlling for workers' characteristics.

reach of agglomeration advantages will typically be confined within a political jurisdiction. In choosing their workplace, individuals trade-off the advantages (i.e., wage and working conditions) of a given job against travel costs (distance, time, and money).¹³ We simplify our analysis by assuming away residence choice, a reasonable assumption at the scale of a metropolitan area, as stated by Wildasin (1986, p. 72) in his seminal book on urban public finance: (...) *it is reasonable to assume that the employment and residence decisions within a given metropolitan area can be made independently.*¹⁴

The main objective of this paper is to show that majority-elected local governments prefer the decentralized outcome over the first best because of the opportunity of the majority to use taxing power autonomy in their favor. Two nice by-products of this main focus are the characterizations of the nature of tax competition arising in a city with interjurisdictional commuting, and pinpointing the nontrivial change in tax choices and welfare analysis when one switches from the usual assumption of utilitarian to majoritarian local governments.

The usual result in the literature is that tax competition is inefficient when compared to centralized tax decisions (that yield the first best). This is due to the interjurisdictional spillover it creates. If jurisdictions had some (not too expensive) way to make transfers, they all could attain a higher welfare by setting taxes cooperatively. Given that tax competition games are in general repeated, one should expect cooperation to be often observed.¹⁵ At the international level, lack of coordination seems to be the rule. At smaller scales (like metropolitan areas) where centralization used to prevail, one might expect decentralization never to arise. At least one lower-tier government, anticipating its loss, should not approve of a move toward decentralization. Nevertheless, decisions are becoming more decentralized. For instance, in the United States, state and local government spending has had higher growth rates than the overall size of the economy, population or price levels, between the early 1950s and the early 1990s (Fisher 1996). The same pattern is observed in most EU countries, where subnational taxes represent increasing percentages of subnational expenditures: a recent OECD (2002) survey shows that the figure

¹³So, Orazem, and Otto (2001) estimate elasticities between the number of commuters (from nonmetropolitan to metropolitan De Moines area) and commuting time (-1.8), and metropolitan wages (0.75). Rouwendal (1999) estimates that a (female Dutch) worker is willing to accept a 1 km increase in the two-way commuting distance in exchange for one extra Dutch guilder of daily wage. For North Carolina, Renkow and Hoover (2000) have computed the elasticity of out-commuting (as a percentage of local population) with respect to destination urban county wage (0.13) and to distance in miles (-1).

¹⁴Empirical evidence shows that individuals choose residence based on factors other than closeness to work place (see, e.g., Rouwendal and Meijer 2001, Glaeser, Kolko, and Saiz 2001, Zax 1991, 1994).

¹⁵See Cardarelli, Taugourdeau, and Vidal (2002) for the treatment of a repeated tax competition game.

has increased sharply in most of the eight countries covered.¹⁶ Our paper highlights one possible mechanism explaining the widespread phenomenon of tax decentralization. If local governments are majoritarian, they may support tax decentralization even though total social welfare decreases with it. This result is obtained through a welfare analysis of tax competition in an enriched setting, characterized by two types of asymmetry: on the one hand, jurisdictions are asymmetric and, on the other, residents of each jurisdiction are heterogeneous.

1.1. Related Literature

Braid (2000) studies tax competition in a spatial setup in which jurisdictions may use wage, capital and head taxes, but they do not tax wages because there is no interjurisdictional commuting in equilibrium, thanks to the symmetry assumption. Most authors use nonspatial models (unlike the present paper). In a model with land as a (nonresident owned) fixed factor, Braid (2005) shows that the wage tax may be used as a means for tax exporting.¹⁷ The consequence of jurisdiction asymmetry has been extensively analyzed in papers dealing with capital tax competition.¹⁸ With utilitarian local governments, the importing (exporting) region taxes (subsidizes) capital. A “small region advantage” of the least populated region has been identified by Bucovetsky (1991) and Wilson (1991). The introduction of median voter equilibrium in tax competition analysis has been done by Fuest and Huber (2001) and Grazzini and van Ypersele (2003), who also show that (partially or fully) centralizing capital tax decisions may worsen the median voter’s welfare.¹⁹ A closely related argument is found in Cremer, de Kerchove, and Thisse (1985) (a spatial setup, like ours), where it is shown that majority voting for the location of public facilities in space yields a larger than optimal number. Our results can also be related to the (spatial) literature on secession. In their paper about the number (and size) of nations, Alesina and Spolaore (1997) show that majoritarian governments lead to an excessive number of countries. Haimanko, Le Breton, and Weber (2005) show that a country can be efficient, and yet prone to secession threats on behalf of some of its regions.

The paper is organized as follows. The next section introduces the model and Section 3 presents the first best. Tax competition under majoritarian local governments is characterized in Section 4. Section 5 is devoted to the welfare

¹⁶For instance, in Belgium, it has been up from 26% in 1980 to 78.5% in 1998, in Denmark, from 38.7 to 51.2%, and in Sweden from 57 to 74.5%.

¹⁷Braid (1996) is similar to Braid (2005), without tax exporting, therefore wages go untaxed in equilibrium, if a head tax is available.

¹⁸See, e.g., Bucovetsky (1991), Wilson (1991), DePater and Myers (1994), and Peralta and van Ypersele (2005).

¹⁹Other papers with political considerations on tax competition issues include Besley and Smart (2003) and Kessler et al. (2002)

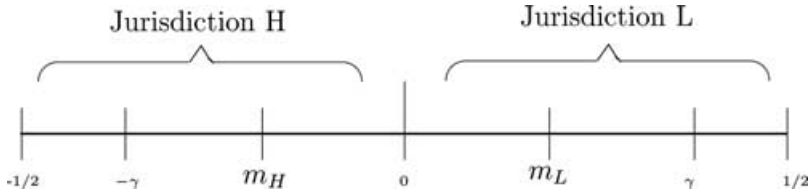


Figure 1: The city

effects of tax competition, as compared to the first best. Section 6 discusses possible extensions and concludes.

2. The Model

We consider a linear duocentric city composed of two jurisdictions, as shown in Figure 1.²⁰ We use H to denote the high-productivity jurisdiction, and L for the low-productivity one. For simplicity, we normalize the total number of city residents to 1 and the two extreme points of the segment to $-1/2$ and $1/2$, respectively. The city is inhabited by a uniform continuum of individuals indexed by their residence place, x .²¹ Letting $n(x)$ (resp. $N(x)$) denote the density (resp. distribution) function, we have

$$n(x) = 1 \quad \text{and} \quad N(x) = x + 1/2.$$

Median residents then coincide with the geographical center of each jurisdiction, i.e., $m_H = -1/4$ and $m_L = 1/4$. Given the symmetry of the uniform distribution, each jurisdiction has the same number of inhabitants which we denote \bar{N} , with $\bar{N} = 1/2$. Each jurisdiction has an employment center, denoted, respectively, $-\gamma$ and γ . The employment center is located outwards from the median resident (to the left in jurisdiction H and to the right in L). This opens the possibility for a majority of the residents of one jurisdiction to commute to the other.²²

An homogeneous good is produced according to a linear technology, which is more productive in jurisdiction H than in L. Denoting Y_i the production in jurisdiction i , we have $Y_i = \alpha_i N_i$, with $\alpha_H \geq \alpha_L > 0$.²³ The local

²⁰A duocentric city can be the endogenous result of information externalities pushing firms to locate close together and commuting costs borne by workers and land scarcity acting as dispersion forces (Fujita and Thisse 2002, chapter 6).

²¹All our results carry on, with a minor qualification in Proposition 2, to the case of a symmetric distribution respecting some technical condition. The reader is referred to Peralta (2004) for details and proofs of the results in more general settings.

²²As will become clear, this is never an equilibrium of the taxation game, so if median voters coincide (geographically) with employment centers our analysis goes unchanged.

²³The assumption of a linear technology is not essential. Our results are unchanged if we introduce (perfectly mobile) capital in the model with a constant returns to scale production.

government of each jurisdiction finances a fixed public budget, G_i , by collecting an *ad-valorem* source-based tax on wages (τ_i), paid by all workers in jurisdiction i and a head tax (T_i) paid by all its residents.²⁴ Given that residency is fixed, this head-tax can equivalently be considered as a land or residential property tax (if it is assumed that the house size is fixed). In what follows, τ and T refer to the vectors of local wage and residence taxes, i.e. $\tau = (\tau_H, \tau_L)$ and $T = (T_H, T_L)$. The local government of jurisdiction i faces the budget constraint:

$$G_i = \alpha_i N_i \tau_i + \bar{N} T_i,$$

where N_j is the number of workers in the jurisdiction and α_i their gross wage.

While place of residence is given, individuals are free to choose their workplace, $-\gamma$ or γ , by paying a constant per mile commuting cost of c . Notice that all individuals commute, either to their own jurisdiction's employment center or the other one. We shall refer to the former as *ii-commuters* and to the latter as *ij-commuters*, to make the point that they commute inside jurisdiction i or between jurisdictions i and j . They derive utility both from private consumption and from the local public budget, which is assumed to provide services to the residents. Each individual provides one unit of labor and pays a wage tax at the source. The individual has an amount W of revenue from other sources, assumed high enough such that each individual can always pay his tax bill.²⁵ We let $\omega_j = \alpha_j(1 - \tau_j)$ denote the net wage of the individual working in j . The utility enjoyed by individual x , an i resident working in j is quasi-linear and given by:

$$U_{ij}(x; \tau) = \omega_j - T_i + W - c|x - EC_j| + v(G_i) \quad i, j = H, L, \quad (1)$$

where EC_j is the location of the employment center in j , G_i the public budget in i , and $v(G)$ is an increasing concave function. The total monetary travelling cost borne by the individual is $c|x - EC_j|$. The i resident x works in i if and only if $U_{ii}(x; \tau) - U_{ij}(x; \tau) \geq 0$, otherwise he works in j .

Timing is as follows. In the first period, the two local governments choose head and wage tax rates simultaneously, anticipating their influence on commuting decisions. In the second period, individuals decide in which jurisdiction to work. Finally, production and consumption take place.

Then, jurisdictions are price-takers in the world capital market and local capital supply is perfectly elastic, hence they do not tax capital in equilibrium, and the gross wage is uniquely determined by the world net capital price.

²⁴Thanks to the lump-sum tax T_i , our analysis would be unchanged if we endogenized the public budget, either as a pure public good or as a publicly provided private good. The Samuelson Rule would then determine G_i .

²⁵ W would be capital revenue in the equivalent model with capital.

2.1. The Effect of Wage Taxes on Commuting and Head Taxes

We begin by computing the marginal *ij*-commuter, denoted by \hat{x} . Using (1), the utility difference, $U_{iH}(x; \tau) - U_{iL}(x; \tau)$, is

$$\begin{aligned} \omega_H - \omega_L - c(x + \gamma) + c(\gamma - x), \quad i = H, L, \quad \text{if } -\gamma < x < \gamma \\ \omega_H - \omega_L - c(x + \gamma) + c(x - \gamma), \quad i = L, \quad \text{if } x \geq \gamma \\ \omega_H - \omega_L - c(-x - \gamma) + c(x + \gamma), \quad i = H, \quad \text{if } x \leq -\gamma. \end{aligned} \tag{2}$$

One immediately sees that the utility difference for $|x| > \gamma$ is independent from x , therefore, if one individual to the right of γ *ij*-commutes, then all do. The same is true of individuals to the left of $-\gamma$. If this happens, one of the jurisdictions has no workers at all. We shall assume away such noninteresting cases.²⁶

When $-\gamma < x < \gamma$, (2) reduces to

$$\omega_H - \omega_L - 2cx,$$

yielding the marginal *ij*-commuter:

$$\hat{x}(\tau_H, \tau_L) = \frac{\omega_H - \omega_L}{2c} = \frac{\alpha_H(1 - \tau_H) - \alpha_L(1 - \tau_L)}{2c}. \tag{3}$$

To sum up, all $x < \hat{x}$ work in H and all $x > \hat{x}$ work in L, assuming that $-\gamma < \hat{x} < \gamma$. The marginal interjurisdictional commuter \hat{x} defines a *commuting equilibrium*. Labor employed in each jurisdiction is given by $N_H(x) = \bar{N} + \hat{x}$, and $N_L(x) = \bar{N} - \hat{x}$.

Local governments in H and L simultaneously decide the wage and the residence tax, anticipating how they influence the workforce in the jurisdiction and the local budget constraint. Given the assumption of a fixed local budget, the government's decision is unidimensional. Once τ_i is decided, T_i adjusts to satisfy the fixed budget requirement, that is,

$$T_i = \frac{G_i}{\bar{N}} - \frac{N_i}{\bar{N}}\alpha_i\tau_i. \tag{4}$$

The wage tax is distortive. Through its effect on net wages, it affects the marginal *ij*-commuter, thus the number of workers in each jurisdiction. Not surprisingly, the marginal *ij*-commuter moves leftwards (rightwards) when $\tau_H(\tau_L)$ increases:

$$\frac{d\hat{x}}{d\tau_H} = -\frac{\alpha_H}{2c} < 0 \quad \text{and} \quad \frac{d\hat{x}}{d\tau_L} = \frac{\alpha_L}{2c} > 0.$$

²⁶One way to do this is to assume a discontinuity in the production function, such that the wage gets arbitrarily large in the neighborhood of $N_i = 0$. In the equivalent model with capital, Inada conditions do the job. Then, there is a very high wage in the jurisdiction with no workers and this is not an equilibrium, for all individuals would rather work there.

The number of workers in each jurisdiction changes accordingly. As for the residence tax, we use (4) to obtain:

$$\frac{dT_i}{d\tau_i} = -\alpha_i \frac{N_i}{\bar{N}} - \frac{1}{\bar{N}} \alpha_i \tau_i \frac{dN_i}{d\tau_i} = -\alpha_i \frac{N_i}{\bar{N}} + \frac{1}{\bar{N}} \alpha_i \tau_i \frac{\alpha_i}{2c}. \tag{5}$$

The first term is the direct positive effect: workers pay a higher tax rate, hence the government collects more funds. The second term is an indirect effect: the increase in the tax decreases the number of workers. If the wage is taxed, this decreases the funds available to the government; if instead it is subsidized, available funds increase.

3. First Best

In this section, we compute the utilitarian first best, as a benchmark to evaluate the potential costs of tax competition.²⁷ A city-level benevolent planner allocates workers to employment centers, chooses tax and public good levels so as to maximize the overall sum of utilities under the budget constraint

$$G_H + G_L = \tau_H \alpha_H (\bar{N} + \hat{x}) + \tau_L \alpha_L (\bar{N} - \hat{x}) + \bar{N} (T_H + T_L). \tag{6}$$

We begin by computing total commuting costs, denoted C_i for jurisdiction i . It can never be optimal to have workers commuting from H to L, since they would pay a cost to work in the less productive jurisdiction. Therefore, all H residents commute to $-\gamma$ and we have:

$$C_H = c \left[\int_{-1/2}^{-\gamma} (-x - \gamma) dx + \int_{-\gamma}^0 (x + \gamma) dx \right] = c \left(\frac{1}{8} + \gamma^2 - \frac{\gamma}{2} \right).$$

As for L, residents to the right of \hat{x} commute to γ whereas those to the left commute to $-\gamma$, yielding:

$$\begin{aligned} C_L &= c \left[\int_0^{\hat{x}} (x + \gamma) dx + \int_{\hat{x}}^{\gamma} (\gamma - x) dx + \int_{\gamma}^{1/2} (x - \gamma) dx \right] \\ &= C_H + 2c \int_0^{\hat{x}} x dx. \end{aligned}$$

Denoting total utility in H by $U_H(\tau)$ (respectively, $U_L(\tau)$), and using (1), one has

$$U_H(\tau) = \bar{N}(\omega_H + v(G_H) + W - T) - C_H \tag{7}$$

$$U_L(\tau) = \bar{N}(\omega_L + v(G_L) + W - T) - C_H + \hat{x}(\omega_H - \omega_L) - 2c \int_0^{\hat{x}} x dx. \tag{8}$$

²⁷Given the quasi-linear utility, it makes sense to add up individual utilities.

The last two terms in (8) are the gain to L of having some *ij*-commuters. Their sum is positive as the wage differential more than pays for the travel costs to all but the marginal *ij*-commuter.

The first best consists in choosing \hat{x} , τ_L , τ_H , T_L , and T_H , so as to maximize $U_H(\tau) + U_L(\tau)$, as given by (7) and (8), under the constraint (6). From the first order conditions on T_L and T_H , the Lagrange multiplier on the government budget constraint is equal to 1. Optimal \hat{x} then solves

$$\alpha_H(1 - \tau_H) - \alpha_L(1 - \tau_L) - 2c\hat{x} + \tau_H\alpha_H - \tau_L\alpha_L = 0$$

yielding the first best marginal *ij*-commuter

$$\hat{x}^o = \frac{\alpha_H - \alpha_L}{2c} \geq 0. \tag{9}$$

Given the productivity advantage of the H jurisdiction, it is optimal to have *ij*-commuting in equilibrium, more so the lower c , and the higher the productivity difference. To ensure that this commuting equilibrium is interior, we shall assume throughout the paper that $\hat{x}^o \leq \gamma$. That is, the employment center must be sufficiently peripheral, the productivity advantage of H cannot be too high or, equivalently, travel costs must be high enough. From the first order conditions on wage taxes,

$$(-\bar{N} - \hat{x})\alpha_H + (\bar{N} + \hat{x})\alpha_H = 0 \quad \text{and} \quad (-\bar{N} + \hat{x})\alpha_L + (\bar{N} - \hat{x})\alpha_L = 0$$

we have that both τ_H and τ_L are indeterminate. This implies that any set of taxes that respects (6) with $\hat{x} = \hat{x}^o$ is optimal, so that both wage and residence taxes are indeterminate.

The objective of our analysis is to use the first best as a benchmark to evaluate the costs of fiscal competition and the incentives of individual jurisdictions to decentralize fiscal decisions. This implies that we need a jurisdiction-specific first best welfare level to use as benchmark, i.e., we must avoid indeterminacy in jurisdiction level taxes. Given that tax competition is globally welfare worsening as compared to the first best, it is a trivial exercise to design lump-sum transfers that make both jurisdictions prefer the first best. In other words, there are wage and head taxes that make both jurisdictions prefer the first best. In order to proceed, we need to fix the tax rates that allow for a nontrivial welfare analysis. We shall do so by relying on the most “neutral” set of taxes in the sense that they eliminate all interjurisdictional transfers at the first best. Notice that the first best *ij*-commuting is decentralized when $\alpha_H\tau_H = \alpha_L\tau_L$, which is respected by the “neutral” tax pair $\tau_H = \tau_L = 0$. Each region is supposed to finance its budget with the head tax, so that $T_i^o = G_i/\bar{N}_i$. Any other tax arrangement that decentralizes the first best *ij*-commuting and respects the budget constraint (6) is an implicit form of interjurisdictional transfers which we want to avoid to make sure that our welfare analysis is non trivial. Our analysis is just another statement of the well known fact that interjurisdictional transfers are needed to avoid excessive

decentralization. See, e.g., Haimanko, Le Breton, and Weber (2005), who show that transfers must be used in order to avoid country secession.

4. Tax Competition

In this section, we devolve fiscal power to the jurisdictions and solve the Nash equilibrium in tax rates when local governments are democratically elected. It is useful to begin by discussing briefly what would happen under benevolent social planners, the most common assumption in the literature (*cf.*, e.g., the survey by Wilson 1999). The working paper version Peralta (2004) derives the following result in detail.

PROPOSITION 1: *If each jurisdiction is run by a benevolent planner, then a unique tax equilibrium exists. There is a wage tax in jurisdiction H and no wage tax (nor subsidy) in jurisdiction L. Interjurisdictional commuting is reduced as compared to the first best.*

As usual in models with factor mobility in equilibrium (DePater and Myers 1994, Peralta and van Ypersele 2005), tax exporting leads jurisdiction H to tax its work force. In jurisdiction L, the same workers contributing to the public budget get a wage loss, hence the wage tax is equal to zero. The above mentioned contributions to the literature obtain the exporting region subsidizing the production factor, provided it is not pricetaker in the international factor market. This is not the case here: jurisdiction L has no instrument to manipulate the pocket wage earned by its residents who work in H. Interestingly, Braid (1993), in a setup of interjurisdictional shopping trips, obtains that one jurisdiction sets a positive commodity tax, while in the other there is no tax (nor subsidy).

In the remainder of this section, we assume that a majoritarian government in each jurisdiction decides tax levels. In this case, the majority election outcome corresponds to the preferred policy of the median resident. As will become clear, the wage tax choice is independent of the precise location of a given individual in his jurisdiction: it only depends on where he works. Therefore, in each jurisdiction, all the *ij*-commuters have the same preferred tax level, and the same is true of the *ii*-commuters. The majority group is, by definition, the one to which the median voter belongs. The nature of tax competition depends on whether the L median voter commutes to work at γ or rather at $-\gamma$.

Let us look at m_H 's tax choices to begin with. We may decompose the effect of the wage tax on m_H 's utility into (i) the decrease in the pocket wage, and (ii) the effect on T_H as given by (5), yielding

$$-\alpha_H \left(1 - \frac{N_H}{\bar{N}} \right) - \frac{\alpha_H^2}{2c} \frac{\tau_H}{\bar{N}} = 0, \quad (10)$$

from which we obtain the (implicit) reaction function

$$\tau_H^{mLi} = 2c \frac{N_H(\tau_H^{mLi}, \tau_L^{mLi}) - \bar{N}}{\alpha_H} = \frac{2c \hat{x}(\tau_H^{mLi}, \tau_L^{mLi})}{\alpha_H} \geq 0, \tag{11}$$

where the superscript mLi denote the tax choices when m_L works in i . We thus have that jurisdiction H taxes labor, passing on a part of the tax burden public budget to nonresidents, thereby benefiting the residents. The result that jurisdiction H taxes its labor force is usual in tax competition games where a region imports some production factor.

As regards m_L , when working in his own jurisdiction, an analogous reasoning to (10) and (11) above yields

$$\tau_L^{mLL} = 2c \frac{N_L(\tau_H^{mLL}, \tau_L^{mLL}) - \bar{N}}{\alpha_L} = -2c \frac{\hat{x}(\tau_H^{mLL}, \tau_L^{mLL})}{\alpha_L} \leq 0. \tag{12}$$

As L exports labor, only $N_L < \bar{N}$ workers pay wage taxes, therefore the decrease in the head tax is lower than the decrease in the pocket wage. Hence, m_L chooses to *subsidize* labor. When he does not work in L, his pocket wage is unaffected by his choice of τ_L and he is only concerned by its effect on the head tax. He maximizes the fiscal revenue from the wage tax. In so doing, he decreases his own contribution to the public budget, equal to T_L . Using (5), we obtain

$$\tau_L^{mLH} = 2c \frac{N_L(\tau_H^{mLH}, \tau_L^{mLH})}{\alpha_L} = 2c \frac{1/2 - \hat{x}(\tau_H^{mLH}, \tau_L^{mLH})}{\alpha_L} \geq 0. \tag{13}$$

Using (3) and (11)–(13), we obtain linear reaction functions, and it is straightforward to solve for equilibrium taxes:

$$\begin{aligned} \tau_H^{mLH} &= \frac{c + (\alpha_H - \alpha_L)}{3\alpha_H} & \tau_L^{mLH} &= \frac{2c - (\alpha_H - \alpha_L)}{3\alpha_L} \\ \tau_H^{mLL} &= \frac{\alpha_H - \alpha_L}{3\alpha_H} & \tau_L^{mLL} &= -\frac{\alpha_H - \alpha_L}{3\alpha_L}. \end{aligned} \tag{14}$$

Using (3) and (14), the marginal ij -commuter is, respectively

$$\hat{x}^{mLH} = \frac{\hat{x}^o}{3} + \frac{1}{6} \quad \text{and} \quad \hat{x}^{mLL} = \frac{\hat{x}^o}{3}, \tag{15}$$

where \hat{x}^o is given by (9), and the meaning of the superscript mLi is the same as defined immediately after (11).

We must now check for the *consistency* of the equilibrium taxes, that is, whether at the resulting commuting equilibrium m_L works in the right jurisdiction. More precisely, we have that $\hat{x}^{mLL} < m_L$ if $\hat{x}^o < 3/4$, and since $\hat{x}^o \leq \gamma < 1/2$, this is true (see Equation (15)). Analogously, we must have $\hat{x}^{mLH} > m_L$, and since $m_L = 1/4$, this is true (see Equation (15)) if $\hat{x}^o > 1/4$, that is, if m_L ij -commutes at the first best. This means that when $\hat{x}^o < 1/4$ the Nash equilibrium is such that a majority of the L residents are not

ij-commuters, and (see Equation (14)) wages are taxed in H and subsidized in L. When $\hat{x}^o > 1/4$, the two tax pairs are *consistent* and we must check which of the situations is preferred by m_L , i.e., whether the equilibrium utility he attains by working in H is higher or lower than the one he attains by working in L. As shown in the next proposition, it is never the case that m_L prefers to *ij*-commute.^{28, 29}

PROPOSITION 2: *If local governments are majoritarian, then there is a unique tax equilibrium, with a majority of L residents working in L. Wages are taxed at H and subsidized at L. Moreover, there is less ij-commuting than at the first best.*

Proof: For $\hat{x}^o < m_L = 1/4$, see the analysis above. When $\hat{x}^o > m_L$, using (1) and (4) we have $U_{LL}(m_L, \tau^{mLL}) - U_{LH}(m_H, \tau^{mLH})$ given by

$$\alpha_L(1 - \tau_L^{mLL}) + \frac{\bar{N} - \hat{x}^{mLL}}{\bar{N}}\alpha_L\tau_L^{mLL} - \left(\alpha_H(1 - \tau_H^{mLH}) + \frac{\bar{N} - \hat{x}^{mLH}}{\bar{N}}\alpha_L\tau_L^{mLH} \right) - \frac{c}{2}$$

which, using (14) and $\bar{N} = 1/2$, and after straightforward manipulation reduces to

$$\frac{c}{9} \left(\frac{7}{2} - 4\hat{x}^o \right) > 0.$$

Thus the case *mLL* applies here too. ■

Even when the resident at $m_L = 1/4$ prefers to work in the more productive jurisdiction in the absence of distortive taxation, he chooses to work in the less productive one in the majoritarian tax competition equilibrium. This is true irrespective of the gross wage difference $\alpha_H - \alpha_L$. By working in L instead of H, m_L has a wage subsidy instead of a tax. But this advantage comes at a cost. On the one hand, since he *ij*-commutes at the first best, his gross wage net of commuting costs is lower. On the other hand, the head tax is higher when m_L works in L for, in addition to the public budget, it must cover the subsidy that is paid to all L workers; on the contrary, when m_L works in H, there is a wage tax at L, which partly covers the public budget, decreasing the head tax. The combined distortion of the wage subsidy in L and the wage tax in H is so high that it compensates for the two costs, and m_L prefers to work in his own jurisdiction.

²⁸For the sake of completeness, we must impose conditions such that equilibrium taxes are interior, i.e., not greater than 1. Taking this into account does not change the results of our analysis. The reader is referred to Peralta (2004) for a complete treatment.

²⁹Under a generic density function, we may have *mLH* as the majoritarian tax competition equilibrium, if \hat{x}^o is sufficiently high (cf. Peralta 2004).

5. Does the First Best Please the Majority?

As one should expect, overall city welfare is lower under tax competition. The inefficiency of tax competition is due to the shrunken *ij*-commuting, which is lower under tax competition than at first best. Some individuals produce α_L instead of α_H , and bear a lower commuting cost, which, is however, more than compensated by the lost production, because these individuals *ij*-commute at the first best. It is interesting to notice, however, that *ij*-commuting always goes in the good direction, because the jurisdiction with in-commuters taxes wages under any form of local government; if it is also the less productive one, it is not attractive to *ij*-commuters.³⁰

What can we say about majoritarian local governments? All the voters in jurisdiction H agree that they prefer tax decentralization to the first best because they can export taxes, i.e., fund the public budget partly from taxing the other jurisdiction’s residents. The surprising result is that, while total welfare in jurisdiction L decreases, it is possible that a majority of the voters attains a higher utility in the majoritarian tax competition equilibrium, as compared to the first best. Then, there is a majority of city residents (all the H residents plus more than one half of L residents) that are better off at an inefficient equilibrium than at the first best, even if this inefficient equilibrium is an obvious loss to one of the jurisdictions (and a loss to the city as a whole).

PROPOSITION 3: *If local governments are majoritarian, and the productivity asymmetry between the two jurisdictions is not too large, then they both prefer tax decentralization to the first best.*

Proof: For the median voter in H and for the median voter in L who works in L at the first best (the case $\hat{x}^o < 1/4$), straightforward computations using (1), (4), (14), and $\bar{N} = 1/2$, yield

$$U_{ii}(m_i, \tau^o) - U_{ii}(m_i, \tau^{mLL}) = \alpha_i \tau_i^{mLL} \left(1 - \frac{N_i(\hat{x}^{mLL})}{\bar{N}} \right) < 0.$$

(Recall that $N_L^{mLL} < \bar{N}$, $\tau_L^{mLL} < 0$, $N_H^{mLL} > \bar{N}$, and $\tau_H^{mLL} > 0$.) For $\hat{x}^o > m_L = 1/4$ we use using (1), (4), (14), and $\bar{N} = 1/2$ to obtain $U_{LH}(m_L, \tau^o) - U_{LL}(m_L, \tau^{mLL})$

$$\alpha_H - \alpha_L(1 - \tau_L^{mLL}) - \frac{\bar{N} - \hat{x}^{mLL}}{\bar{N}} \alpha_L \tau_L^{mLL} - \frac{c}{2} = -c \left(\frac{4}{9} \hat{x}^{o^2} - 2\hat{x}^o + \frac{1}{2} \right)$$

which is negative for $\hat{x}^o < (9 - 3\sqrt{7})/4 \simeq 0.27$. Thus, both jurisdictions prefer tax decentralization if $\hat{x}^o < 0.27$. ■

³⁰The reader is referred to Peralta (2004) for the formal proofs.

The regional preference for decentralization is not just a result of decentralization *per se*. Rather, it depends on the *type of decentralization*. Suppose that local governments were benevolent total utility maximizing planners instead, with a wage tax in H and no tax (nor subsidy) in L (see Proposition 1). Then, m_H prefers the tax competition equilibrium, due to tax exporting, but m_L (the L median voter) always (weakly) prefers the first best to a utilitarian government, because his tax bill is unchanged but he may lose pocket wage (either for working in L instead of H, or for working in H with wage tax). With majoritarian local governments, the L median voter gets a wage subsidy, creating a deficit in government revenue and paying a higher head tax in order to finance the public budget. As there are less workers getting the subsidy than residents paying the head tax, the head tax increase is less than the subsidy. Hence, all L residents who work in L under both the first best and majoritarian tax competition equilibrium gain with tax decentralization. The *ij*-commuters partly fund, through the head tax, the subsidy for the majority of their fellow residents. Therefore, when m_L works in his own jurisdiction anyway, he always gains with tax decentralization. However, if he *ij*-commutes in the first best, he gets a lower gross wage at the majoritarian tax competition equilibrium. If this gross wage difference is very high, m_L loses with majoritarian tax competition.³¹

Notice that m_L is decisive in the choice between the first best and majoritarian tax competition. There are three relevant groups of voters: those who *ij*-commute in both equilibria (prefer the first best), those who do not in both equilibria (prefer tax competition), and those who *ij*-commute at the first best and do not with tax competition. For these latter, the fiscal advantage of tax competition must be traded off against the decrease in gross wage net of commuting costs, which is higher for voters closer to the border. Hence, there exists a voter such that all those to his left prefer the first best and all those to his right tax competition. By definition, the median voter belongs to the majoritarian group.

6. Conclusion

This paper studies tax competition when residence place does not necessarily coincide with workplace and individuals pay taxes in both. Tax decentralization distorts commuting decisions, hence decreasing total welfare as compared to the first best. The main contribution of this paper is to show that a majority of voters in each jurisdiction may be better off under the inefficient majoritarian tax competition equilibrium than at the first best. In so doing, it calls our attention to the importance of the choice of the regional objective function and to the importance of modeling asymmetry along different axis, i.e., both inter and intrajurisdictional.

³¹This proposition is unchanged with a generic density function (*cf.* Peralta 2004).

Our results are robust to changing the assumptions in a number of directions, some of which have been discussed above: introducing capital through a constant returns to scale technology, changing the (symmetric) distribution of residents or endogeneizing the public budget. As regards taxation, the head tax is equivalent to a land or residential property tax (under a fixed lot assumption); if a capital tax were available, it would not be used by either local government; the wage tax is equivalent to a payroll tax, and similar to a value added tax paid at the production stage. One could envisage other forms of local revenue collection that would yield similar results as long as it is exportable to nonresidents in H, and allows for discrimination of the fiscal burden between intra and interjurisdictional commuters in L. That is, we need one tax instrument which is linked to one's residence, and the other to one's productive activity. Any tax falling on local firms (value added, corporate or property tax, price of public inputs) is partly borne by production factors and may replace the wage tax. Some pricing schemes of local amenities would also do the job, like public transportation (mainly used by intrajurisdictional commuters in L) partially subsidized by residence tax revenue, or parking facilities outside the employment center (mainly used by interjurisdictional commuters in H) priced above their cost.

Finally, one could envisage endogeneizing residency or the productivity difference. The first would be problematic in terms of ensuring equilibrium existence.³² Moreover, we would be forced to introduce a normalization assumptions (utility level in an open city, price of agricultural land in a closed city), such that tax choices would capitalize into land prices and have no influence on equilibrium utility (Wildasin 1986). Alternatively, we would have to introduce some friction that avoids land price capitalization, but then the results would not be too different: lower rents in jurisdiction L (because of the lower wages there) would induce some individuals to live in L and work in H. The productivity difference may stem from agglomeration externalities, which could be endogeneized by letting the productivity increase with the number of workers. Jurisdictions would then tradeoff the advantages of tax exporting against the wage change due to the changed employment concentration. As long as the agglomeration externality is not too strong, our results should not vary a lot.

References

- ALESINA, A., and E. SPOLAORE (1997) On the number and size of nations, *Quarterly Journal of Economics* **112**(4), 1027–1056.
- AMIEVA-HUERTA, J. (1997) Mexico, in *Fiscal Federalism in Theory and Practice*, T. Ter-Minassian, ed. Washington, DC: IMF.

³²Caplin and Nalebuff (1997) derive some general conditions for equilibrium existence, supposing, however, that individuals do not anticipate whether they become pivotal when joining a club.

- BESLEY, T., and M. SMART (2003) Fiscal restraints and voter welfare, Mimeo, L.S.E.
- BOGART, W. T., and W. C. FERRY (1999) Employment centers in greater Cleveland: Evidence of evolution in a formerly monocentric city, *Urban Studies* **36**(12), 2099–2110.
- BRAID, R. (1993) Spatial competition between jurisdictions which tax perfectly competitive retail (or production) centers, *Journal of Urban Economics* **34**, 75–95.
- BRAID, R. (1996) Symmetric tax competition with multiple jurisdictions in each metropolitan area, *American Economic Review* **86**(5), 1279–1290.
- BRAID, R. (2000) A spatial model of tax competition with multiple tax instruments, *Journal of Urban Economics* **47**, 88–114.
- BRAID, R. (2003) A three-input model of the spatial effects of a central-city wage tax, *Journal of Urban Economics* **54**, 89–109.
- BRAID, R. (2005) Tax competition, tax exporting and higher-government choice of tax instruments for local governments, *Journal of Public Economics* **89**, 1789–1821.
- BUCOVETSKY, S. (1991) Asymmetric tax competition, *Journal of Urban Economics* **30**, 167–181.
- CAMERON, G., and J. MUELBAUER (1998) The housing market and regional commuting and migration choices, *Scottish Journal of Political Economy* **45**(4), 420–446.
- CAPLIN, A. and B. NALEBUFF (1997) Competition among institutions, *Journal of Economic Theory* **72**, 306–342.
- CARDARELLI, R., E. TAUGOURDEAU, and J-P. VIDAL (2002) A repeated interactions model of tax competition, *Journal of Public Economic Theory* **4**(1), 19–38.
- CHU, K., and J. NORREGAARD (1997) Korea, in *Fiscal Federalism in Theory and Practice* by T. Ter-Minassian, ed. Washington, DC: IMF.
- CREMER, H., A-M DE KERCHOVE, and J-F. THISSE (1985) An economic theory of public facilities in space, *Mathematical Social Sciences* **9**, 249–262.
- DEPATER, J., and G. MYERS (1994) Strategic capital tax competition: A pecuniary externality and a corrective device, *Journal of Urban Economics* **36**, 66–78.
- FISHER, R. S. (1996) *State and Local Public Finance*, 2nd Edition. Chicago: Irwin.
- FUEST, C., and B. HUBER (2001) Why is there so little tax coordination? The role of majority voting and international tax evasion, *Regional Science and Urban Economics* **31**, 299–317.
- FUJITA, M., and J-F. THISSE (2002) *Economics of Agglomeration*. Cambridge, UK: Cambridge University Press.
- GARREAU, J. (1991) *Edge City: Life on the New Frontier*. New York: Doubleday.
- GLAESER, E., J. KOLKO, and A. SAIZ (2001) The consumer city, *Journal of Economic Geography* **1**(1), 27–50.
- GRAZZINI, L., and T. VAN YPERSELE (2003) Fiscal coordination and political competition, *Journal of Public Economic Theory* **5**(2), 305–325.
- HAIMANKO, O., M. LE BRETON, and S. WEBER (2005) Transfers in a polarized country: Bridging the gap between efficiency and stability, *Journal of Public Economics* **89**(7), 1277–1303.
- HAUGHWOUT, A., R. INMAN, S. CRAIG, and T. LUCE (2004) Local revenue hills: Evidence from four US cities, *Review of Economics and Statistics* **86**(2), 570–585.
- INMAN, R. (2003) Should philadelphia's suburbs help their central city? *Federal Reserve Bank of Philadelphia Business Review*, **Q2**, 24–36.
- JUN, M-J., and S-K. HA (2002) Evolution of employment centers in Seoul, *Review of Urban and Regional Development Studies* **14**(2), 117–132.

- KESSLER, A., C. Lulfesmann, and G. Myers. (2002) Redistribution, fiscal competition and the politics of economic integration, *Review of Economic Studies* **69**, 899–923.
- OECD (1992) Revenue statistics of OECD member countries 1965–1991, Paris.
- OECD (1999) Taxing powers of state and local government, *OECD Tax Policy Studies* No.1, Paris.
- OECD (2002) *Fiscal Decentralization in EU Applicant States and Selected EU Member States*, Paris.
- PERALTA, S. (2004) Political support for tax decentralisation, *CORE Discussion Paper* 2004/24 http://www.core.ucl.ac.be/services/psfiles/dp04/dp2004_24.pdf.
- PERALTA, S., and T. VAN YPERSELE (2005) Factor endowments and welfare levels in an asymmetric tax competition game, *Journal of Urban Economics* **57**, 258–274.
- RENKOW, M. (2003) Employment growth, worker mobility and rural economic development, *American Journal of Agricultural Economics* **85**(2), 503–513.
- RENKOW, M., and D. HOOVER (2000) Commuting, migration, and rural-urban population dynamics, *Journal of Regional Science* **40**(2), 261–287.
- ROUWENDAL, J. (1999) Spatial job search and commuting distances, *Regional Science and Urban Economics* **29**, 491–517.
- ROUWENDAL, J., and E. MEIJER (2001) Preferences for housing, jobs and commuting: A mixed logit analysis, *Journal of Regional Science* **41**(3), 475–505.
- SHIELDS, M., and D. SWENSON (2000) Regional labour markets: The relationship between industry level employment and in-commuting in Pennsylvania counties, *The Journal of Regional Analysis and Policy* **30**(2), 81–94.
- SO, K., P. ORAZEM, and D. OTTO (2001) The effects of housing prices, wages and commuting time on joint residential and job location choices, *American Journal of Agricultural Economics* **83**(4), 1036–1048.
- THE ECONOMIST (1998) *All jamed up*, 3/9/98.
- THIMOTY, D., and W. WHEATON (2001) Intra-urban wage variation, employment location and commuting times, *Journal of Urban Economics* **50**(2), 338–66.
- VAN OMMEREN, J., P. RIETVELD, and P. NIJKAMP (1999) Job moving, residential moving and commuting: A search perspective, *Journal of Urban Economics* **46**, 230–253.
- WILSADIN, D. (1986) *Urban Public Finance*. New York: Harwood Economic Publishers.
- WILSON, J. D. (1991) Tax competition with interregional differences in factor endowments, *Regional Science and Urban Economics* **21**, 423–451.
- WILSON, J. D. (1999) Theories of tax competition, *National Tax Journal* **52**(2), 269–304.
- ZAX, J. (1991) The substitution between quits and moves, *The Economic Journal* **101**(409), 1510–1521.
- ZAX, J. (1994) When is a move a migration?, *Regional Science and Urban Economics* **24**, 341–360.