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Mobility and reliefs for traveling expenses to work

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Mobility and Reliefs for Traveling Expenses to Work

by

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Abstract

This paper proposes the question whether or not traveling expenses to work should be deductible from the income tax base. In order to answer this question, a simple model of (im-) perfect household and worker mobility is employed. The focus of the analysis is on the efficient use of land and the efficient allocation of people and labor in a multi-region framework. The paper shows that deductibility is inefficient only if households are perfectly mobile and if households cannot choose their place of work. If the region of work is not exogenously fixed, traveling expenses to work should be deductible at more than one hundred percent, even if households choose simultaneously the place of work and the region of residence, and even if tax rates are not standardized within the federation.

Keywords: Income taxation, reliefs, household mobility, labor mobility, traveling expenses to work, optimum taxation

JEL-Classification: H21, H24, J61

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Mobility and Reliefs for Traveling Expenses to Work

I. Introduction

The treatment of traveling expenses to work by the tax laws is not internationally standardized, not even within the group of industrialized countries. Traveling expenses to work are not deductible in many countries such as the United States, the United Kingdom and even several continental European countries, but they are deductible in other countries such as the Scandinavian countries and Germany [see OECD (1993), p. 37]. These differences raise the question of whether or not from an economic point of view traveling expenses to work should be deductible from the income tax base. Although there is some discussion in accounting and tax law journals, the question is, with just a few exceptions, widely ignored in the theoretical economics literature.

Reliefs for traveling expenses to work are grounded on equity and efficiency considerations. From the ability-to-pay principle associated with horizontal and vertical equity[1] follows the principle that pure work-related expenses should be excluded from the tax base since income that is used to pay for work-related expenses does not increase the taxpayer's ability to contribute to the cost of government. However, since horizontal and vertical equity and the ability-to-pay principle are somewhat vague concepts, which are, in addition, not perfectly in line with the optimum taxation theory, this paper utilizes a traditional optimization approach and focuses, therefore, mainly on efficiency and ignores the ability-to-pay-principle argument.[2]

The main efficiency argument in favor of a relief is that income tax should not distort worker' decisions concerning their place of work. Critics, however, argue that rather than the place of work, the location of residence matters and that preferential treatment of far-off domiciles by the tax code not only reduces tax revenue but is also inefficient. There is a long debate as to whether the choice of the place of work or the

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1 See Musgrave and Musgrave (1989), p. 198.

2 A more careful analysis of the equity argument regarding work-related expenses can be found by Baldry (1998).

choice of the location of residence is causal for commuting and how the tax code should be adjusted to that phenomenon. Many authors support the US government's policy which has always taken the view that commuting expenses are personal expenses and, hence, should not be deductible at all [see Due (1977)].

This paper attempts to clarify the relationship between mobility and deductibility of traveling expenses to work from the perspective of the allocation branch of government. Therefore, a simple model of (im-) perfect household and worker mobility is employed, which borrows heavily from the public finance literature on decentralization and household mobility. The focus of the analysis is on the efficient use of land and, particularly, on the efficient allocation of people and labor in a multi-region framework. Not surprisingly, the tax code affects the allocation of labor and residents. Although the impacts of deductibility of traveling expenses to work on the allocation of labor and residents will be discussed separately after the introduction of the model, the main interest of the paper is to discuss the deductibility of traveling expenses in the simultaneous presence of labor and household mobility. If individuals decide simultaneously on the place of work and on the location of residence, the treatment of traveling expenses by the tax code might distort both decisions.

The remaining part of the paper is organized as follows. Section two presents the basic model which is, for the sake of simplicity, just a two-region model. While section three focuses on pure household mobility, section four only discusses worker mobility. Section five analyzes the more general case of simultaneous household and worker mobility. Since the analysis reveals a difference between the set of efficient allocations and the set of equilibria in a decentralized economy, section six introduces tax-rate differences between regions to overcome that shortcoming. Finally, section seven concludes.

II. The model

The federation consists of two regions, indexed $i = d, f$. The size of national population is denoted by N. People can live and work in either region. A subscript will be used to indicate the region of residence, a superscript to indicate the region of work. N_i^j is the (non-negative) number of individuals who live in region i and work in region j. Since all households must reside at some location, we have

(1) $$\sum_{i=d,f}\sum_{j=d,f} N_i^j = N .$$

Individuals living in region i and working in region j derive utility from consumption of a private good C_i^j, from leisure F_i^j, and from housing H_i^j (measured in units of land). The (sub-)utility function $U\left(C_i^j, F_i^j, H_i^j\right)$ is well behaved. Individuals are either homogeneous or they are only heterogeneous with respect to their attachment to home. In the latter case, they also derive utility from the region of residence. Therefore, we assume a continuum of individuals, where each is characterized by the type n. Individuals are equally distributed with density one on the interval $\left[0, N\right]$. The preferences of a type-n individual are given by[3]

(2) $U + a\left(N - n\right)$, if he lives in region d,

$U + an$, if he lives in region f.

The parameter a, with $a \geq 0$, measures the imperfection of household mobility. If a equals zero, households are perfectly mobile. Otherwise, their is attachment to home, and individuals are, therefore, not perfectly mobile.

Individuals who do not work in their region of residence, i.e., commuters, consume X units of the private good and need T time units for commuting purposes. Each individual is endowed with $\overline{F}$ units of time. Working time is exogenously fixed at L. Hence, leisure is given by

(3) $$\begin{aligned} F_d^d &= F_f^f = \overline{F} - L, \\ F_d^f &= F_f^d = \overline{F} - L - T, \end{aligned}$$

respectively. Note that leisure time of commuters is less than leisure time of non-commuters.

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[3] This approach has been previously used, among others, by De Palma and Papageorgiou (1988) and Mansoorian and Myers (1993).

Each region is endowed with land $\overline{B}_i$. Land can be either used for production or housing. Land which is used in the production process is denoted by B^i. The land constraints are, therefore,

(4)
$$N_d^d H_d^d + N_d^f H_d^f + B^d = \overline{B}_d, \quad N_f^f H_f^f + N_f^d H_f^d + B^f = \overline{B}_f.$$

Similarly, labor which is used in the production process is denoted by L^i and the labor constraints are

(5)
$$\left(N_d^d + N_f^d\right)L = L^d, \quad \left(N_d^f + N_f^f\right)L = L^f.$$

In region i production takes place according to a linearly-homogenous concave production function $f^i\left(B^i, L^i\right)$. Either output can be used for private consumption and traveling purposes or output can be transformed into a public good of which quantity G is exogenously fixed. The marginal rate of transformation between the private and the public good is constant and normalized at unity. Hence, the national feasibility constraint is given by[4]

(6)
$$G + N_d^d C_d^d + N_d^f\left(C_d^f + X\right) + N_f^d\left(C_f^d + X\right) + N_f^f C_f^f = f^d\left(B^d, L^d\right) + f^f\left(B^f, L^f\right).$$

The individual's decision can be seen as a three-stage process. Individuals make a decision upon the region of residence at the first stage and choose the region of work at the second stage. Finally, they decide on consumption and housing. The commuting equilibrium at the second stage is characterized by

(7)
$$\left[U\left(C_d^d, F_d^d, H_d^d\right) - U\left(C_d^f, F_d^f, H_d^f\right)\right] N_d^d\, N_d^f = 0 \text{ and}$$
$$\left[U\left(C_f^d, F_f^d, H_f^d\right) - U\left(C_f^f, F_f^f, H_f^f\right)\right] N_f^d\, N_f^f = 0.$$

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4 Thus, it is assumed that output can be transported without additional costs, e.g., because there are negligible in comparison with commuting costs. Although it is possible to incorporate transport costs into the model, the costs in terms of complexity outweigh the benefits.

If some residents decide to commute and others do not, i.e., if, e.g., $N_d^d > 0$ and $N_d^f > 0$, they derive the same (sub-) utility from consumption, leisure and housing.

Note that corner solutions are also possible. If (sub-) utilities for commuters and non-commuters were not equalized, the residents of the respective region would either abstain from commuting or would not work in the home region.[5]

$\hat{U}_i = \text{Max}\left\{U\left(C_i^d, F_i^d, H_i^d\right), U\left(C_i^f, F_i^f, H_i^f\right)\right\}$ is the maximum utility a resident of region i can achieve. A migration equilibrium requires

$$(8) \qquad \left[\hat{U}_d + a\left(N - n_d\right) - \left(\hat{U}_f + a n_d\right)\right] n_d \left(N - n_d\right) = 0,$$

where n_d is the marginal individual who is (at interior solutions) indifferent between regions d and f. All individuals with a type less than n_d live in region d, the other people in region f. Since n_d is also the number of region d's inhabitants, the migration equilibrium condition can be also written as

$$(9) \qquad \left[\hat{U}_d + a\left(N_f^d + N_f^f\right) - \left(\hat{U}_f + a\left(N_d^d + N_d^f\right)\right)\right]\left(N_d^d + N_d^f\right)\left(N_f^d + N_f^f\right) = 0.$$

Since it would be extremely inefficient, if people neither work nor live in a particular region, $0 < N_d^d + N_d^f + N_f^d < N$ and $0 < N_f^f + N_d^f + N_f^d < N$ will be assumed in the entire analysis.

To make explicit comparisons in some particular cases possible, it is assumed that utility is weakly separable between, on the one hand, leisure and, on the other hand, consumption and housing:

$$(10) \qquad U\left(C_i^j, F_i^j, H_i^j\right) = \Psi\left(\Phi\left(C_i^j, H_i^j\right), F_i^j\right).$$

Furthermore, the private good and housing are normal goods. Hence, if some residents of a particular region commute and others do not, and if the marginal rates of substitution between consumption and housing are equalized across them, then this will only

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5 Corner solutions could be described by additional inequalities. However, to save space these inequalities will be suppressed.

constitute an equilibrium if commuters who enjoy less leisure can consume more private goods and have, in addition, bigger houses.

Consider next competitive markets where p is the nationwide price of the private good, w_i and q_i are the wage rate and the price of land in region i respectively. Profit maximization in this region implies

$$(11) \qquad pf_B^i = q_i \quad \text{and} \quad pf_L^i = w_i .$$

Because of the constant returns to scale, firms earn no profits. Identical endowments of households with the federation's immobile resources lead to identical rent incomes

$$(12) \qquad R = \left(q_d \overline{B}_d + q_f \overline{B}_f\right) / N .$$

Suppose further that a wage tax is levied at rate τ, $\tau > 0$. The budget constraint of a non-commuting resident of region i reads

$$(13) \qquad \frac{R}{p} = C_i^i + \frac{q_i}{p} H_i^i - \frac{(1-\tau) w_i}{p} L .$$

Neglecting the parameter of attachment to home[6], the utility maximization problem of this individual can be written as

$$(14) \qquad \underset{H_i^i}{\text{Max}}\ U\left(C_i^i, F_i^i, H_i^i\right) = U\left(\frac{R + (1-\tau) w_i L - q_i H_i^i}{p}, \overline{F} - L, H_i^i\right).$$

The first-order condition is

$$(15) \qquad \frac{U_{H_i^i}}{U_{C_i^i}} = \frac{q_i}{p} .$$

The marginal rate of substitution between housing and consumption is equal to the relative price of land and consumption.

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6 Since the degree of attachment to home is irrelevant with respect to this decision, it can be suppressed.

Traveling expenses of commuters are pX, but a fraction β of the traveling expenses is deductible from the tax base of the labor income tax such that the government effectively subsidizes traveling expenses at a rate[7]

(16) $\theta = \beta\tau$.

Hence, commuters who live in region i and work in region j face the budget constraint

(17) $$\frac{R}{p} = C_i^j + (1-\theta)X + \frac{q_i}{p} H_i^j - \frac{(1-\tau)w_j}{p} L$$

and solve

(18) $$\underset{H_i^j}{\text{Max}}\ U\left(C_i^j, F_i^j, H_i^j\right) = U\left(\frac{R + (1-\tau)w_j L - (1-\theta)pX - q_i H_i^j}{p}, \bar{F} - L - T, H_i^j\right).$$

The first-order condition is

(19) $$\frac{U_{H_i^j}}{U_{C_i^j}} = \frac{q_i}{p}.$$

Finally, the budget constraint of the federal government that provides the public good G can be written as

(20) $$\tau\left[w_d\left(N_d^d + N_f^d\right) + w_f\left(N_d^f + N_f^f\right)\right]L - \theta pX\left(N_d^f + N_f^d\right) = pG.$$

III. Household mobility

Suppose first that production is restricted to only one region. W.l.o.g. production takes place solely in region d. Hence, $N_d^f \equiv N_f^f \equiv 0$ and $B^f \equiv L^f \equiv 0$. Households decide on the region of residence, but their is no choice concerning the region of work.

Efficient allocations are solutions of [8]

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[7] It is assumed that $\theta < 1$.

[8] See, e.g., Wellisch (1994).

(21) $$\max_{\substack{C_d^d, H_d^d, C_f^d, H_f^d, \\ L^d, B^d, N_d^d, N_f^d}} \left(1-\delta_f^d\right)U\left(C_d^d, F_d^d, H_d^d\right) + \delta_f^d U\left(C_f^d, F_f^d, H_f^d\right)$$

s.t. (1), (3), (4), (5), (6), (9),

$$N_d^f \equiv N_f^f \equiv 0, \; B^f \equiv L^f \equiv 0.$$

δ_f^d is the weight of commuting residents of region f in the social welfare function, where $0 \leq \delta_f^d \leq 1$. The constraints are the feasibility constraints concerning people (1), land (4), labor (5), and output (6), the definition of leisure (3), and the migration equilibrium condition (9).

Rearranging the first-order conditions, yields

(22) $$\frac{U_{H_d^d}}{U_{C_d^d}} = f_B^d.$$

In that region where production actually takes place, the marginal rate of substitution between housing and consumption should be equal to its opportunity costs, i.e., the marginal product of land in the production process.

Furthermore, taking into account all feasible values of δ_f^d, one obtains

(23) $$2a\frac{N_d^d}{U_{C_d^d}} \geq C_f^d + X + \frac{U_{H_f^d}}{U_{C_f^d}} H_f^d - \left(C_d^d + \frac{U_{H_d^d}}{U_{C_d^d}} H_d^d\right) \geq -2a\frac{N_f^d}{U_{C_f^d}}.$$

The marginal net costs of mobile households in terms of the private good in the various regions should not differ too much from each other. If there were no attachment to home, i.e., if a = 0, marginal net costs should be equalized across regions. Conditions like these are well known from the public finance literature on household mobility [see, e.g., Mansoorian and Myers (1993), Wellisch (1995), Wrede (1997)].

In a decentralized economy, profit maximization and utility maximization in region d lead to

(24) $$\frac{U_{H_d^d}}{U_{C_d^d}} = \frac{q_d}{p} = f_B^d.$$

The use of land is therefore efficient.

Using the first-order conditions of households, it follows from the budget constraints of non-commuting residents of region d and commuters living in region f that

(25) $$C_f^d + X + \frac{U_{H_f^d}}{U_{C_f^d}} H_f^d - \left(C_d^d + \frac{U_{H_d^d}}{U_{C_d^d}} H_d^d \right) = \theta X .$$

Thus, the following proposition can be stated:

Proposition 1*: If all people work in one and the same region, an efficient migration equilibrium requires*

(26) $$2a \frac{N_d^d}{XU_{C_d^d}} \geq \theta \geq -2a \frac{N_f^d}{XU_{C_f^d}} .$$

Hence, the subsidy rate is constrained from above and below. As a means of redistribution, the subsidy rate can be positive or negative.

From the proposition, the following corollary follows immediately.

Corollary*: If all people work in one and the same region and if individuals are perfectly mobile, an efficient migration equilibrium requires a zero subsidy rate.*

If households were perfectly mobile, i.e., if a = 0, traveling expenses should not be deductible from the tax base: $\theta = \beta = 0$ would be optimal. The choice of the region of residence should not be distorted by deductible traveling expenses. If traveling expenses were deductible, the marginal net costs of mobile households would not be equalized across regions. The higher costs of commuters would be understated at the migration equilibrium.

Notice that incorporation of land in the model is essential here. Only if the price of land in region f were lower than the price of land in region d would there be incentives for individuals to live in region f and to commute, in particular, if traveling expenses were not deductible from the tax base.

IV. Worker mobility

Suppose now that housing is restricted to only one region. W.l.o.g. all people live in region f. Hence, $N_d^f \equiv N_d^d \equiv 0$. Households choose the region of work, but their is no choice concerning the region of residence. Whether individuals are attached to home or not is negligible since households are crowded together in one and the same region.

Efficient allocations are solutions of

$$\text{(27)} \qquad \underset{\substack{C_f^f, H_f^f, C_f^d, H_f^d, \\ L^d, B^d, L^f, B^f, N_f^f, N_f^d}}{\text{Max}} \; U\left(C_f^f, F_f^f, H_f^f\right)$$

$$\text{s.t.} \qquad (1), (3), (4), (5), (6),$$

$$U\left(C_f^d, F_f^d, H_f^d\right) = U\left(C_f^f, F_f^f, H_f^f\right),$$

$$N_d^f \equiv N_d^d \equiv 0, \; B^d \equiv \overline{B}_d .$$

The constraints are the feasibility constraints with respect to people (1), land (4), labor (5), and output (6), the definition of leisure (3), and the commuting equilibrium condition [see (7)].[9]

Solving the optimization problem, yields

$$\text{(28)} \qquad \frac{U_{H_f^d}}{U_{C_f^d}} = \frac{U_{H_f^f}}{U_{C_f^f}} = f_B^f .$$

The marginal rate of substitution between housing and consumption should be equalized among residents of region f and, furthermore, equal to the marginal productivity of land.

An efficient allocation of workers also requires

$$\text{(29)} \qquad C_f^f + f_B^f H_f^f - f_L^f L = C_f^d + X + f_B^f H_f^d - f_L^d L .$$

The marginal net costs of mobile workers in terms of the private good should be equalized across regions. Note that there is no hint on equalized marginal products of labor.

Since utility was assumed to be weakly separable between, on the one hand, leisure and, on the other hand, consumption and housing, and since the marginal rates of

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[9] A possible corner solution, i.e., that all individuals work in region d, is neglected here.

substitution between consumption and housing are equalized across individuals, an explicit comparison between the marginal products of labor is possible. Commuters will only be put on an equal footing with non-commuters if they consume more of the private good and also more housing than non-commuters. Hence, by the efficiency condition (29), it becomes clear that, taking traveling costs into account, commuters have to be more productive at the margin than non-commuters: $f_L^d - X/L > f_L^f$. Otherwise, too much individuals would commute.

In a decentralized economy, households and firms will make an efficient use of land since in region d land is solely used in the production process and in region f selfish behavior ensures

$$(30) \qquad \frac{U_{H_f^f}}{U_{C_f^f}} = \frac{U_{H_f^d}}{U_{C_f^d}} = \frac{q_f}{p} = f_B^f.$$

Making use of these equilibrium conditions and bringing together the budget constraints of non-commuting and commuting individuals, one obtains

$$(31) \qquad C_f^f + f_B^f H_f^f - f_L^f L - \left(C_f^d + X + f_B^f H_f^d - f_L^d L\right) = \tau\left(f_L^d - f_L^f\right)L - \theta X.$$

Obviously, efficiency calls for a zero RHS. Taking the higher productivity of commuters at an efficient allocation into account, i.e.,

$$(32) \qquad f_L^d - \frac{X}{L} > f_L^f \Leftrightarrow \frac{\left(f_L^d - f_L^f\right)L}{X} > 1,$$

the RHS is equal to zero only if the subsidy rate θ exceeds the tax rate τ.[10]

Summarizing:

Proposition 2: *If all people live in one and the same region, an efficient commuting equilibrium requires*

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[10] A subsidy being higher than the tax rate guarantees that the commuters' income net of wages and traveling expenses is higher than the non-commuters' income net of wages:

$R + (1-\tau)w_d L - (1-\theta)X = pC_f^d + q_f H_f^d > pC_f^f + q_f H_f^f = R + (1-\tau)w_f L$.

(33) $$\theta = \frac{\tau\left(f_L^d - f_L^f\right)L}{X} > \tau \, .$$

The proposition states that traveling expenses should be deductible at more than one hundred percent: $\beta > 1$. The choice of the region of work would not be distorted by a hundred-percent deductibility of traveling expenses if commuting were not time consuming. However, commuting usually takes a considerable amount of time, and thus a hundred-percent deductibility is insufficient to ensure neutrality with respect to the choice of the location of work.

V. Household and worker mobility

Ignore now all restrictions put on the locations of production and residence. Individuals can live and work in either region.

However, resources would be wasted if some individuals were commuting from region d to f and simultaneously others were commuting the other way round. This can easily be shown. Suppose, by contradiction, that $\tilde{N}_d^d$, $\tilde{N}_d^f$, $\tilde{N}_f^d$, $\tilde{N}_f^f$, where $\tilde{N}_d^f > 0$ and $\tilde{N}_f^d > 0$, is an optimum population distribution. Consider a change in the population distribution such that the number of commuters in either direction is reduced by one, and such that the number of non-commuters in regions d and f is increased by one each, i.e., $\Delta N_d^f = \Delta N_f^d = -1$ and $\Delta N_d^d = \Delta N_f^f = 1$. Hence, the residential populations of region d as well as of region f remain unaltered. Although output is also unaltered, less resources (and less time) are used for traveling purposes. Everybody could be made better off, even if everybody gets the same acres of land as before. This contradicts the assumption that the original population distribution was optimal. Hence, w.l.o.g. in the remaining part of the section $N_d^f \equiv 0$ is assumed.

Furthermore, if households were perfectly mobile, i.e., if a = 0, and if the production technologies were the same in both regions, an efficient allocation can be easily described by

$$(34)\qquad N_d^d = \frac{\overline{B}_d}{\overline{B}_d + \overline{B}_f} N,\; N_d^f = N_f^d = 0,\; N_f^f = N - N_d^d,\; L^d = N_d^d L,\; L^f = N_f^f L,$$

$$H_d^d = H_f^f,\; C_d^d = C_f^f,\; \frac{B^d}{\overline{B}_d} = \frac{B^f}{\overline{B}_f},\quad \text{and}\quad \frac{U_{H_i^i}}{U_{C_i^i}} = f_B^i,\quad i = d, f.$$

No one should commute, the population-land ratios (and the labor-land ratios) should be equalized across regions, in either region production should take place, and in each region the marginal rate of substitution between housing and consumption should be equal to the marginal product of land. Output and housing per capita would be the same in both regions.

Commuting might only be efficient if two conditions are fulfilled. First, individuals are attached to home. Second, regions are asymmetric. With attachment to home, equal subutilities $\hat{U}_d$ and $\hat{U}_f$ (implied by the same per-capita quantities of consumption, housing and leisure) are compatible with the migration equilibrium condition (9) only if the sizes of residential population are also equalized. The solution to the allocation problem when individuals are perfectly mobile is not within reach with the attachment to home and asymmetric regions. Equalized population-land ratios together with the same per-capita quantities of consumption and housing in both regions are no longer possible if one region is larger than the other.

Efficient allocations are solutions of

$$(35)\qquad \max_{\substack{C_d^d, H_d^d, C_f^d, H_f^d, C_f^f, H_f^f,\\ L^d, B^d, L^f, B^f, N_d^d, N_f^d, N_f^f}} \left(1-\delta_f^d-\delta_f^f\right)U\left(C_d^d, F_d^d, H_d^d\right) + \delta_f^d U\left(C_f^d, F_f^d, H_f^d\right) + \delta_f^f U\left(C_f^f, F_f^f, H_f^f\right)$$

$$\text{s.t.}\qquad (1), (3), (4), (5), (6), (7), (9),\; N_d^f \equiv 0.$$

δ_f^d and δ_f^f are the weights of commuting and non-commuting residents of region f in the social welfare function where $0 \le \delta_f^d \le 1$ and $0 \le \delta_f^f \le 1$. The constraints are the feasibility constraints concerning people (1), land (4), labor (5), and output (6), the definition of leisure (3), the commuting equilibrium condition (7), and the migration equilibrium condition (9).

The focus from now on will be on interior solutions, i.e., $0 < N_d^d N_f^d N_f^f$. The marginal rate of substitution between housing and consumption and the marginal product of land should be equalized in every region which is ensured in a decentralized economy:

$$(36) \qquad \frac{U_{H_d^d}}{U_{C_d^d}} = \frac{q_d}{p} = f_B^d \quad \text{and} \quad \frac{U_{H_f^f}}{U_{C_f^f}} = \frac{U_{H_f^d}}{U_{C_f^d}} = \frac{q_f}{p} = f_B^f .$$

Additionally, taking into consideration the whole range of feasible values of δ_f^d and δ_f^f, one obtains from the first-order conditions that the difference of marginal net costs of mobile households working in region d in terms of the private good should be within a certain range:

$$(37) \qquad 2a\frac{N_d^d}{U_{C_d^d}} \geq C_f^d + X + f_B^f H_f^d - \left(C_d^d + f_B^d H_d^d\right) \geq -2a\frac{N_f^d U_{C_f^d} + N_f^f U_{C_f^f}}{U_{C_f^d} U_{C_f^f}} .$$

Furthermore, an efficient allocation of residents of region f requires that the marginal net costs of residents of region f in terms of the private good should be equalized, i.e., (29) has to hold. Finally, commuters have to be more productive at the margin than non-commuters: $f_L^d - X/L > f_L^f$ [see previous section].

At the equilibrium, (25) and (31) have to be fulfilled simultaneously.[11] Hence, concerning efficiency, the following proposition can be immediately stated.

Proposition 3*: If people live in both regions and if some residents of region f commute, an efficient commuting and migration equilibrium requires*

$$(38) \qquad 2a\frac{N_d^d}{XU_{C_d^d}} \geq \theta = \frac{\tau\left(f_L^d - f_L^f\right)L}{X} > \tau .$$

Since the subsidy rate θ should exceed the tax rate τ, traveling expenses should be deductible at more than hundred percent: $\beta > 1$. However, the subsidy rate is also con-

[11] From $f_L^d - X/L > f_L^f$ follows that at an efficient equilibrium the real wage rate in region d exceeds the real wage rate in region f. Hence, it is guaranteed that residents of region d are not tempted to commute, i.e., that $N_d^f = 0$.

strained from above. It can be easily seen that this constraint would be violated if the attachment parameter a were sufficiently close to zero. Hence, asymmetry and strong attachment to home are required to allow for simultaneous household and worker mobility.

Note that the set of efficient allocations and the set of equilibria do not coincide. If the government can only freely vary the tax rate and the subsidy rate, it is unable to achieve allocations at which the marginal net costs of non-commuting residents of region d are larger than (or roughly the same as) the marginal net costs of commuters from f to d. This can be easily explained. In a decentralized economy, the marginal net costs of mobile households are equal to the income net of taxes (divided by p) plus tax deductions (if adequate). Since commuters from f to d and non-commuting residents of d earn the same income net of taxes, the marginal net cost of non-commuting residents of d could be larger than the marginal net costs of mobile commuters only if tax deductions were negative. This would be, however, incompatible with equal marginal net costs of non-commuting and commuting residents of region f.

In order to make the whole range of efficient allocations available, the government has to have access to an additional policy instrument.

VI. Household and worker mobility and tax rate differences

To enable the government to discriminate against the residents of region f, the wage tax should be levied at different rates according to the residence principle. If the tax rate in region i is denoted by τ_i, the budget constraint of non-commuting and commuting residents of region i become

$$(39) \qquad \frac{R}{p} = C_i^i + \frac{q_i}{p} H_i^i - \frac{(1-\tau_i)w_i}{p} L \quad \text{and} \quad \frac{R}{p} = C_i^j + (1-\theta)X + \frac{q_i}{p} H_i^j - \frac{(1-\tau_i)w_j}{p} L$$

respectively. Instead of (31),

$$(40) \qquad C_f^f + f_B^f H_f^f - f_L^f L - \left(C_f^d + X + f_B^f H_f^d - f_L^d L\right) = \tau_f\left(f_L^d - f_L^f\right)L - \theta X$$

is fulfilled at the equilibrium. Recall that efficiency requires the RHS to be zero. Furthermore, the difference of marginal net costs of workers in region d is given by

(41) $$C_f^d + X + f_B^f H_f^d - \left(C_d^d + f_B^d H_d^d\right) = \theta X - \left(\tau_d - \tau_f\right) f_L^d\, L\,.$$

Hence, the following proposition can be derived

***Proposition 4**: If people live in both regions and if some residents of region f commute and if the government is able to levy the wage tax at different rates according to the residence principle, an efficient commuting and migration equilibrium requires*

(42) $$\theta = \frac{\tau_f\left(f_L^d - f_L^f\right)L}{X} > \tau_f \quad \text{and} \quad 2a\frac{N_d^d}{U_{C_d^d}} \geq \left(\tau_d f_L^d - \tau_f f_L^f\right)L \geq -2a\frac{N_f^d U_{C_f^d} + N_f^f U_{C_f^f}}{U_{C_f^d} U_{C_f^f}}\,.$$

If the tax rate in region f is larger than the tax rate in region d, allocations that are not available without discriminating taxation are within reach. Tax rate differences make it possible that the marginal net costs of non-commuting residents of region d are larger than the marginal net costs of commuters from f to d. The whole range of efficient allocations is available.

VII. Concluding remarks

The basic question of the paper was whether or not traveling expenses to work should be deductible from the income tax base. In order to answer this question, a simple two-regions model of (im-) perfect household and worker mobility has been employed. The analysis focused on the efficient allocation of land, labor and residents. The following main results were derived.

First, deductibility of traveling expenses to work is clearly inefficient only if households are perfectly mobile with respect to their place of residence and if, in addition, households cannot choose the place of work, i.e., if there is not an equally good place of work.

Second, if, at the optimum, households are indifferent between various regions of work, traveling expenses have to be deductible from the wage tax base at more than one hundred percent. This holds true even if households choose simultaneously the place of work and the region of residence.

Third, in the presence of imperfect household mobility, a uniform tax rate and a subsidy rate are insufficient instruments for making the whole set of efficient allocations available. If, however, the government levied the wage tax according to the residence principle and if tax rate differences were possible, the entire range of efficient allocations would be within reach. The discussion has shown that non-uniform tax rates or similar instruments are necessary to enable the government to achieve the more extreme subsets of efficient allocations. This points to a positive role of decentralization.

Although the discussion has been embodied in a general equilibrium framework, the analysis has obviously some important shortcomings. One is the limitation to the first-best analysis. By fixing the working hours per person, a second-best-taxation problem has been avoided. Naturally, results become more vague in a second-best situation. The second weakness of the approach is the already mentioned lack of a transportation cost in the model. If the transport of final goods caused considerable costs, commuting would be less efficient since, to a larger extent, production should take place where consumers live. However, in a multi-good model the desirability of commuting could be restored. Another weak point of the analysis is that any compliance and administration costs of a relief for traveling expenses to work have been neglected. Finally, a possible inverse relationship between the expenses to work and the traveling time has not been discussed here [see Wrede (1999)].

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