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Does Commuting Reduce Wage Disparities?

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ABSTRACT: This paper shows that in the Baltic countries, commuting reduces urban-rural wage and employment disparities and increases national output. To quantify the effect of commuting on wage differentials, two sets of earnings functions are estimated (based on Estonian, Latvian, and Lithuanian Labor Force Surveys) with location variables (capital city, rural, etc.) measured at the workplace and at the place of residence. We find that the *ceteris paribus* wage gap between capital city and rural areas, as well as between capital and other cities is significantly narrowed by commuting in some cases but remains almost unchanged in other. Different outcomes are explained by country-specific spatial patterns of commuting, educational and occupational composition of commuting flows, and presence or absence of wage discrimination against rural residents in urban markets. A treatment effects model is used to estimate individual wage gains to rural—urban or inter-city commuting; these gains are substantial in most but not all cases. Wage effects of commuting distance, as well as impact of education, gender, ethnicity, and local labor market conditions on the commuting decision are also explored.

Introduction

The main purpose of this paper is to quantify the effect of commuting on earnings disparities between three types of residential areas: capital cities, other urban areas and the countryside. The Baltic countries, which despite their small geographical size, feature considerable regional variation in earnings level, provide good examples. According to most recent available enterprise surveys, reported average gross wage in the capital city exceeds the one in the rest of the country by 40 percent in Latvia and by about 30 percent in Estonia and Lithuania. At the same time employees in the poorest counties of Estonia and Lithuania earn less than 80 percent of the national average, while the poorest municipalities in Latvia and Lihtuania are below 70 percent of this level.

Of course this comparison does not account for different occupational and industrial structures of employment. However, earnings functions based on year 2000 Labor Force Survey data reveal wage differentials of more than 40 percent between capital and rural areas outside the capital region in Estonia and more than 30 percent in Latvia even when employee and job characteristics, as well as the local unemployment rate, are controlled for; differentials between capitals and other urban areas exceed 20 percent (similar to Poland, see Newell (2001), Table 9). In Lithuania, respective differentials are about 10 percentage points smaller than in Latvia, but they are still significant.

On the other hand, due to agglomeration, employment opportunities are better (and more diverse) in urban areas than in the countryside, as well as in capitals compared to other cities.[1] Combined with high housing prices in the capitals and overall small distances, such differentials can generate a lot of commuting, mostly (but not only) toward capitals, with gains to typical commuters going beyond compensation for travel expenses. Indeed, more than 40 percent of full-time employees residing in Latvian and Estonian rural areas and more than 60 percent of their Lithuanian counterparts travel to the workplace in another (usually urban) municipality; commuting from small cities is also substantial (Tables 1, 2a, 2b).

To what extent does commuting reduce spatial wage disparities? In other words, it is known that an employee *working* in Tallinn earns, on average, 33 percent more than an otherwise similar employee *working* in the countryside. Yet what if employees *living* in Tallinn and in the countryside are compared? Given how many of the rural residents work in cities, one should expect the latter differential to be significantly smaller than the former. This suggests that income disparities between urban and rural residents, high as they stand,[2] would be even higher without commuting. It takes some doing to prove it rigorously, though; in particular, this study shows that accounting for suburbanization (workers with high incomes moving from the capitals to cheaper and better housing in the surrounding countryside while keeping their jobs in the capital) does not destroy the conclusion.

Relevant recent literature on commuting is overviewed in section two. Section three presents and compares commuting patterns in the three countries. Section four analyzes the

impact of commuting on urban and rural labor markets, including occupational composition of labor supply. It is shown that commuting reduces (at least in the short run) welfare disparities between capital cities and rural areas. This is done in a partial equilibrium framework, assuming fixed distribution of residential location between capital cities, other urban areas, and the countryside; evidence is provided to justify this assumption for the countries in question.

The paper's main research question is approached in section five, where earnings functions with controls for job location and for residence are compared. Results show that effect of commuting on wage disparities is country- and region-specific. In search for an explanation of the differences, the study tests whether commuters from rural areas are subject to wage discrimination in cities[3]; significant effects are found only in Lithuania. The reasons for such different outcomes are further explored in section seven, which is devoted to determinants of commuting decision, including education, gender, ethnicity, and local labor market conditions (cf. Artis et al. (2000) for a related study).

While the inequality-reducing effect of commuting is of social importance, it is driven by individual gains to rural-urban or inter-city commuting. These gains are evaluated in section six; a treatment effects model is applied to correct for selectivity bias. Section eight summarizes main findings and briefly discusses the relevance of spatial mismatch and intervening opportunities hypotheses in the Baltic context.

Literature Survey

Although the issue of commuting has been thoroughly investigated in labor economics, urban economics, and regional science both theoretically and empirically, the debate is still alive. The spatial mismatch hypothesis (see Kain (1968, 1992)) has been recently supported by search equilibrium and other models in Brueckner and Martin (1997), Arnott (1998), Zenou and Wasmer (1999), Zenou (2000), Coulson et al. (2001), McQuaid et al. (2001), So et al. (2001), and Brueckner et al. (2002). These authors, as well as Sen et al. (1999), Webster (2000), Martin (2001), and Wrede (2001) discuss welfare implications and policy recommendations. While all models predict longer commutes for low-skilled workers, the spatial structure in Brueckner et al. (2002), where high-income residents live near the center (like in a number of European cities), differs from the one predicted by standard urban economics models and de-concentration (preferences for smaller density) hypotheses, with the high-income group dispersed in the suburbs or small cities.[4]

Thomas (1998) and van Ham et al. (2001) have found empirical support for the mismatch hypothesis, while Taylor and Ong (1995) have not. Ethnic, gender, and other special group issues in the context of commuting are discussed also in van Ommeren et al. (1998) and Gottlieb and Lentnek (2001).

To the author's knowledge, apart from the thesis by Erbenova (1997), who analyzed interregional commuting flows and determinants of individual commuting decision in the Czech Republic, there has been no research dealing with commuting in a transition context.

Patterns of Commuting in the Baltic Countries

For the purposes of this paper commuters are defined as employed persons whose workplace is located in a municipality other than their residence; each city is considered as one municipality (even if it is administratively subdivided in smaller districts, as is the case for Riga and Tallinn). According to year 2000 data (Table 1), about 20 percent of all workers employed in the Baltic States are commuters in this sense. In rural areas the proportion of commuters among full-time employees[5] is 43 percent in Latvia, 48 percent in Estonia, and 67 percent in Lithuania (Table 1).[6]

The average commuting distance of full-time employees who live in the countryside and work in the cities is 24 km in Estonia and 21 km in Latvia. Those who commute to capital cities from elsewhere travel on average 41 km in Estonia and 36 km in Latvia.[7] Only 8 to 9 percent of the employees in Latvia and Estonia work more than 20 km away from home, and only 4 to 5 percent more than 30 km. Long distances are more likely to be made by rural residents. Average distance between residence and workplace for full-time employees in Estonia is just 9 kilometers (see Tables 2a, 2b, and 3 for other details). While these figures might look low by

large country standards, one has to keep in mind that in the Baltic countries, areas only 10-15 km away from the borders of capital cities are in a different world.

While rural areas are net senders of workforce and capital cities are net receivers of workforce in all three countries, other cities are on average net senders in Latvia but net receivers in Estonia and Lithuania (details are found in Tables 4 and 5).

Spatial patterns of (between-municipalities) commuting differ among the three countries. Commuting from urban areas surrounding capitals in Latvia is almost completely oriented toward the capital city, while in Lithuania this accounts only for 35 percent of commutes (with the remaining commuting happening mainly between the small towns within Vilnius County and to some extent toward other urban and even rural areas). Commuting from other cities in Lithuania goes in equal proportions to urban (outside Vilnius County) and rural areas, while in Latvia flow to Riga accounts for about 50 percent of all cases, and flows between other cities only for 10 percent. Estonia is somewhere in between these two patterns, though closer to the Lithuanian one. Commuters from the countryside are predominantly absorbed by cities other than the capital (51 percent in Estonia, 46 percent in Latvia, 58 percent in Lithuania); share of capital city is more than 30 percent in Latvia and Estonia but just 13 percent in Lithuania.

In contrast with big cities in the U.S. (see, e.g., Zax and Kain (1996)), there is very little reverse commuting from capital cities to suburban areas: less than 1 percent in Lithuania, 2.5 percent in Estonia, and 3 percent in Latvia. See Tables 2a, 2b for details. Table 5 documents that net inflow of commuters (including self-employed) in each of the three capitals accounts for 11 (Tallinn), 13 (Riga), and 15 (Vilnius) percent of resident labor force (which is not much below the unemployment rate in Tallinn and Riga but slightly above it in Vilnius). Net inflow of full-time employees into Tallinn, Riga, and Vilnius accounts for 14 to 16 percent of resident full-time employees. Net outflow of full-time employees from rural markets as a proportion of resident full-time employees amounts to one sixth in Latvia, one quarter in Estonia, and more than one third in Lithuania. Urban markets outside capital districts experience very modest net outflow in Latvia, but considerable net inflow in Estonia and especially Lithuania; however, urban areas around capital cities in all three countries see big net outflows, mainly to the capitals (Tables 2a, 2b, 4). Commuters from elsewhere constitute 15 to 17 percent of full-time employees working in the capitals and from 16 to 26 percent in other cities; in the countryside this proportion is as high as one quarter in Estonia, one third in Latvia, and almost one half in Lithuania (Table 5).

Commuting Impact on Urban and Rural Labor Markets

Analysis of the impact of commuting on urban and rural labor markets is begun here by assuming fixed distribution of residences among the three types of territories—capital city, other cities, and rural areas. Hence concepts of wage and employment disparities refer to the groups of population of more or less fixed size residing in these three types of territories.[8] This partial equilibrium approach is justified by the fact that the process of relocation of residences in the Baltic countries is slow, especially when compared to commuting rates. Hazans (2003, Table 2) shows that distribution of population between capital city, other cities and rural areas has changed very little since 1989 in each of the three Baltic countries. While recent overall internal migration rates were between 1 and 1.5 percent per annum, urban-rural and rural-urban migration flows have been of comparable size, resulting in very low net migration rates (Hazans 2003, Tables 1, 10).

Job distribution is, in principle, endogenous with respect to commuting. Supply shifts can lead to changes in the number of jobs in each market, but in the presence of two-digit unemployment (see Table 5), this is not necessarily the case. There is also a demand side effect: thousands of rural residents working in the capital city do their shopping and use other services there, thus increasing market size and (maybe) leading to more job creation. For future reference, let $\alpha C = (\alpha^S + \alpha^D)C$ denote the total number of additional jobs created due to these supply and demand effects in market *j* (say, capital city) by C commuters from market *i* (say, countryside); α of course depends on *j*. Obviously, $\alpha^S < 1$, while $\alpha^D < 0.5$, so $\alpha < 1.5$; a more

realistic estimate for practical purposes is $\alpha \leq 0.5$ with interpretation that at least one out of two commuters has followed the job that was already in place at the host location. Moreover, empirical evidence allows assumption that in the Baltic rural markets α is close to zero. Indeed, between 1997 and 2002 net inflow of commuters (full-time employees) into Latvian capital, Riga, has increased from 10 to 17 percent, and net outflow from rural areas, from 16 to 28 percent. In the same period the share of full-time employees whose main job is located in Riga has increased from 41.4 to 44.4 percent, while the proportion of jobs located in the countryside has not decreased (the estimated proportion has even increased from 17.8 to 18.6 percent, but the standard errors are about 1.1 percentage points). In Estonia distribution of jobs has been even more stable than in Latvia: jobs in the capital city accounted for 37.2 percent of the total in 1998 and 37.3 percent in 2001, while the share of rural jobs increased from 20.5 to 21.4 percent at the expense of other cities (despite net outflow from the countryside increasing from 19 to 20 percent).

How can one explain $\alpha \approx 0$? Low population density in the rural areas means that the "rural labor market" is actually a result of aggregation of many rather small isolated markets with almost inelastic labor demand curves (hence $\alpha^S \approx 0$). On the other hand, the demand effect is a sum of relatively small effects associated with different occupations (say, one shop assistant per 100 customers, one dentist per 200 patients, etc.): $\alpha^D C = \sum \text{int}(\alpha^{D,k} C)$, where int($x$) is the largest integer not exceeding x. For instance, in communities where outflow of commuters $C < 100$, demand effects for occupation k with $\alpha^{D,k} = 0.01$ will be zero, while in the capital city total demand effect generated by inflow of, say, C=1,000 commuters from 40 small rural communities will be 10 jobs in occupation k.

Simple supply-demand analysis suggests that labor reallocation caused by commuting drives wages in capital cities down and bids up wages in the countryside (and urban areas near capitals, where employers compete for workers with the capital city), thus bringing wage levels in capital cities, other cities, and rural areas closer to each other.

In theory, if those who now commute would migrate, each worker would earn the same wage as in the present situation. However, in this case wage gap between *residents* of the capital and other areas would be larger. Commuting thus goes beyond (hypothetical) migration in reducing urban-rural wage disparities. The next section will quantify this difference. It is worth noticing though that migration at rates comparable to commuting in the Baltic countries does not seem realistic.

It will be shown that commuting also reduces rural-urban employment disparities. Again it is necessary to rely on the assumption (discussed above) that the effect of commuting on number of employee jobs in the countryside is virtually zero. Let k be the proportion of rural-urban commuters-employees who would be otherwise non-employed or would crowd out of employment an equivalent number of rural employees (recall that migration is assumed away). In view of two-digit unemployment rates in the countryside (Table 5), k will sometimes be assumed to be equal to one, which can be inerpreted in two ways: (i) The commuters would not go for subsistence farming; or (ii) subsistence farming should be ignored when estimating disparities in employment rates (huge commuting outflows from rural areas reported in Tables 2a and 2b suggest that farming cannot be considered as a perfect substitute for an employee job).

In the Baltic countries, the number of rural-urban commuters substantially exceeds the size of the opposite flow (see Table 5), so it is assumed for simplicity that just C commuters are coming from the countryside to urban areas. Working-age population is denoted in area i by P_i. The above-stated assumptions imply that the rural employment rate goes up by $\Delta E_{rural} = kC/P_{rural}$, while urban employment rate changes by $\Delta E_{urban} = (\alpha C - \beta C)/P_{urban}$, where β is the proportion of commuters who crowd out of employment urban residents.[9] The sign of ΔE_{urban} is ambigous, but as long as

$$\alpha - \beta < kP_{urban}/P_{rural}, \qquad (1)$$

the two employment rates become closer to each other: : $\Delta E_{urban} < \Delta E_{rural}$ (the latter inequality together with the fact that "post-commuting" $E_{urban} > E_{rural}$ implies that without commuting the urban employment rate also would be higher than rural). The urban–rural population ratio for

age group 15-74 is 2.4 in Estonia, 2.3 in Latvia, and 1.7 in Lithuania, so if k=1, (1) clearly holds since $\alpha < 1.5$ and $\beta \geq 0$. Under realistic assumptions $\alpha \leq 0.5$ (see discussion above) and $\beta \geq 0.1$ (1) holds even for $k \geq 0.2$ in Estonia and Latvia and $k \geq 0.3$ in Lithuania. If one compares the countryside with the capital city (rather than all urban areas), the condition which ensures convergence of employment rates is $\alpha - \beta < kP_{capital}/P_{rural}$. The latter population ratio is 1.0 in Estonia, 1.1 in Latvia, and 0.44 in Lithuania, so the condition is met under the same assumptions $\alpha \leq 0.5$ and $\beta \geq 0.1$, if $k > 0.4$ (Estonia and Latvia), and at least for $k = 1$ (the initial assumption) in Lithiuania. In fact, as shown in footnote 9, β is likely to be close to 0.5, in which case there is virtually no restrictions on k.

What about total national output? If q_0 is labor productivity in alternative rural employment of those $(1-k)$C rural-urban commuters who would have one, and q_1 is average labor productivity of these commuters in the cities, then change in GDP due to rural-urban commuting $\Delta Y = [(1+\alpha-\beta)q_1-(1-k)q_0]C$ is positive if and only if

$$(1+\alpha-\beta)q_1/q_0 > 1-k. \qquad (2)$$

A good proxy for q_1/q_0 is the non-agricultural to agricultural labor productivity ratio, which, according to OECD (2003, Table 1.8) was 1.1 in Estonia (2001), 3.4 in Latvia (2000), and 2.6 in Lithuania (2000). Since $\alpha \geq 0$ and $\beta \leq 0.6$ for Latvia and Lithuania (see footnote 9), (2) holds for these countries even if $k = 0$, so commuting increases GDP. For Estonia the same conclusion holds if one assumes, for instance, $\alpha \geq 0.2$ (100 rural-urban commuters generate at least 20 new jobs in urban service sector), $\beta \leq 0.5$ (as in Latvia; Estonian LFS data are not detailed enough in terms of occupations), and $k \geq 0.23$ (at least 23 percent of rural-urban commuters would be non-employed in the countryside). Under the assumption that alternative rural employment would be farming on one's own plot, this positive GDP effect already accounts for lost commuting time. Indeed, productivity ratios used above are based on number of employed persons rather than number of hours worked, and average usual weekly working hours of (full-time) self-employed farmers exceed those of rural-urban commuters (full-time employees) by 12.7 hours in Estonia and by 8.7 hours in Latvia, while average commuting time for this category of commuters, according to Estonian data, is 96 minutes per day, or 8 hours per week (this is a reasonable estimate also for Latvia, as average daily commuting distance for the same category of commuters here is 42.5 km). In Lithuania the difference in weekly working hours between farmers and urban employees is just 42 - 40 = 2 hours, so to fully account for commuting time, one needs to scale down the productivity ratio 2.6 by a factor 40/46 = 0.87. Condition (2) still holds with the resulting ratio 2.26 and any α, $k \geq 0$, given that the crowding-out ratio $\beta \leq 0.5$.

It has been shown that in each of the Baltic countries commuting reduces both wage and (under reasonably mild assumptions) employment disparities between residents of capital cities and rural areas; hence the welfare differential is reduced as well. Moreover, the commuting effect on GDP is positive. Additional positive welfare effects come from the fact that commuters' households can buy consumer goods at the lower of the two prices (rural and urban). Neglecting the congestion, one can conclude that commuting improves total welfare.

Comparison of educational and occupational structure of employees by residence and by job location (Table 6) reveals an interesting difference between Estonia and Latvia on one hand and Lithuania on the other. In Estonia and Latvia commuting results in net decrease both of average educational attainment and average skills level (as well as quantity) of rural employees (most educated and skilled people commute to cities) and slight improvement[10] in quality (in addition to above documented increase in quantity) of labor supplied to the capital cities. In Lithuania composition of rural employees remains almost unchanged (those who commute to cities are typical or just above average rural employees), while average quality of labor in Vilnius clearly (although not strongly) worsens. A common feature of all three countries is that commuting compensates for a shortage of skilled manual workers in capital cities.

Measuring the Effect of Commuting on Regional Earnings Differentials

It has been shown that in the Baltic countries commuting does reduce urban-rural wage disparities. Since this effect is not neutralized by employment effect (which goes in the same direction) and since the effect of commuting on national welfare is also positive, it makes sense to measure the reduction in wage differentials as a part of economic benefits of commuting. The wage effect has two parts: (i) wage levels of employees working in the capital city and in the countryside become closer; (ii) wage differential between *residents* of the capital city and the countryside become smaller than similar differentials measured by job location. Only the second part will be measured here. This study's approach is based on estimating two sets of earnings functions (based on year 2000 LFS data for Estonia, Latvia, and Lithuania; for Estonia and Latvia year 1999 results are also presented) with geographical variables (like capital city, rural, etc.) measured at the job location and at the place of residence. Earnings differentials (e.g., between capital city and rural areas) derived from the first set of functions show how much earnings of an employee *working* in a capital city exceed earnings of an employee *working* in rural areas, controlling for personal and human capital characteristics of the employee, as well as his occupation (nine major ISCO groups), sector of economic activity of the enterprise (fifteen major NACE categories), and ownership sector it belongs to. Local unemployment rate is also controlled for. Similar earnings differentials derived from the second set of functions show how much earnings of an employee *living* in a capital city exceed the earnings of an employee *living* in rural areas (controlling for the same factors). When the second differential falls short of the first one, the reduction should be attributed to commuting: some people live in rural areas but work in the capital city etc.

Notice that all of the "important" coefficients in the earnings functions referred to hereafter are highly significant and have expected signs (detailed results are available on requests; slightly different but similar specifications with job location variables are found in OECD (2003, Annex 3)).

Tables 7a, 7b present the results when urban and rural areas in capital districts are not separated from other urban[11] and rural territories outside capitals. As one can see from Table 7b, in year 2000 commuting narrows the *ceteris paribus* wage gap between capital city and rural areas by 15 percentage points in Estonia and by 9 percentage points in Latvia. The gap between capital and other cities was reduced by 8 percentage points in both countries. This suggests that both residents of rural areas and of small cities gain from commuting. Interestingly, in Estonia the effect of commuting on the urban-rural wage differential was much smaller during the 1999 recession (caused by the Russian financial crisis of 1998).

In Lithuania, by contrast, there is little (statistically insignificant) difference between regional differentials by workplace and by residence. Estimated commuting-driven reduction in the wage differential between Vilnius and small cities is just 2 percentage points, and between Vilnius and rural areas—4 percentage points. This is despite the fact that almost half of employees residing in rural areas work in cities (Table 2b) and indeed enjoy significant earnings gains (see the next section). The reasons are found partly in the fact that rural-urban flows of commuters in Lithuania are dominated by manual workers (see Table 6 and preceding comments) and partly in wage discrimination against commuters from the countryside in urban markets (explored further in this section).

To account for the special role of capital districts, where commuting toward capital cities is much more intensive than elsewhere (see Table 2a, 2b), both urban and rural areas outside the capitals were subdivided into two categories (inside and outside capital district). Results presented in Table 8 shed some light on the situation in Lithuania: the only differential there substantially (by 9 percentage points) reduced by commuting is the one between Vilnius and urban areas in Vilnius County. In Latvia, by contrast, there are three such differentials: residents of cities within the Riga district, as well as urban and rural residents outside the Riga district seem to be successful in catching up with Riga residents (respectively by 12, 9, and 11 percentage points). So the processes behind very modest (just 2 percentage points) and not significant reduction in the wage gap between urban and rural areas outside capital districts are very different in Latvia and Lithuania.

In Estonia rural residents outside the capital district seem to gain more from commuting than their urban counterparts. More interestingly, in contrast with the other two countries, residents of rural areas surrounding Tallinn earn even more (although not significantly) than otherwise similar residents of the capital city. This suggests that some of the high wage earners have started to move from sleeping districts of Tallinn to their own houses in rural areas nearby.

One possible reason why commuting in Lithuania does not have a significant effect on the urban-rural earnings gap is that commuters from the countryside do not receive fair pay at their workplaces. Table 9 presents results derived from earnings functions augmented with dummies for different types of commuters and estimated separately for employees working in the capital city, other urban areas, and rural areas. Indeed, in Vilnius commuters from rural areas earn 16 percent less than local employees of the same age, education, gender, ethnicity, type of contract (permanent or temporary), and enterprise ownership sector (this holds both with and without controlling for industry and occupation). In other cities discrimination against rural residents is smaller (8-9 percent) but still very significant. This finding is fully consistent with estimated urban-rural differentials in reservation wages of the unemployed in Lithuania (results are available on request), which in turn have to do with scarcity of paid jobs in rural areas. Employers' discrimination cannot be excluded either (residence of an applicant is readily available from his passport). By contrast, there is no evidence of such discrimination in Estonian urban markets and only very weak (4-5 percent, statistically not significant) signs of discrimination in Latvia; recall that commuters from the Estonian and Latvian countryside are on average even more educated and skilled than resident urban employees.[12] On the other hand, in all three countries urban residents working in the countryside find better industry/occupation combinations than their otherwise similar local counterparts, and, furthermore, are better paid than locals with the same characteristics, industry, and (major group of) occupation; the latter differential is 21 percent in Lithuania and 9-10 percent in Latvia and Estonia, but without industry and occupation controls, respectively 28 and 19-21 percent. See Zax (1991) for an early study of the effect of residence on earnings of workers with the same job location.

Individual Gains to Commuting and Job Location

Observed wage gains to commuting are found by estimating an earnings function augmented with a dummy for commuters and regional dummies by residence (selection issue is dealt with later on). Recall that commuters in this paper stand for those whose job is located not in the same municipality as residence. Moreover, as far as rural residents are concerned, in this section (and in Table 10), only commuters to cities are considered to make the results comparable with those of the previous section; this does not change the results qualitatively. As the focus here is on individual gains rather than urban-rural differentials, and employment opportunities might be very different at residence and job location, ownership sector, industry, and occupation are not controlled for in the wage equation (in contrast with equations discussed in the previous section); this is partly compensated by more detailed education classification (six categories instead of three).

Results reported in Table 10 (rows "Independent equations estimate") show that in Latvia, commuters from urban (outside Riga) or rural areas earn on average 16-17 percent more than otherwise similar non-commuters from the same region and type of residential area. These differentials are significant at the 1 percent level. Commuters from urban (respectively, rural) areas in the Riga district gain more (respectively, less) than those living outside. The situation is similar for commuters from the countryside in Lithuania, although gains to working in cities are just 11 percent on average. Commuters from Lithuanian cities earn just 7 percent more than non-commuters, other things equal. This differential is marginally insignificant; when cities nearby the capital are excluded, it narrows down (in contrast with Latvia) to 5 percent and becomes very insignificant. Observed wage gains for residents of Estonian rural areas working in the cities are higher than in the other two countries (24 percent). Consistent with the author's previous findings (Table 8) and in marked contrast with Latvia and Lithuania, this gain is larger for rural residents of the capital region (despite wages here that are substantially higher than

elsewhere in the countryside also for non-commuters). Available Estonian data do not allow identifying all commuters between cities.

When residence is controlled for (or if the sample is limited to employees residing in urban or rural areas), the dummy for being a commuter can be viewed as an endogenous decision variable, and the full effect of this variable on earnings has to be estimated jointly with the decision model. A conventional tool for dealing with this selection issue is a treatment effects model (Maddala 1983), which in the context of this paper consists of two equations with correlated errors:

(i) Earnings equation regressing log wages on age and its square, education, gender, ethnicity dummies, dummy for fixed-term contracts, relevant regional dummies by residence, and dummy COMMUTE.

(ii) Probit with dependent variable COMMUTE (a dummy for commuters) and the following explanatory variables: education, gender, ethnicity, age groups, marital status and children dummies, regional dummies or relevant characteristics of local labor market at residence, and instrument(s) significantly influencing the commuting decision and uncorrelated with errors in earnings equation (see Puhani (2000) on importance of this point).

Notice that returns estimated in this model are conditional on being hired. Results are reported in Table 10. In the case of Latvia, distance from Riga and a dummy for females with children were used as instruments (additionally to age group dummies instead of age and age squared). Hypothesis of independence of errors in equations (i) and (ii) is strongly rejected for all employees, as well as for urban and rural sub-samples. Unobserved characteristics which promote commuting have a negative impact on earnings. The maximum likelihood estimate of returns to commuting is about 50 percent in urban areas (Riga excluded) and about 60 percent in the countryside. In other words, commuters earn 1.5 to 1.6 times more than they could potentially make being employed at their residence places.

A similar picture (with 44 percent returns to working in cities) is found in Lithuanian rural areas. For residents of Lithuanian small cities (as well as for the pooled sample), the treatment effects model produces (insignificantly) negative wage returns to commuting, suggesting that commuters from urban areas gain mainly in terms of employability; error correlation is positive (although weak). However, when cities in Vilnius County are included, hypothesis of independence of errors in wage and selection equations (under which positive "almost significant" returns to commuting were found) is not rejected, confirming once again that commuters from these cities gain more than other urban commuters.

Yet another pattern is found in Estonia. Depending on regional controls in the wage equation, it was found that the average commuter from rural to urban areas earns 77 to 93 percent more than he/she could make at residence, but when rural residents of the capital county are removed from the sample, returns to commuting become negative (despite observed differential of +21 percent), and error correlation positive. As instruments in the commuting equation (without county dummies, except for the capital county), lagged urban and rural county unemployment rates have been used, the former having negative and the latter positive and very significant impact; several alternative specifications lead to similar results. People from rural areas around Tallinn commute to the capital city, where they earn much more than it would be possible to earn outside Tallinn. About 90 percent of commuters to cities from countryside outside the capital county, predominantly well educated, end up in cities other than Tallinn; their earning abilities could allow them to make more money in the countryside if jobs at suitable positions in wage distribution were available.

Estonian and Latvian data allow estimating returns to distance commuted (Table 11). These returns appear to be substantial (more than enough to cover commuting costs), although diminishing as distance increases. In Estonia returns are higher for urban, but in Latvia—for rural residents, who gain from the distance made, be it to urban or rural destination. Longer commutes provide better industry-occupation combinations.

Determinants of the Commuting Decision

Tables 12 and 13 present estimated logit models, which measure impact of individual and regional characteristics on the (between-municipalities) commuting decision in Latvia and Lithuania. Four models compare (i) employees-commuters with other employees; (ii) all employed commuters with other employed; (iii) all employed commuters with other economically active (thus alternatives to commuting are working at the residence place or job-seeking); and (iv) all employed commuters with the rest of population aged fifteen or older (thus adding inactivity as alternative to commuting).[13] Other things equal, the likelihood of commuting increases with education (except for the Lithuanian rural sub-sample, not shown in the table) and, teenagers aside, decreases with age; females are less likely to commute. When inactive persons are not considered (i.e., in models (i)—(iii)), teenagers are more likely to commute than persons aged thirty-five and older in Latvia, or twenty-five and older in Lithuania. Ethnic minorities in Lithuania are significantly more inclined to commute between municipalities than Lithuanians. In Latvia as a whole, ethnicity does not matter for the commuting decision; however, when the sample is restricted to urban areas (Riga excluded), minority employees are more likely to commute than Latvians, other things equal.

Residents of capital cities and other big cities are very unlikely to take jobs elsewhere, while residents of rural areas and districts surrounding capitals are much more likely to commute than residents of small cities outside capital districts.

In Latvia probability to commute strongly declines as the distance between place of residence and capital city goes up, thus supporting the gravity center model (data for such analysis in the case of Lithuania were not available). When this distance (which is positively correlated with the local unemployment rate and negatively with wages) is included in the model, neither unemployment rate at residence[14] nor local wage rate is significant. However, when distance is excluded, the impact of the local unemployment rate becomes negative, even if only employees are considered (although it is not significant in this case). In other words, negative impact of physical distance from Riga on worker mobility is stronger than impact of unemployment as a push factor.

In Lithuania both unemployment rate at residence and local wage rate have negative and significant impact on the likelihood of commuting. The negative impact of wage rate has a natural interpretation, but this is not the case with unemployment (the distance story does not work since two of the three counties with the highest unemployment rates are close to Vilnius). Perhaps the fact that unemployment is measured by larger units in Lithuania than in Latvia (counties rather than districts) plays a role here: given that the travel-to-work area is in most cases within a given county, there are few opportunities for commuting if unemployment in the county is high. Another explanation could be poor infrastructure in such counties.

Conclusions

In each of the three Baltic States labor market in the capital city is subject to net inflow of commuters comparable to the pool of unemployed, while rural markets see net outflow varying from one sixth (Latvia) to one third (Lithuania) of full-time employees. It has been shown that in Estonia and Latvia *ceteris paribus* wage differentials between capital city and rural areas, as well as between capital and other cities, are reduced substantially when measured by residence rather than job location. In Lithuania the only differential significantly reduced by commuting is the one between Vilnius and urban areas in Vilnius County, despite the fact that almost half of employees residing in rural areas commute to cities and indeed enjoy significant earnings gains. So different outcomes are explained by (i) spatial patterns of commuting (from essentially monocentric in Latvia to polycentric in Lithuania), (ii) wage discrimination against rural residents in Lithuanian urban labor markets, (iii) country-specific housing preferences of high-income earners, and (iv) occupational composition of commuters' flows. An additional reason is probably better family networking between countryside and capital city in Latvia and Estonia, which promotes job search away from residence (Coulson et al. (2001) show the crucial role of information frictions for spatial mismatch).

Commuting in Lithuania has some features supporting spatial mismatch hypothesis (in its general form, without reference to reverse commuting): ethnic minorities[15] are more likely to

commute; unskilled labor prevails in rural-urban flows, with skilled labor prevailing in the opposite flows. Although employees with higher education are, on average, more likely to commute (which is not consistent with the spatial mismatch story), this pattern does not hold when one looks at rural residents only; moreover, there are indications that many commuters in Lithuania take up occupations which require less education than they actually have.

In Latvia results give more support to the IOSD (intervening opportunities with spatial dominance, see Akwawua and Pooler (2001)) model than to spatial mismatch: commuting is directed predominantly toward the capital city; the likelihood of commuting increases with education both in urban and rural areas and falls when one moves further away from the capital; the occupational structure of commuters' flows is closer to host than to source demand structure; and the capital city-countryside gap in educational attainment of employees widens when measured by job location rather than residence, in contrast with Lithuania, where it narrows.

While some individuals gain and some (e.g., resident employees in capital cities) lose as the result of commuting, urban-rural welfare disparities are reduced, and national output goes up, at least in the short run, because of the shift of labor from rural areas to capital cities (this effect is conditional on fixed distribution of residences—an assumption which is justified by data for the countries in question). The findings here provide support for commuting-promoting public policies. Of course alternatives such as creating remote workplaces and stimulating entrepreneurial activities in the countryside must be considered as well.

NOTES

1. Even raw employment rates, which do not account for job location are lower in rural areas (Table 1).
2. According to the results of Household Budget Surveys, in the year 2000 per capita disposable income in rural areas was on average just 67-69 percent of that in urban areas. Moreover, the rural-urban income ratio has fallen since 1996 when it was 76 percent in Estonia and Lithuania, and 90 percent in Latvia.
3. The results in this section interfere with the discussion in van Ommeren and Rietveld (2003).
4. The latter has been recently supported by evidence from the U.S. and the Netherlands in Benkow and Hoover (2000) and Rouwendal and Meijer (2001)). Interestingly, Baltic capitals feature a mixture of these two models.
5. Hereafter the focus is on full-time employees because the methodology relies on wage regressions. Those who live or work abroad are excluded.
6. This, together with availability of subsistence farming, explains why rural unemployment rates do not exceed the urban ones (they are even lower in Latvia and Lithuania, see Table 5).
7. Source: author's calculations based on LFS data. Estonian LFS has a question on commuting distance. For Latvia distance between the centers of respective municipalities has been used as a proxy (Latvian LFS provides four-digit territory codes; Riga is subdivided into six districts, while each of the other cities is one municipality).
8. Later urban and rural areas surrounding the capital city will be separated; this is ignored here for simplicity of presentation.
9. Analysis of four-digit occupation codes of commuters to and from Riga, as well as codes of last job and certified professions of unemployed residents of Riga shows that roughly half of the jobs occupied by commuters to Riga could have been potentially filled by unemployed residents and commuters from Riga (mostly by the former). Similar analysis for Vilnius is less reliable (Lithuanian LFS provides only three-digit occupation codes and does not have a question on certified profession) but also reveals that a big part (although most likely no more than 60 percent) of the commuters to Vilnius are "crowding out" residents.
10. In Latvia only in terms of education.
11. However, dummies for Ventpils (Latvia), and Kaunas and Klaipeda (Lithuania), where wages are significantly higher than in other urban areas, are included in the models.
12. This does not hold for commuters from rural areas outside the capital county to Tallinn; when this group is considered separately, it appears that they earn 9 percent less than Tallinn residents, other things equal, but the differential is not statistically significant.
13. More complicated discrete choice models have not been pursued. One possibility could be a nested logit (see Greene (2000)) model, where the agent first decides whether to participate in the labor force; those active are further classified into three categories: unemployed jobseekers, employed at residence

location, and commuters to another municipality. Alternatively, following Rouwendal and Meijer (2001), a mixed logit model (McFadden and Train (2000)) with random coefficients can be used.

14. Except for the model where self-employed and employers are added to the employees.
15. In Lithuania minority workers are, on average, less educated than Lithuanians.

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TABLE 1. PROPORTION (PERCENT) OF EMPLOYED PERSONS WHOSE RESIDENCE AND MAIN JOB ARE LOCATED IN DIFFERENT MUNICIPALITIES. THE BALTIC COUNTRIES, 2000.

Country	**Estonia**			**Latvia**			**Lithuania**		
Residents	All	Urban	Rural	All	Urban	Rural	All	Urban	Rural
Commuters/employed [a]	21.5	13.0	42.7	17.3	12.7	28.4	22.7	10.1	45.3
Commuters/full-time employees [a]	23.0	13.5	48.4	19.3	12.6	43.3	23.0	9.6	66.5
Employment rate [b]	54.5	56.2	50.9	48.5	49.0	47.5	51.2	52.4	48.8

Note: All persons aged fifteen and older (except those working abroad) included.
Source: [a] LFS data (annual average for Estonia, May for Latvia and Lithuania) and author's calculations.
[b] Annual average LFS results provided by national statistical offices.

TABLE 2A. FULL-TIME EMPLOYEES [a] BY RESIDENCE AND WORKPLACE. ESTONIA, 2000.
Percent within given residence *(average commuting distance in parentheses)*

	Residence			
Job location	Tallinn	Urban 1 [b]	Urban 2 [c]	Rural
Tallinn	97.3 (*7*)	25.4 (*21*)	2.0 (*103*)	14.1 (*36*)
Urban 1 [b]	1.0 (*10*) [d]	67.9 (*4*)	0.0	1.0 (*52*) [d]
Urban 2 [c]	0.2 …	0.0 …	89.7 (*6*)	22.1 (*15*)
Rural	1.5 (*22*)	6.7 (*16*) [d]	8.3 (*17*)	62.8 (*6*)
Total	100.0 (9)	100.0 (9)	100.0 (8)	100.0 (*13*)
Different from residence	2.7	20.7 [g]		48.4 [g]

TABLE 2B. FULL-TIME EMPLOYEES [a] BY RESIDENCE AND WORKPLACE. LATVIA AND LITHUANIA, 2000

Percent within given residence

	Latvia				**Lithuania**			
	Residence				**Residence**			
Job location	Riga	Urban 1 [b]	Urban 2 [f]	Rural	Vilnius	Urban 1 [b]	Urban 2 [f]	Rural
Capital city	95.4	44.5	9.5	13.7	98.2	23.5	0.9	8.6
Urban 1 [b]	0.8	46.1	0.1 [d]	0.7	0.0	64.3	0.0	1.7
'Special' cities [e]	0.0	0.0	0.2	0.4	0.5 [d]	1.2	2.1	7.2
Urban 2 [f]	1.3	0.9 [d]	82.8	19.1	0.7 [d]	6.1	90.2	30.3
Rural	2.5	8.5	7.4	66.0	0.6 [d]	2.7	6.8	52.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Different from residence	4.6	54.7	19.0	43.3	1.8	66.2	14.4	66.5

Notes: [a] Employees working or living abroad excluded. [b] Urban areas surrounding capital city, i.e., belonging to Harju County (Estonia), Riga district (Latvia), Vilnius County (Lithuania). [c] All urban areas excluding Tallinn and Urban 1. [d] Based on less than ten observations. [e] Port of Ventspils (Latvia); Kaunas and port of Klaipeda (Lithuania). [f] All urban areas excluding capital city, Urban 1, and "special" cities.
Source: Author's calculations based on LFS data (Q1 and Q2 for Estonia, May for Latvia and Lithuania).
[g] Statistical office of Estonia (annual average data).

TABLE 3. FULL-TIME EMPLOYEES [a] BY DISTANCE BETWEEN RESIDENCE AND THE MAIN JOB. ESTONIA AND LATVIA, 2000.

Percent

	Estonia			**Latvia**		
	Total	Urban	Rural	Total	Urban	Rural
n. a.	3.7	3.6	3.9	0.0	0.0	0.1
up to 10 km	75.3	80.3	62.9	79.3	81.9	67.6
11 – 20 km	12.4	10.1	18.0	12.5	11.4	17.5
21 – 30 km	4.4	3.6	6.6	2.9	2.5	4.6
31 – 50 km	2.3	1.2	5.1	3.2	2.8	5.2
51 – 100 km	1.0	0.5	2.3	1.7	1.1	4.4
> 100 km	0.9	0.7	1.3	0.4	0.3	0.6

TABLE 4. FULL-TIME EMPLOYEES [a] BY RESIDENCE AND WORKPLACE. THE BALTIC COUNTRIES, 2000

Percent of all full-time employees

Country	**Estonia**		**Latvia**		**Lithuania**	
	Residence	Workplace	Residence	Workplace	Residence	Workplace
Capital City	32.3	37.0	39.5	45.2	21.2	24.9
Other Urban	39.2	41.4	38.8	36.7	54.5	59.9
Rural	28.5	21.6	21.7	18.1	24.3	15.2
Total	100.0	100.0	100.0	100.0	100.0	100.0
Capital district [b]	9.9	6.7	6.6	4.3	8.6	5.3
incl. Urban 1 [c]	3.4	2.9	3.0	1.9	4.0	3.1
"Special" cities [d]			1.9	2.0	20.6	22.3
Urban 2 [e]	35.8	38.5	33.9	32.8	29.9	34.5

Notes. [a] Hereafter employees working or living abroad excluded. "Full-time" refers to the main job and is defined by respondents in Latvian and Lithuanian LFS; in the case of Estonia definition is "at least 35 hours usually worked per week" (this definition differs slightly from the one used by the Estonian Statistical office, which counts hours worked in all jobs).
[b] Harju County excluding Tallinn (Estonia), Riga district excluding Riga (Latvia), Vilnius County excluding Vilnius (Lithiuania).
[c] Urban areas in Capital district. [d] Port of Ventspils (Latvia); Kaunas and port of Klaipeda (Lithuania).
[e] All urban areas excluding capital city, Urban 1, and "special" cities.
Source: Author's calculations based on LFS data (Q1 and Q2 for Estonia, May for Latvia and Lithuania).

TABLE 5. IMPACT OF COMMUTING IN URBAN AND RURAL LABOR MARKETS. THE BALTIC COUNTRIES, 2000.

	Estonia			Latvia			Lithuania		
	Tallinn	Other Urban	Rural	Riga	Other Urban	Rural	Vilnius	Other Urban	Rural
Net Inflow:									
All employed [a]	11.0	4.4	-18.1	12.8	-5.0	-9.3	14.8	5.9	-15.8
Full-time [a]	10.4	4.2	-16.3	11.1	-4.0	-8.7	12.4	6.0	-14.8
employees [b]	14.4	5.8	-24.2	14.5	-5.8	-16.6	16.3	8.6	-35.2
Share of commuters [c]	15.1	25.5	23.6	16.7	16.3	32.0	15.6	20.6	46.6
Unemployment	12.8	15.1	13.7	14.1	17.5	11.0	13.9	17.7	10.8

Notes: [a] Commuting inflow less outflow as percent of resident labor force. [b] Commuting inflow less outflow as percent of resident full-time employees. [c] Commuters (full-time employees) working in the area as percent of all full-time employees working in the area. *Source:* Hereafter author's calculations based on LFS data (Q1 and Q2 for Estonia, May for Latvia and Lithuania).

TABLE 6. FULL-TIME EMPLOYEES BY EDUCATION, OCCUPATION, RESIDENCE ([a]) OR JOB LOCATION ([b]). THE BALTIC COUNTRIES, 2000

Percent

Education	Estonia				Latvia				Lithuania			
	Tallinn		Rural		Riga		Rural		Vilnius		Rural	
	a	b	a	b	a	b	a	b	a	b	a	b
University	26	26	12	10	27	28	17	14	35	32	18	17
Secondary [c]	65	66	71	71	64	63	62	62	56	58	65	66
Below secondary [d]	9	8	17	19	9	9	21	24	9	10	17	17
Occupation												
Nonmanual	52	52	34	27	49	47	38	32	52	49	33	31
Skilled [e] manual	39	40	54	59	40	42	47	47	38	41	48	49
Unskilled manual	9	8	11	13	11	11	15	21	10	10	19	20

Notes: [c] Including comprehensive secondary, secondary with vocational training (secondary technical) and postsecondary with vocational training (secondary special or college). [d] Including basic or less, as well as vocational after basic. [e] Including semi-skilled. *Source:* Author's calculations based on LFS data (Q1 and Q2 for Estonia, May for Latvia and Lithuania).

TABLE 7A. *CETERIS PARIBUS* URBAN-RURAL WAGE DIFFERENTIALS (PERCENT). [A] THE BALTIC COUNTRIES, 1999-2000.

Country	Estonia		Latvia		Lithuania		
Monthly wage differential	Job location	Residence	Job location	Residence	Job location	Residence	Year
Capital city/	23.3	17.3	16.6	6.2			1999
Other cities	20.1	13.2	17.9	10.1	11.7	9.5	2000
Other cities/	6.7	9.0	8.7	10.7			1999
Rural	10.9	4.8	6.4	5.9	8.8	7.6	2000
Capital city/	31.5	27.8	26.8	17.5			1999
Rural	33.2	18.6	25.4	16.6	21.5	17.9	2000
# obs.	2516	2516	3690	3690	2424	2424	2000
R-squared	0.414	0.398	0.528	0.521	0.484	0.483	2000

TABLE 7B. WAGE EFFECTS OF COMMUTING IN THE BALTIC STATES, 1999-2000.

Monthly wage differential	Reduction of wage differential due to commuting, percentage points			
	Estonia	**Latvia**	**Lithuania**	Year
Capital city/	6.0	10.4	n.a.	1999
Other cities	6.9	7.8	2.4	2000
Other cities/	-2.3	-2.0	n.a.	1999
Rural	6.2	0.4	1.2	2000
Capital city/	3.7	9.2	n.a.	1999
Rural	14.6	8.8	3.6	2000

Notes: Dependent variable: log monthly earnings (net for Estonia and Lithuania, gross for Latvia).
[a] Controls include education (three categories), gender, age and its square, marital status, belonging to ethnic minority, having temporary or seasonal job, ownership sector (public or private), sector of economic activity, occupation, and unemployment rate at job location. [b] *Other cities* stand for all urban areas excluding: Riga and port of Ventspils (Latvia); Vilnius, Kaunas and port of Klaipeda (Lithuania); Tallinn (Estonia). *Capital city/Other cities* wage differential is calculated as exp(β)-1, where β is the coefficient of the *Capital city* dummy (the reference group consists of employees working in *Other Cities*). *Capital city/Rural* differential is obtained in a similar way, and *Other cities/Rural* differential is derived. Only full-time employees included. All differentials in Table 7a are significantly different from 0 at the 1 percent level, with robust standard errors between 0.02 and 0.03.

TABLE 8. *CETERIS PARIBUS* URBAN-RURAL WAGE DIFFERENTIALS (PERCENT) [a]. ESTONIA, LATVIA AND LITHUANIA. 2000.

Country	**Estonia**			**Latvia**			**Lithuania**		
Monthly wage differential	Job location	Resi-dence	Reduc-tion [b]	Job location	Resi-dence	Reduc-tion [b]	Job Loc.	Resi-dence	Reduc-tion [b]
Capital city/ Urban1	(5.0)	(-3.3)	8.3	14.5	(2.9)	11. 6	18.2	10.0	8.3
Capital city/ Urban2	24.2	19.3	4.9	21.6	13.1	8.5	10.6	8.8	1.8
Capital city/ Rural1	13.3	(-5.6)	18.9*	8.4	8.2	0.2	29.2	25.3	4.0
Capital city/ Rural2	42.4	33.6	8.8	31.8	21.0	10.9*	19.6	15.6	3.9
Urban2/ Rural2	14.6	11.9	2.7	8.5	7.0	1. 5	8.1	6.3	1.8
# obs.	2516	2516		3690	3690		2424	2424	
R-squared	0.420	0.417		0.530	0.523		0.485	0.484	

Notes: Dependent variable: log monthly earnings (net for Estonia and Lithuania, gross for Latvia).
[a] Controls include education level, gender, age and its square, belonging to ethnic minority, having temporary or seasonal job, ownership sector (public or private), sector of economic activity (15 major NACE sectors), local unemployment rate (according to working place) and (in Model 2) occupation (according to 9 major ISCO groups). *Urban1, Urban2* and *Rural1, Rural2* denote urban and rural areas inside and outside county (Estonia, Lithuania) or district (Latvia) surrounding the capital city. Only full-time employees included. Differentials are derived as explained in Notes to Table 7. Differentials shown in parentheses are not significantly different from 0 at the 10 percent level, others are significantly different from 0 at 1 percent level with robust standard errors between 0.02 and 0.04 (in one case significance is at 5 percent).
[b] Percentage points. * Reduction significant at 10 percent level.

TABLE 9. *CETERIS PARIBUS* COMMUTERS-RESIDENTS WAGE DIFFERENTIALS (PERCENT) BY JOB LOCATION. THE BALTIC COUNTRIES, 2000.

Country	**Estonia**			**Latvia**			**Lithuania**		
	Job location			Job location			Job location		
Commuters from	Tallinn	Other Urban	Rural	Riga	Other Urban	Rural	Vilnius	Other Urban	Rural
Model 0 (without industry and occupation controls)									
Capital		16.0	[c]		-1.3	[c]	[d]	[c]	[c]
t-value		*0.96*			*-0.13*				
Urban 1 [a]	12.0	n.a.	[c]	6.8	[c]	[c]	3.3	[c]	[c]
t-value	*1.03*			*1.18*			*0.32*		
Urban 2 [b]	-8.1	n.a.	21.2	-2.6	5.6	19.4	[d]	-6.7	27.5
t-value	*-0.69*		*3.69****	*-0.61*	*0.88*	*2.74****		*-1.11*	*3.38****
Rural areas	8.8	-0.1	n.a.	-6.7	-5.2	13.4	-15.5	-8.8	9.4
t-value	*1.20*	*-0.02*		*-1.25*	*-1.40*	*2.04***	*-2.72****	*-3.11****	*1.57*
# obs.	541	1286	751	1584	1382	724	615	1560	367
R-squared	0.303	0.223	0.186	0.247	0.311	0.266	0.307	0.280	0.395
Model 2 (with industry and occupation controls)									
Capital		8.8	[c]		-0.6	[c]		[c]	[c]
t-value		0.70			-0.08				
Urban 1 [a]	14.6	n.a	[c]	6.5	[c]	[c]	5.9	[c]	[c]
t-value	*1.03*			*1.19*			*0.68*		
Urban 2 [b]	-6.6	n.a	9.3	-3.9	1.7	9.7	[d]	-5.7	20.8
t-value	*-0.56*		*1.69**	*-1.04*	*0.29*	*1.60*		*-0.95*	*3.04****
Rural areas	5.6	0.9	n.a.	-0.5	-3.9	8.6	-16.5	-7.3	4.4
t-value	*0.85*	*0.24*		*-0.10*	*-1.40*	*1.56*	*-3.00****	*-2.73****	*0.81*
# obs.	541	1286	751	1584	1382	724	615	1532	367
R-squared	0.442	0.365	0.300	0.491	0.517	0.437	0.460	0.376	0.507

Notes: Differentials are derived from earnings functions controlling for education level (six categories), gender, age and its square, belonging to ethnic minority, having temporary or seasonal job, ownership sector (public or private); Model 2 includes also sector of economic activity (fifteen major NACE sectors) and occupation (according to nine major ISCO groups).

[a] Urban areas in capital county or district. [b] Urban areas outside capital county or district.

[c] Merged with *Urban 2*.

[d] Merged with *Urban 1* (due to small number of observations).

***, **, * = significant at 1 percent, 5 percent, and 10 percent level, respectively.

TABLE 10. INDIVIDUAL GAINS TO COMMUTING: *CETERIS PARIBUS* WAGE DIFFERENTIALS (PERCENT) COMPARED TO NON-COMMUTERS FROM THE SAME RESIDENTIAL AREA [a]. THE BALTIC STATES, 2000.

		Full-time employees, by residence				
		All	Urban B [b]	Urban 2 [c]	Rural	Rural 2 [d]
Latvia	# obs.	3690	1430	1188	920	849
# commuters		707	336	209	278	238
Treatment effects model [e]: MLE		**55.5**	**47.9**	**41.6**	**58.9**	**74.4**
z – value		*6.9****	*6.3****	*4.9****	*3.6****	*5.2****
Error correlation in wage and selection eqs.		-0.45***	-0.35***	-0.29***	-0.48***	-0.56***
Independent equations estimate [f]		**13.6**	**17.4**	**14.9**	**15.7**	**19.8**
t- value		*5.2****	*4.9****	*3.7****	*3.8****	*4.9****
Lithuania	# obs.	2542	887	814	610	483
# commuters		595	146	110	305	234
Treatment effects model [e]: MLE		**-12.6**	**-2.4**	**-5.5**	**48.0**	**54.5**
z – value		*-1.1*	*-0.3*	*-0.63*	*3.0****	*3.7****
Error correlation in wage and selection eqs.		0.32*	0.15	0.17*	-0.50**	-0.60***
Independent equations estimate [f]		**8.7**	**7.1**	**5.3**	**11.2**	**12.9**
t- value		*2.7****	*1.4*	*0.9*	3.2***	3.2***
Estonia	# obs.				953	795
# commuters					322	242
Treatment effects model [e]: MLE					**92.7**	**-30.1**
z – value					*3.3****	*-1.9**
Error correlation in wage and selection eqs.					-0.53**	0.62***
Independent equations estimate [f]					**23.9**	**20.9**
t- value					*6.2****	5.0***

Notes: [a] Controls for wage equations include education (six categories), gender, marital status, ethnicity, age and its square, regional dummies by residence, and dummy for commuters to another municipality. For rural sub-sample presented, results refer to the case when this dummy includes only commuters to cities, who are of primary interest for us; Latvian and Lithuanian results, however, do not change qualitatively when all commuters are considered (Estonian data do not allow identifying all commuters). Regional dummies: Latvia—five regions, with seven major cities treated separately; Lithuania—ten counties, with three major cities treated separately;Estonia—fifteen counties (reported results) or five regions (similar but less significant results).

[b] Urban excludes capital cities, as well as Ventspils (Latvia), and Kaunas and Klaipeda (Lithuania); this category was denoted as *Other Cities* in Table 6.

[c] Urban B excludes *capital region* (Harju County in Estonia, Riga district and nearby city of Jurmala in Latvia, Vilnius County in Lithuania).

[d] Rural outside capital region.

[e] Accounts for endogeneity of commuting decision and for correlation between errors in wage equation and selection equation. Controls for selection equation: education (six categories), gender, ethnicity, age groups, marital status (for Latvia also regional dummies), and strong instruments. The latter include: for Latvia—dummy for females with children (*) and distance to Riga (***); for Lithuanian pooled and urban samples—log wage by county (***) in 1999, with eleven biggest cities treated separately; for Lithuanian rural samples—log urban wage by county in 1999 (**; in this case results are almost unchanged if county dummies are dropped from wage equation); for Estonia—rural (***) and urban unemployment rates (1999) by county. All results are robust with respect to change of instruments.

[f] Observed wage differential (commuters vs non-commuters) from the wage equation without accounting for selection bias. ***, **, * = significant at the 1 percent, 5 percent, 10 percent level, respectively, based on robust standard errors.

TABLE 11. *CETERIS PARIBUS*[a] WAGE DIFFERENTIALS BY DISTANCE COMMUTED (*VS* 1 KM).

Percent

	Estonia					**Latvia**			
Distance commuted, km	Urban outside Tallinn			Rural		Urban outside Riga		Rural	
10	15.8	13.7	12.0	4.9	4.1	19.6	17.5	28.4	23.8
20	21.1	18.2	15.9	6.5	5.4	26.2	23.3	38.4	32.0
30	24.2	20.9	18.3	7.4	6.2	30.3	26.9	44.7	37.0
50	28.4	24.4	21.3	8.5	7.1	35.5	31.5	52.9	43.7
100	34.2	29.3	25.5	10.1	8.4	43.0	38.0	64.9	53.2
250	42.2	36.0	31.3	12.2	10.2	53.6	47.2	82.1	66.8
Industry controls [c]	no	yes	yes	no	yes	no	yes	no	yes
Occupation controls	no	no	yes	no	yes	no	yes	no	yes

Notes: [a] Controls, apart from those shown in the table, include education (six categories), age and its square, gender, ethnicity, marital status, dummies for fixed-term contracts and for job in rural area, and regional dummies (four regions, Riga district and port of Ventspils for Latvia; fifteen counties for Estonia). For Latvia, distance from Riga is controlled as well. Endogeneity of commuting decision is not accounted for. Commuting distance for Estonia is reported in LFS; for Latvia it is imputed using residence and workplace codes (for employees working and living in the same municipality an average distance of 3 km is assumed, but varying this constant did not change the results substantially).

[c] Fifteen major sector according to NACE classification., as well as ownership sector.

All differentials are significant at the 1 percent level. Distance variables are included and in logarithmic form. For rural residents in Estonia (but not in Latvia) returns to commuting are about two times larger when job location in rural area is not controlled for.

TABLE 12. DETERMINANTS OF THE COMMUTING DECISION. LATVIA, 2000.

Variable	Sample							
	Employees		All employed		Labor force		Population aged 15+	
	odds ratio [c]	*t* value	odds ratio	*t* value	odds ratio	*t* value	odds ratio	*t* value
Higher education	3.198***	*6.53*	3.033***	*6.59*	3.696***	*7.78*	5.356***	*10.24*
Postsecondary or secondary vocational education	1.812***	*3.73*	1.964***	*4.65*	2.167***	*5.41*	2.761***	*7.16*
General secondary education	1.576***	*2.69*	1.609***	*3.02*	1.753***	*3.71*	2.097***	*5.08*
Vocational education after basic (without secondary)	1.357	*1.30*	1.472*	*1.76*	1.587**	*2.16*	2.238***	*3.72*
Female	0.682***	*-3.70*	0.731***	*-3.15*	0.73***	*-3.48*	0.609***	*-5.39*
Female with children	0.685**	*-2.45*	0.642***	*-2.96*	0.678***	*-2.60*	0.679**	*-2.56*
Ethnic minority	1.076	*0.67*	1.105	*0.86*	0.996	*-0.04*	0.940	*-0.61*
Age 15-19	2.962***	*3.58*	2.691***	*3.24*	2.003**	*2.36*	1.421	*1.30*
Age 20-24	4.039***	*6.62*	4.188***	*6.71*	3.476***	*6.14*	8.248***	*10.46*
Age 25-34	3.863***	*7.01*	3.640***	*6.74*	3.069***	*5.83*	9.785***	*11.96*
Age 35-44	2.541***	*4.55*	1.976***	*3.42*	1.775***	*2.98*	5.700***	*8.96*
Age 45-54	1.869***	*3.17*	1.555**	*2.24*	1.404*	*1.76*	4.304***	*7.54*
Single	1.179	*1.39*	1.273**	*2.07*	1.129	*1.06*	0.997	*-0.02*
Divorced or widowed	1.244	*1.57*	1.304*	*1.94*	1.182	*1.25*	1.118	*0.84*
Local unemployment rate at residence, percent	1.009	*0.79*	1.025**	*2.08*	1.013	*1.13*	1.005	*0.51*
Riga city	0.026***	*-12.99*	0.021***	*-13.66*	0.023***	*-13.63*	0.022***	*-13.72*
Riga district	1.996***	*3.34*	2.187***	*3.55*	2.028***	*3.38*	1.676***	*2.84*
Jurmala [a]	1.680***	*2.42*	1.864***	*2.72*	1.651***	*2.33*	1.591**	*2.31*
Other big cities	0.187***	*-6.61*	0.225***	*-6.04*	0.222***	*-6.22*	0.231***	*-6.13*
Rural	1.976***	*6.19*	1.425***	*3.03*	1.43***	*3.23*	1.339***	*2.84*
Distance between residence and Riga (per 10 km) [b]	0.932***	*-4.84*	0.906***	*-5.97*	0.914***	*-5.79*	0.912***	*-6.12*
Number of observations	5907		7446		8617		15816	

Notes: All variables except unemployment rate and distance are dummies. Registered unemployment rate by seven major cities and twenty-six districts has been used.

Reference categories: basic (or below basic) education; males; ethnic Latvians; age fifty-five and older; married or cohabited; urban areas excluding Riga, Riga district, and the major cities (Jurmala, Jelgava, Daugavpils, Rezekne, Ventspils, Liepaja).

Method: survey logistic regression. Data: LFS (May 2000).

[a] Jurmala is a city nearby Riga, usually included (together with Riga district) in so called Riga region.

[b] Distance between residence and Riga is strongly positively correlated with local unemployment rate (and negatively with local wage rate). When this variable is excluded, local unemployment rate becomes negative in all specifications (and significant in the last three), indicating that distance from Riga is a much stronger factor.

[c] For dummy variables *odds ratio* is ratio of odds to be a commuter:
P(commuting)/(1 - P(commuting) for a given category *vs* reference category, other things equal. For unemployment rate (respectively, distance) odds ratio represents the effect of one percentage point increase of the rate (respectively, 10 km increase of distance).

[d] Odds ratios significantly different from 1 at the 0.1, 0.05, and 0.01 level are denoted by *, **, and ***, respectively. *t*-values and significance are based on robust standard errors.

TABLE 13. DETERMINANTS OF THE COMMUTING DECISION. LITHUANIA, 2000.

Variable	Sample							
	Employees		All employed		Labor force		Population aged 15+	
	odds ratio [b]	*t* value	odds ratio	*t* value	odds ratio	*t* value	odds ratio	*t* value
Higher education	1.707*	*1.88*	2.974***	*5.05*	3.265***	*5.81*	6.347***	*9.26*
Postsecondary or secondary vocational education	1.329	*1.14*	1.843***	*3.31*	1.774***	*3.32*	3.058***	*6.73*
General secondary education	1.02	*0.07*	1.434*	*1.78*	1.439*	*1.90*	2.093***	*4.04*
Vocational education after basic (without secondary)	0.841	*-0.50*	1.112	*0.43*	1.036	*0.16*	1.97***	*3.14*
Female	0.211***	*-4.79*	0.23***	*-5.59*	0.265***	*-5.45*	0.253***	*-5.89*
Ethnic minority	1.876***	*2.77*	1.807***	*2.87*	1.38*	*1.69*	1.223	*1.17*
Age 15-19	4.903**	*2.48*	2.509**	*2.37*	1.287	*0.73*	1.074	*0.25*
Age 20-24	3.859***	*4.06*	2.777***	*3.84*	1.852**	*2.48*	4.187***	*5.88*
Age 25-34	2.577***	*3.64*	1.79***	*2.76*	1.449*	*1.94*	4.235***	*7.83*
Age 35-44	1.944**	*2.50*	1.436*	*1.74*	1.213	*1.02*	3.676***	*7.18*
Age 45-54	1.569*	*1.68*	1.16	*0.70*	0.99	*-0.05*	3.065***	*6.05*
Single	1.133	*0.53*	1.034	*0.18*	0.884	*-0.71*	0.763	*-1.59*
Divorced or widowed	0.964	*-0.18*	0.841	*-0.98*	0.718*	*-1.84*	0.615***	*-2.82*
Log average wage at residence, ×100	0.955***	*-3.36*	0.940***	*-5.31*	0.945***	*-5.24*	0.948***	*-5.17*
Local unemployment rate [a] at residence, percent	0.899**	*-2.23*	0.923**	*-2.04*	0.926**	*-2.14*	0.942*	*-1.71*
Vilnius city	0.048***	*-7.37*	0.049***	*-7.65*	0.055***	*-7.60*	0.061***	*-7.35*
Vilnius County	1.622	*1.28*	1.753*	*1.84*	1.348	*1.09*	1.317	*1.05*
Other big cities	0.258***	*-5.24*	0.401***	*-3.59*	0.382***	*-3.93*	0.388***	*-3.93*
Rural	3.87***	*3.43*	2.309**	*2.49*	2.211**	*2.56*	2.469***	*2.97*
Number of observations	3002		3911		4610		7562	

Notes: All variables except Local unemployment rate and Log average wage are dummies.
Reference categories: basic (or below basic) education; males; ethnic Lithuanians; age fifty-five and older; married or cohabited; urban areas excluding Vilnius, Vilnius County and the three biggest cities (Kaunas, Klaipeda, Shauliai).
Method: survey logistic regression. Data: LFS (May 2000).

[a] Gender-specific ILO unemployment rate by ten counties, with the three biggest cities (Vilnius, Kaunas, Klaipeda) separated from respective counties.

[b] For dummy variables *odds ratio* is ratio of odds to be a commuter (P(commuting)/(1 - P(commuting)) for a given category versus reference category, other things equal. For unemployment rate (respectively, local wage) odds ratio represents the effect of one percentage point (respectively, one percent) increase of respective variable.

Odds ratios significantly different from 1 at the 0.1, 0.05, and 0.01 level are denoted by *, **, and ***, respectively. *t*-values and significance are based on robust standard errors.