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Commuting in the Baltic States: Patterns, determinants and gains

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Center for European Integration Studies
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**Commuting in the Baltic
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Determinants, and Gains**

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COMMUTING IN THE BALTIC STATES:
PATTERNS, DETERMINANTS, AND GAINS

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Abstract

To what extent does commuting reduce urban – rural and regional wage disparities? This question is addressed by estimating two sets of earnings functions (based on 2000 LFS data for Estonia, Latvia and Lithuania): with location variables (like capital city, rural etc.) measured at the workplace and at the place of residence. The main finding is that in Estonia and Latvia commuting has significantly narrowed the *ceteris paribus* wage gap between capital city and rural areas, as well as between capital and other cities. In Lithuania only residents of urban areas in the capital county manage to catch up significantly with the capital, while overall urban-rural gap remains almost unchanged. So different outcomes are explained by country-specific skills composition of rural – urban commuting flows and wage discrimination against rural residents in Lithuanian urban markets. Individual gains to rural – urban or inter-city commuting (both with and without correcting to selectivity) are uniformly big in Latvia but on average negligible in Lithuanian urban areas.

Key words: commuting, earnings functions, treatment effects model, wage disparities, Baltic States, ethnic minority.

JEL classification: J31, J61, R23, D63, C31, C35.

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Introduction.

The Baltic States, despite their small geographical size, feature considerable regional variation in earnings level. 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 national average, while the poorest districts¹ in Latvia and Lithuania are below 70 percent of this level.

Of course this comparison does not account for different occupational and industrial structure of employment. However, earnings functions based on year 2000 Labour Force Survey data (see Tables 7) reveal wage differentials of more than 40 percent between capital and rural areas outside capital region in Estonia and more than 30 percent in Latvia even when employee and job characteristics, as well as local unemployment rate, are controlled for; differentials between capitals and other urban areas exceed 20 percent (similar to Poland in 1998, see Newell (2001), Table 9). In Lithuania respective differentials are about 10 percentage points smaller than in Latvia but still significant.

On the other hand, employment opportunities (see Table 5) are much better in urban areas than in the countryside, as well as in capitals compared to other cities. Combined with high housing prices in the capitals and overall small distances, such differentials can generate a lot of commuting, mostly (but not only) towards 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 workplace in another (usually urban) municipality; commuting from small cities is also substantial (Tables 4a, 4b).

To what extent does commuting reduce spatial wage disparities? In other words, we know that an employee *working* in Tallinn earns, on average, 38 percent more than otherwise similar employee *working* in the countryside. What if we compare employees *living* in Tallinn and in the countryside? Given how many of the rural residents work in cities, one should expect the latter differential to be significantly smaller than the

¹ 10 Lithuanian counties are further subdivided into 12 main towns (cities) and 44 districts; similarly, Latvia (where counties do not exist) consists of 7 main cities and 26 districts.

former. This suggests that urban – rural income disparities, high as they stand², could be even higher without commuting (it takes some doing to prove it rigorously though). As preventing rural areas from depopulation is one of the national priorities in the Baltic States, we expect to find some support for commuting-promoting public policies.

Recent literature on commuting is overviewed in Section 2. Section 3, after presenting and comparing basic facts about commuting in the three countries, analyses the impact of commuting on urban and rural labour markets, including occupational composition of labour supply. We show that commuting reduces (at least in the short run) welfare disparities between capital cities and rural areas.

Our main research question is approached in Section 4, where earnings functions with controlling for job location and for residence are compared. We discover that effect of commuting on wage disparities is country- and region- specific. We also test whether wage discrimination against commuters exists at their workplaces. Individual gains to rural-urban or inter-city commuting are evaluated in Section 5; treatment effects model is applied to correct for selectivity bias. Here we also estimate returns to commuting distance and show how wages decline with distance from the capital city. Section 6 is devoted to determinants of commuting decision, including education, gender, ethnicity and local labour market conditions. Section 7 summarises main findings and briefly discusses relevance of *spatial mismatch* and *intervening opportunities* hypotheses in the Baltic context.

2. Literature survey.

Although the issue of commuting has been thoroughly investigated in labour 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 models in Brueckner and Martin (1997), Arnott (1998), Zenou and Wasmer (1999), Zenou (2000), Adams (2001), Coulson et al (2001), McQuaid et al. (2001), So et al. (2001), Brueckner et al. (2002); these authors, as well as Sen et al. (1999), Yamaga (2000), 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

² According to Household Budget Surveys 2000, per capita disposable income in rural areas was on average just 67 – 69 percent of that in urban areas. Moreover, rural – urban income ratio has fallen since 1996 when it was 76 percent in Estonia and Lithuania, and 90 percent in Latvia.

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 economic models and de-concentration (preferences for smaller density) hypothesis, with high income group dispersed in the suburbs or small cities³.

Housing markets have been included in models by Kain (1997), van Ommeren et al. (1997, 1999, 2000a), Rouwendal (1998,1999), Muellbauer and Cameron (1998). Harris – Todaro type model of migration with housing market by Brueckner and Kim (2001) gives useful insights for commuting theory as well.

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 groups issues in the context of commuting are discussed also in van Ommeren et al. (1998), Gottlieb and Lentnek (2001).

Different methods and data lead to estimates of marginal willingness to pay for commuting from rather high to surprisingly low (see Zax (1991), van Ommeren et al. (2000b), Rouwendal and Meijer (2001), Timothy and Wheaton (2001)). In this context Cooke and Ross (1999) rise the selection bias issue, while Redmond and Mokhtarian (2001) argue and give some evidence that commuting as such "is not unequivocally a source of disutility..."

A wide literature is devoted to spatial models explaining commuting flows between given sources and destinations in terms of their size (importance) and distances between them (see Akwawua and Pooler (2001) and references therein).

However, to our knowledge, there has been no research dealing with commuting in transition context. Moreover, apart from forthcoming OECD (2002) study (see also Hazans et al (2002)) there have been very little research about Baltic labour markets in the 3 country framework in general; we can recall only Smith (2001).

³ The latter has been recently supported by evidence from US and Netherlands in Benkow and Hoover (2000), Rouwendal and Meijer (2001)). Interestingly, Baltic capitals feature a mixture of these two models.

3. Patterns of commuting and its impact on urban and rural labour markets

For the purposes of this paper we define commuters as employed persons whose workplace is located in other municipality than their residence; each city is considered as one municipality (even if it is administratively subdivided in smaller districts, as it is the case for Riga and Tallinn). According to year 2000 data (Table 1), about 20 percent of all employed in the Baltic States are commuters in this sense. In rural areas proportion of commuters among full-time employees⁴ is 43 percent in Latvia, 48 percent in Estonia and 67 percent in Lithuania (Table 1). High commuting rates in the rural areas explain (at least in part) why rural unemployment rates do not exceed the urban ones (they are even lower in Latvia and Lithuania, see Table 1).

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 make on average 41 km in Estonia and 36 km in Latvia.⁵ Only 8 to 9 percent of the employees in Latvia and Estonia work more than 20 km away from home, and 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 Table 2 and Table 4A for other details). While these figures might look low by big country standards, one has to keep in mind that in the Baltic States 10 – 15 km away from the borders of capital cities bring you into 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 3 and 5).

Spatial patterns of (between-municipalities) commuting differ among the three countries. Commuting from urban areas surrounding capital is almost completely oriented towards capital city in Latvia, while in Lithuania this accounts only for 35 percent of commutes (remaining part happens mainly between the small towns within Vilnius county and to some extent towards 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 again flow to Riga accounts for about

⁴ Hereafter we focus on full-time employees because our methodology relies on wage regressions. Those who live or work abroad are excluded.

50 percent of all cases, and flows between other cities only for 10 percent; Estonia is somewhere in between these two patterns, closer to Lithuanian one. Commuters from the countryside are predominantly absorbed by cities other than 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 US (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 4a, 4b 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 labour force (which is not much below 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 proportion of resident full-time employees amounts to one sixth in Latvia, one quarter in Estonia and more than one third in Lithuania⁶. Urban markets outside capitals 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 (Table 3). 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).

Notice that migration and job relocation processes in the Baltic States are slow. According to LFS data, just 1.3 percent of full-time employees in Estonia have changed the type of territory they live in during 1999; net inflow into Tallinn was 1.6 percent and into other cities 0.8 percent, net outflow from the countryside was 0.8 percent. Weights of Tallinn, other cities and rural areas in distribution of full-time employees by workplace during the same period have changed from 36.7, 41.5 and 21.8 percent to 36.9, 41.6 and 21.5 percent.

⁵ Source: own calculations based on LFS data. Estonian LFS has a question on commuting distance. For Latvia we have used as a proxy distance between the centres of respective municipalities (Latvian LFS provides 4 digit territory codes; Riga is subdivided into 6 districts, while each of the other cities is one municipality).

⁶ Notice that both net outflow from rural areas and difference in job access between capital city and countryside is largest in Lithuania (Table 5).

Alternative internal migration data (source: statistical yearbook of Estonia, 2001) report net immigration to urban areas about 0.1% of total population per annum. This justifies partial equilibrium analysis, assuming for a moment a hypothetical situation without rural-urban and inter-city commuting and unchanged distribution of jobs and residences among the three types of territories - capital city, other cities and rural areas. Figures presented above show that in such situation unemployment (open and hidden) would increase dramatically in rural areas of each of the three countries and decrease in the capitals⁷. A huge gap in unemployment rates would emerge between Riga and the rest of Latvia, as well as between capitals and rural areas in Estonia and Lithuania. Simple supply-demand analysis (or the 'wage curve' argument, see Blanchflower and Oswald (1994)⁸) suggests that at the same time wages of employees would increase in the capitals and fall in rural areas. Commuting thus does indeed reduce (at least in the short run) welfare disparities between capital cities and rural areas, and it makes sense to try to measure this effect, which is the very purpose of present paper.

Comparison of educational and occupational structure of employees by residence and by job location (Table 11) 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 of both average educational attainment and average skills level (as well as quantity) of rural employees (most educated and skilled people commute to cities) and slight improvement⁹ in quality (in addition to above documented increase in quantity) of labour 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 labour in Vilnius clearly (although not strongly) worsens. A common feature of all three countries is that commuting compensates shortage of skilled manual workers in capital cities.

⁷ Analysis of 4 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 3 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.

⁸ Our estimates of the earnings functions confirm existence of wage curve in Latvia and Estonia.

⁹ In Latvia only in terms of education.

4. Measuring the effect of commuting on regional earnings differentials.

Our approach is based on estimating two sets of earnings functions (based on 2000 LFS data for Estonia, Latvia and Lithuania¹⁰): 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 by 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, sector of economic activity of the enterprise and ownership sector it belongs to. Similar earnings differentials derived from the second set of functions show by how much earnings of an employee *living* in a capital city earns more than 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.

Tables 6a, 6b present the results when capital districts are not separated from other urban¹¹ and rural territories outside capitals. As one can see from Model 2 in Table 6b, 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 is reduced by 6 percentage points in Estonia and by 8 percentage points in Latvia. This suggests that both residents of rural areas and of small cities gain from commuting.

In Lithuania, by contrast, there is little (statistically not significant) 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 almost half of employees residing in rural areas work in cities (Table 4b) and indeed enjoy significant earnings gains (see Section 5). The reasons are found partly in the fact that rural-urban flows of commuters in Lithuania are dominated by manual workers (see Table 11 and comments in Section 3) and partly in wage discrimination against commuters from the countryside in urban markets (explored further in this section).

¹⁰ For Estonia and Latvia 1999 results are available as well.

¹¹ However, dummies for Ventpils (Latvia), Kaunas and Klaipeda (Lithuania), where wages are significantly higher than in other urban areas, are included in the models.

Table 6b suggests also that for rural residents of Estonia and Latvia during the 1999 recession (caused by the Russian financial crisis of 1998) commuting had less impact on wage differentials than in 2000, but it goes the other way around for residents of small cities.

When occupation is not controlled for, wage differentials we are looking at (urban – rural and capital city – small cities) tend to be larger (see Table 6a): not only similar jobs are better paid in "better" places, but it is a bit easier to find a better occupation there, given one's age, gender and education. However, this advantage seems to be very little exploited by commuters from rural areas in Latvia and Lithuania, where the wage effect of commuting without occupation control tends to be weaker (Table 6b, right panel; Table 7), although not statistically significantly so.

To account for the special role of capital districts, where commuting towards capital cities is much more intensive than elsewhere (see Table 4a, 4b), both urban and rural areas outside the capitals were subdivided into two categories (inside and outside capital district). Results presented in Table 7 shed some light on 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 Riga district, as well as urban and rural residents outside Riga district seems 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 capital district seems 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 own houses in rural areas nearby.

One possible reason why commuting in Lithuania does not have a significant effect on urban-rural earnings gap is that commuters from the countryside do not receive fair pay at their workplaces. Table 8 presents results derived from earnings functions augmented with dummies for different types of commuters and estimated separately for employees working in 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 unemployed in Lithuania (results are available on request), which in turn have to do with scarcity of paid jobs in rural areas (see section 3 and Table 5). Employers' discrimination cannot be excluded as well (residence of an applicant is readily available from his passport). By contrast, there is no evidence of such discrimination in Estonian urban markets and very weak (4-5 percent, statistically not significant) signs of discrimination in Latvia; recall that commuters from 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 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.

5. Individual gains to commuting and job location

Observed wage gains to commuting are found by estimating an earnings function augmented with 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 9), only commuters to cities are considered to make the results comparable with those of section 4; 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, we do not control for ownership sector, industry, and occupation in the wage equation (in contrast with equations discussed in Section 4); this is partly compensated by more detailed education classification (6 categories instead of 3).

¹² This does not hold for commuters from rural areas outside 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.

Results reported in Table 9 (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 1% level. Commuters from urban (respectively, rural) areas in Riga district gain more (respectively, less) than those living outside. 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 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). Consistently with our previous findings (Table 7) and in marked contrast with Latvia and Lithuania, this gain is larger for rural residents of capital region (despite wages here 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 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 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 treatment effects model (Maddala, 1983), which in 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 labour 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 9. In the case of Latvia we have used distance from Riga and dummy for females with children as instruments (additionally to age group dummies instead of

age and 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. 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.

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) 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 we found positive "almost significant" returns to commuting) 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, we found that 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) we have used lagged urban and rural county unemployment rates, 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 outside Tallinn. About 90 percent of commuters to cities from countryside outside 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 position in wage distribution would be available.

Estonian and Latvian data allow estimating returns to distance commuted (Tables 10a, 10b). 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.

Table 10a documents another interesting pattern found in Latvia. Other things (including industry and/or occupation) equal, every 10 kilometers of distance between the job location and Riga decrease wages by 1.2 percent; this effect is weaker in urban areas and much stronger in the countryside. Returns to commuting distance are 2 to 3 times higher.

6. 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); (iv) all employed commuters with the rest of population aged 15 or older (thus adding inactivity as alternative to commuting)¹³. Other things equal, likelihood of commuting increases with education (except for 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 35 (respectively, 25) and older in Latvia (respectively, Lithuania). Ethnic minorities in Lithuania are significantly more inclined to commute between municipalities than Lithuanians. In Latvia as the whole ethnicity does not matter for the commuting decision; however, when 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 centre model (data for

¹³ We have not pursued more complicated discrete choice models. One possibility could be nested logit (see Greene (2000)) model, where agent first decides whether to participate in the labour 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) mixed logit model (McFadden and Train (2000)) with random coefficients can be used.

such analysis in the case of Lithuania were not available). When this distance (which is positively correlated with local unemployment rate and negatively with wages) is included in the model, neither unemployment rate at residence¹⁴ nor local wage rate is significant. However, when distance is excluded, impact of local unemployment rate becomes negative, even if only employees are considered (although 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 likelihood of commuting. Negative impact of wage rate has a natural interpretation but it is not so with unemployment (the distance story does not work since two of the three counties with highest unemployment rates are close to Vilnius). Perhaps the fact that unemployment is measured by larger units than in Latvia (counties rather than districts) plays a role here: given that travel-to-work area is in most cases within given county, there are few opportunities for commuting if unemployment in the county is high. Another explanation could be bad infrastructure in such counties.

7. Conclusions

In each of the three Baltic States labour 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. Spatial patterns of commuting vary from essentially monocentric in Latvia to polycentric in Lithuania.

We have 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 very 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 residence location preferences of high-income earners, (iv) occupational composition of commuters'

¹⁴ Except for the model where self-employed and employers are added to the employees.

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 minorities¹⁵ are more likely to commute; unskilled labor prevails in rural-urban flows, and skilled labor 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 patterns 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 IOSD (intervening opportunities with spatial dominance, see Akwawua and Pooler (2001)) model than to spatial mismatch: commuting is directed predominantly towards capital city; likelihood of commuting increases with education both in urban and rural areas and falls when one moves further away from the capital; occupational structure of commuters' flows is closer to host than to source demand structure; the capital city - countryside gap in educational attainment of employees widens when measured by job location rather than residence, in contrast with Lithuania where in narrows.

Individual gains to commuting are uniformly big in Latvia but on average negligible in Lithuanian urban areas outside Vilnius county.

Our analysis shows that without rural-urban and inter-city commuting a huge gap in unemployment rates would emerge between capitals and the countryside, while wages of employees would increase in the capitals and fall in rural areas, thus widening urban-rural income gap¹⁶ which is already now an issue of social concern. While some individuals gain and some (e. g. resident employees in capital cities) lose as the result of commuting, national output (and therefore income per capita) goes up because of shift of labor from rural areas (where productivity is well below national average, especially

¹⁵ In Lithuania ethnic minorities are, on average, less educated than Lithuanians: among minority full-time employees 16 percent hold university education, compared to 26 percent among Lithuanians; moreover, unexplained ethnic wage gap amounts to 7 percent. In Latvia and Estonia minorities are not less educated, but are under-represented among managers and professionals; unexplained ethnic wage gaps are 7 and 18 percent respectively (Hazans et al (2002); OECD (2002)).

¹⁶ This part of wage effect of commuting has not been measured in present paper, but it has the same sign as the measured effect (conditional on given wages).

in Latvia and Lithuania) to capital cities (with above average productivity)¹⁷. To see that this is the case, notice that in Riga and Vilnius only about a half of the jobs occupied by commuters could have been potentially filled by unemployed residents and current outgoing commuters (see footnote 6), while there are very few vacant jobs (apart from low productive farming) in the countryside in case if current commuters would stay there. Recall that conventional measures of welfare (see e.g. Grun and Klasen (2001)) are positively related to per capita income and negatively to income inequality. By showing that commuting raises the former and reduces the latter¹⁸, our findings provide support for commuting-promoting public policies, especially taking into account that preventing rural areas from depopulation is a way to protect national identities of the Baltic States. Of course such alternatives as creating remote workplaces and stimulating entrepreneurial activities in the countryside have to be considered as well.

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¹⁷ This productivity gain is conditional on unchanged location of jobs and residences. We believe that this assumption makes sense because job creation and relocation, as well as migration are much slower processes than labor mobility associated with commuting (see Section 3 for some evidence).

¹⁸ At least its socially disturbing urban – rural component.

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Table 1 Proportion (%) of employed persons whose residence and main job are located in different municipalities. The Baltic States, 2000.

| Country | Estonia ^a | | | Latvia ^b | | | Lithuania ^b | | |
|-------------------------------|----------------------|-------|-------|---------------------|-------|-------|------------------------|-------|-------|
| | All | Urban | Rural | All | Urban | Rural | All | Urban | Rural |
| Residents | | | | | | | | | |
| Commuters/employed | 21.5 | 13.0 | 42.7 | 17.3 | 12.7 | 28.4 | 22.7 | 10.1 | 45.3 |
| Commuters/full-time employees | 23.0 | 13.5 | 48.4 | 19.3 | 12.6 | 43.3 | 23.0 | 9.6 | 66.5 |
| Unemployment rate | 13.7 | 13.6 | 13.8 | 14.5 | 15.8 | 10.9 | 14.7 | 16.7 | 11.0 |

Note: Employees working abroad (less than 1 percent in all cases) excluded.

Source: ^a Statistical office of Estonia (annual average data). ^b LFS (May 2000) data and author's calculations.

Table 2 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 3 Full-time employees ^a by residence and workplace. The Baltic States, 2000

| Country | Percent of all full-time employees | | | | | |
|-------------------------------|------------------------------------|-----------|-----------|-----------|-----------|-----------|
| | 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 excl. Tallinn (Estonia), Riga district excl. Riga (Latvia), Vilnius county excl. Vilnius (Lithuania).

^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 4a Full-time employees ^a by residence and workplace. Estonia, 2000.
Percent within given residence (*average commuting distance in parentheses*)

| Job location | Residence | | | |
|--------------------------|-----------------------|-----------------------|----------------------|-----------------------|
| | 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 4b Full-time employees ^a by residence and workplace. Latvia and Lithuania, 2000

Percent within given residence

| Job location | Latvia | | | | Lithuania | | | |
|-------------------------------|--------|----------------------|----------------------|-------|--------------------|----------------------|----------------------|-------|
| | Riga | Residence | | | Vilnius | Residence | | |
| | | Urban 1 ^b | Urban 2 ^f | Rural | | 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 10 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 5. Access to Paid Jobs and Impact of Commuting in Urban and Rural Labour Markets. The Baltic States, 2000.

| | Estonia | | | Latvia | | | Lithuania | | |
|---------------------------------|---------|-------------|-------|--------|-------------|-------|-----------|-------------|-------|
| | Tallinn | Other Urban | Rural | Riga | Other Urban | Rural | Vilnius | Other Urban | Rural |
| Access to Jobs ^a | 90.8 | 83.2 | 57.1 | 92.8 | 72.3 | 49.4 | 93.9 | 81.5 | 30.5 |
| Net Inflow: | | | | | | | | | |
| All employed ^b | 11.0 | 4.4 | -18.1 | 12.8 | -5.0 | -9.3 | 14.8 | 5.9 | -15.8 |
| Full-time ^b | 10.4 | 4.2 | -16.3 | 11.1 | -4.0 | -8.7 | 12.4 | 6.0 | -14.8 |
| Employees ^c | 14.4 | 5.8 | -24.2 | 14.5 | -5.8 | -16.6 | 16.3 | 8.6 | -35.2 |
| Share of commuters ^d | 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 Number of all employees working in the area as percent of resident labour force. ^b Commuting inflow less outflow as percent of resident labour force ^c Commuting inflow less outflow as percent of resident full-time employees. ^d 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 6a *Ceteris paribus* urban-rural wage differentials (percent) ^a in the Baltic states, 1999-2000

| Model | Country | Estonia | | Latvia | | Lithuania | | Year | |
|--|---------------------------------|---------------------------|--------------|-----------|--------------|-----------|--------------|------|-----------|
| | | Monthly wage differential | Job location | Residence | Job location | Residence | Job location | | Residence |
| Model 1 (without occupation controls) | <i>Capital city/</i> | | 26.0 | 18.1 | 17.9 | 5.5 | | 1999 | |
| | <i>Other Cities^b</i> | | 24.1 | 18.0 | 19.8 | 10.5 | 13.2 | 10.5 | 2000 |
| | <i>Other Cities/</i> | | 9.9 | 9.8 | 10.0 | 13.8 | | | 1999 |
| | <i>Rural</i> | | 11.6 | 4.1 | 8.0 | 8.7 | 8.1 | 9.8 | 2000 |
| | <i>Capital city/</i> | | 39.0 | 29.6 | 29.7 | 20.0 | | | 1999 |
| | <i>Rural</i> | | 38.5 | 22.8 | 29.4 | 20.2 | 22.3 | 21.3 | 2000 |
| | # obs. | | 2444 | 2444 | 3690 | 3690 | 2469 | 2469 | 2000 |
| R-squared | | 0.389 | 0.367 | 0.430 | 0.421 | 0.403 | 0.405 | 2000 | |
| Model 2 (with occupation controls) | <i>Capital city/</i> | | 25.0 | 18.0 | 16.6 | 6.2 | | | 1999 |
| | <i>Other Cities</i> | | 21.4 | 15.2 | 17.9 | 10.1 | 11.7 | 9.5 | 2000 |
| | <i>Other Cities/</i> | | 8.7 | 7.3 | 8.7 | 10.7 | | | 1999 |
| | <i>Rural</i> | | 10.3 | 3.1 | 6.4 | 5.9 | 8.8 | 7.6 | 2000 |
| | <i>Capital city/</i> | | 35.4 | 26.7 | 26.8 | 17.5 | | | 1999 |
| | <i>Rural</i> | | 33.9 | 18.8 | 25.4 | 16.6 | 21.5 | 17.9 | 2000 |
| | # obs. | | 2444 | 2444 | 3690 | 3690 | 2424 | 2424 | 2000 |
| R-squared | | 0.461 | 0.442 | 0.528 | 0.521 | 0.484 | 0.483 | 2000 | |

Table 6b Wage effects of commuting in the Baltic States, 1999-2000

| Model | Monthly wage differential | Reduction of wage differentials due to commuting, percentage points | | | Reduction (Model 1) less Reduction (Model 2), percentage points | | | Year |
|--|---------------------------------|---|------|------|---|------|------|------|
| | | EE | LV | LT | EE | LV | LT | |
| Model 1 (without occupation controls) | <i>Capital city/</i> | 7.9 | 12.5 | n.a. | 0.9 | 2.0 | n.a. | 1999 |
| | <i>Other cities^b</i> | 6.1 | 9.3 | 2.7 | -0.1 | 1.5 | 0.3 | 2000 |
| | <i>Other Cities/</i> | 0.1 | -3.9 | n.a. | -1.1 | -1.9 | n.a. | 1999 |
| | <i>Rural</i> | 7.5 | -0.7 | -1.7 | 0.3 | -1.1 | -2.9 | 2000 |
| | <i>Capital city/</i> | 9.4 | 9.6 | n.a. | 0.7 | 0.4 | n.a. | 1999 |
| | <i>Rural</i> | 15.7 | 9.3 | 1.0 | 0.6 | 0.5 | -2.6 | 2000 |
| Model 2 (with occupation controls) | <i>Capital city/</i> | 7.0 | 10.4 | n.a. | | | | 1999 |
| | <i>Other cities</i> | 6.2 | 7.8 | 2.4 | | | | 2000 |
| | <i>Other Cities/</i> | 1.2 | -2.0 | n.a. | | | | 1999 |
| | <i>Rural</i> | 7.2 | 0.4 | 1.2 | | | | 2000 |
| | <i>Capital city/</i> | 8.7 | 9.2 | n.a. | | | | 1999 |
| | <i>Rural</i> | 15.1 | 8.8 | 3.6 | | | | 2000 |

Notes: ^a Controls include: education (3 categories), gender, age and its square, belonging to ethnic minority, having temporary or seasonal job, ownership sector (public or private), sector of economic activity, lagged unemployment rate at job location and (in Model 2) occupation. ^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 $\exp(\beta)-1$, where β the coefficient of the *Capital city* dummy (the reference group consists of employees working in *Other Cities*) in the regression of log earnings on regional dummies and control variables mentioned above. *Capital city/Rural* differential is obtained in a similar way, and *Capital city/Rural* differential is derived. Only full-time employees included. All differentials in Table 6a are significantly different from 0 at 1% level, with robust standard errors between 0.02 and 0.03.

Table 7 *Ceteris paribus* urban-rural wage differentials (percent) ^a. Estonia, Latvia and Lithuania. 2000

| Model | Country | Estonia | | | Latvia | | | Lithuania | | |
|--|----------------------------|---------------------------|----------|-----------|------------------------|----------|-----------|------------------------|----------|--------|
| | | Monthly wage differential | Job loc. | Residence | Reduction ^b | Job loc. | Residence | Reduction ^b | Job Loc. | Resid. |
| Model 1 (without occupation controls) | <i>Capital city/Urban1</i> | (8.8) | (1.0) | 7.8 | 18.7 | (1.4) | 17.3 | 23.2 | 14.1 | 9.1 |
| | <i>Capital city/Urban2</i> | 28.3 | 24.2 | 4.1 | 23.5 | 14.2 | 9.3 | 11.8 | 9.5 | 2.3 |
| | <i>Capital city/Rural1</i> | 17.1 | (-2.2) | 19.3* | 9.7 | 10.8 | - 2 | 26.0 | 26.7 | -0.7 |
| | <i>Capital city/Rural2</i> | 48.2 | 38.4 | 9.8 | 36.6 | 25.2 | 11.4 | 21.1 | 19.6 | 1.6 |
| | <i>Urban2/Rural2</i> | 15.5 | 11.4 | 4.1 | 10.7 | 9.6 | 1.1 | 8.3 | 9.2 | -0.9 |
| | # obs. | 2444 | 2444 | | 3690 | 3690 | | 2469 | 2469 | |
| | R-squared | 0.396 | 0.388 | | 0.432 | 0.424 | | 0.404 | 0.406 | |
| Model 2 (with occupation controls) | <i>Capital city/Urban1</i> | (6.6) | (-2.0) | 8.6 | 14.5 | (2.9) | 11.6 | 18.2 | 10.0 | 8.3 |
| | <i>Capital city/Urban2</i> | 25.5 | 21.3 | 4.2 | 21.6 | 13.1 | 8.5 | 10.6 | 8.8 | 1.8 |
| | <i>Capital city/Rural1</i> | 14.8 | (-3.4) | 18.2* | 8.4 | 8.2 | 0.2 | 29.2 | 25.3 | 4.0 |
| | <i>Capital city/Rural2</i> | 42.9 | 32.8 | 10.0 | 31.8 | 21.0 | 10.9* | 19.6 | 15.6 | 3.9 |
| | <i>Urban2/Rural2</i> | 13.8 | 9.5 | 4.3 | 8.5 | 7.0 | 1.5 | 8.1 | 6.3 | 1.8 |
| | # obs. | 2444 | 2444 | | 3690 | 3690 | | 2424 | 2424 | |
| | R-squared | 0.468 | 0.461 | | 0.530 | 0.523 | | 0.485 | 0.484 | |

Notes: ^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 6. Differentials shown in parentheses are not significantly different from 0 at 10% level, other are significantly different from 0 at 1% level with robust standard errors between 0.02 and 0.04 (in one case significance is at 5%).

^b Percentage points. * Reduction significant at 10% level.

Table 8 *Ceteris paribus* commuters-residents wage differentials (percent) by job location. Latvia and Lithuania. 2000

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

Notes: Ratios are derived from earnings functions controlling for: education level (6 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 (15 major NACE sectors) and occupation (according to 9 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%, 5%, 10% level respectively.

**Table 9 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 |
| | <i>z</i> - 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 |
| | <i>t</i> - 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 |
| | <i>z</i> - 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 |
| | <i>t</i> - 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 |
| | <i>z</i> - value | | | | 3.3*** | -1.9* |
| | Error correlation in wage and selection eqs. | | | | -0.53** | 0.62*** |
| | Independent equations estimate ^f | | | | 23.9 | 20.9 |
| | <i>t</i> - value | | | | 6.2*** | 5.0*** |

Notes: ^a Controls for wage equations include: education (6 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 - 5 regions, with 7 major cities treated separately; Lithuania: 10 counties, with 3 major cities treated separately; Estonia - 15 counties (reported results) or 5 regions (similar but less significant results) ^b Urban excl. capital cities, as well as Ventspils (Latvia), Kaunas and Klaipeda (Lithuania); this category was denoted as *Other Cities* in Table 6.

^c Urban B excl. *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 (6 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 11 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 1%, 5%, 10% level respectively, based on robust standard errors.

Table 10a *Ceteris paribus*^a wage effects of distance from capital and distance commuted^b. Percent per 10 km

| Latvia, 2000 | Job location | | | | | Residence (outside Riga) | | | |
|--------------------------------|--------------|------|------|-------|-------|--------------------------|-------|-------|-------|
| | any | any | any | urban | rural | urban | urban | rural | rural |
| Distance from Riga | -1.2 | -1.2 | -1.1 | -1.0 | -1.8 | -1.1 | -1.2 | -1.9 | -2.2 |
| Commuting | | | | | | 3.7 | 3.7 | 4.8 | 4.5 |
| Industry controls ^c | yes | yes | no | yes | yes | no | yes | no | yes |
| Occup. controls | yes | no | no | no | no | no | no | no | no |

Table 10b *Ceteris paribus*^a wage differentials by distance commuted (vs 1 km) Percent

| Distance commuted, km | Estonia | | | | | Latvia | | | |
|--------------------------------|-----------------------|------|------|-------|------|--------------------|------|-------|------|
| | 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 shown in the table, include: education (6 categories), age and its square, gender, ethnicity, marital status, dummies for fixed-term contracts and for job in rural area, and regional dummies (4 regions, Riga district and port of Ventspils for Latvia; 15 counties for Estonia). For Latvia, distance from Riga is controlled also in Table 10b. 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 15 major sector according to NACE classification., as well as ownership sector.

All differentials are significant at 1% level. Distance variables are included in linear form in Table 10a and in logarithmic form in Table 10b. 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 11 Full-time employees by education, occupation, residence^(a) or job location^(b). The Baltic States, 2000

| Education | Percent | | | | | | | | | | | |
|----------------------------------|---------|----|-------|----|--------|----|-------|----|-----------|----|-------|----|
| | 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 |
| Less than 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 12 Determinants of the commuting decision. Latvia, 2000.

| Variable | Sample | | | | | | | |
|--|------------|---------|--------------|---------|--------------|---------|---------------------|---------|
| | Employees | | All employed | | Labour force | | Population aged 15+ | |
| | odds ratio | 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 |
| Secondary comprehensive educ. | 1.576*** | 2.69 | 1.609*** | 3.02 | 1.753*** | 3.71 | 2.097*** | 5.08 |
| Vocational (without secondary) education after basic educ. | 1.357 | 1.3 | 1.472* | 1.76 | 1.587** | 2.16 | 2.238*** | 3.72 |
| Female | 0.682*** | -3.7 | 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*** | -2.6 | 0.679** | -2.56 |
| Ethnic minority | 1.076 | 0.67 | 1.105 | 0.86 | 0.996 | -0.04 | 0.94 | -0.61 |
| Age 15_19 | 2.962*** | 3.58 | 2.691*** | 3.24 | 2.003** | 2.36 | 1.421 | 1.3 |
| 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 |
| Age35_44 | 2.541*** | 4.55 | 1.976*** | 3.42 | 1.775*** | 2.98 | 5.7*** | 8.96 |
| Age45_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 | 1.68*** | 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 7 major cities and 26 districts has been used.

Reference categories: basic (or below basic) education; males; ethnic Latvians; age 55+; 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 lot stronger factor.

^c For dummy variables *odds ratio* is ratio of odds to be a commuter:

$P(\text{commuting}) / (1 - P(\text{commuting}))$ 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 | | Labour force | | Population aged 15+ | |
| | odds ratio | 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 |
| Secondary comprehensive educ. | 1.02 | 0.07 | 1.434* | 1.78 | 1.439* | 1.92 | 2.093*** | 4.04 |
| Vocational (without secondary) education after basic educ. | 0.841 | -0.51 | 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 |
| Age35_44 | 1.944** | 2.50 | 1.436* | 1.74 | 1.213 | 1.02 | 3.676*** | 7.18 |
| Age45_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 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.

Gender specific ILO unemployment rate by 10 counties, with three biggest cities (Vilnius, Kaunas, Klaipeda) separated from respective counties.

Reference categories: basic (or below basic) education; males; ethnic Lithuanians; age 55+; married or cohabited; urban areas excluding Vilnius, Vilnius county and 3 biggest cities (Kaunas, Klaipeda, Shauliai).

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

For dummy variables *odds ratio* is ratio of odds to be a commuter:

$$\frac{P(\text{commuting})}{(1 - P(\text{commuting}))}$$

for a given category vs 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.

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