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# SOCIAL RETURNS TO COMMUTING IN THE BALTIC STATES

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**Abstract**

To what extent does commuting reduce 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 geographical 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. Individual gains to commuting are uniformly big in Latvia but on average negligible in Lithuanian urban areas.

Other things equal, likelihood of commuting between municipalities increases with education level and decreases with age. Males and rural residents are more likely to commute; it is true also for ethnic minorities in Lithuania and in Latvian urban areas. Wages and probability of commuting in Latvia fall when one moves further away from the capital city. Analysis of spatial patterns of commuting in the three countries reveals some noteworthy differences.

Key words: commuting, earning functions, treatment effects model, Baltic States, ethnic minority.

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

**Introduction.**

The Baltic States, despite their small geographical size, feature considerable regional variation in earnings level and in unemployment rates. 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 districts[i] 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, earning functions based on year 2000 Labor Force Survey data (see Table 6) reveal wage differentials of more than 30 percent between capitals and rural areas in Estonia and 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 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, 30 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 Tallinn, one should expect the latter differential to be significantly smaller than the former. This suggests that urban – rural income disparities, high as they stand[ii], 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 labor markets. Here we explore and compare occupational structure of the flows of commuters between capital cities, other cities and rural areas, as well as the structure of labor supply and demand therein. The purpose of this paper is to quantify the effect of commuting on earning disparities between 3 types of residential areas: capital cities, other urban areas and the countryside, and this is approached in Section 4, where earning functions with controlling for job location and for residence are compared. We find that situation in Lithuania is very different from what is found in the other two countries. We also test whether wage discrimination against commuters exists at their workplaces. In Section 5 treatment effects model is applied to evaluate individual gains to commuting. Here we also show how wages decline with distance from the capital city (only Latvian data allow for such analysis). Section 6 is devoted to determinants of commuting decision. 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 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 models in Brueckner and Martin (1997), Arnott (1998), 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 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 cities[iii]. 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 Turner and

Niemeier (1997), Carlson and Persky (1999), Blumen (2000), Gottlieb and Lentnek (2001), van Ommeren et al. (1998).

Levinson (1997) and Giuliano (1998) study tenure and self-employment as determinants of commuting, while Rogers (1997) and Khan et al. (2001) link commuting to local employment growth. Cervero and Wu (1997, 1998), Artis et al. (2000) are examples of country- or region-specific studies.

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. (2000), 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 few research about Baltic labor markets in the 3 country framework in general; we can recall only Smith (2001).

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

For the purposes of this paper we define commuters as employed persons whose workplace is located in other municipality than their residence. According to year 2000 data, in Latvia 36 percent of all employed and 43 percent of full-time employees are commuters in this broad sense. However, if those who commute within Riga[iv] are excluded, the numbers drop to 17 and 19 percent respectively. Table 1 shows that proportion of commuters is even higher in the other two Baltic countries, reaching more than 40 percent in Estonian and Lithuanian rural areas. 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).

Only 7 to 8 percent of the employed in Latvia and Estonia[v] commute for more than 20 km, and just 4 percent for more than 30 km. Long distances are more likely to be made by males, rural residents and full-time employees (see Table 2 for details).

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 Table 3).

Spatial patterns of commuting differ among the three countries. In contrast with US (see e.g. Zax and Kain (1996)) there is very little reverse commuting from capital cities to suburban areas (see Table 4b). Commuting from urban areas surrounding capital is almost completely oriented towards capital city in Latvia, while in Lithuania it happens between the small towns within Vilnius county and to some extent towards other urban and even rural areas. Commuting from other cities Lithuania goes in equal proportions to urban (outside Vilnius county) and rural areas, while in Latvia again 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. Finally, 42 percent of the commuters from Estonian rural areas have their job in the countryside, followed by cities other than Tallinn (37 percent); only one out of 5 goes to capital city; in Latvia one third of those commuting from the countryside work in Riga, 45 percent – in other cities, and only one out of 5 commute between different places in the countryside. In Lithuania most of the rural commuters are absorbed by cities other than capital. See Tables 4a, 4b for details.

Net inflow of commuters in each of the three capitals accounts for 9 (Tallinn), 13 (Riga) and 15 (Vilnius) percent of resident labor force (which is not much below unemployment rate in Tallinn and Riga but slightly above it in Vilnius) and for 11 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 one sixth in Latvia, one quarter in Estonia and one third in Lithuania[vi]. Urban markets outside capitals districts experience very modest net outflow in Latvia, but considerable net inflow in Lithuania and Estonia; however, urban areas both in Riga district and Vilnius county see big net outflows. Share of commuters among full-time employees varies from 14 to 17 percent in the capitals and from 16 to 26 percent in other cities; it is 27 percent in Estonian countryside and 47 percent in Lithuanian rural areas (Tables 3, 4b, 5).

Figures presented above show that in a (purely hypothetical) situation without commuting unemployment (open and hidden) would increase dramatically in rural areas of each of the three countries and decrease in the capitals[vii]. 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 Osvald (1996)[viii]) suggests that at the same time wages of employees would increase in the capitals and fall in rural areas. Commuting thus does indeed reduce 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.

We conclude this section by a closer look at the nature of rural-urban and urban-rural flows of commuters in Latvia and Lithuania. Commuting is not dominated by either manual or non-manual workers. However, in Lithuania the proportion of non-manual workers (especially professionals) among commuters is smaller than among the rest of employed, while no such difference is found in Latvia. This observation holds both for all employed and for hired employees. On the other hand, in Latvia proportion of employers, self-employed and unpaid family workers among commuters is significantly lower than among all employed, while in Lithuania the difference is negligible. Detailed distribution of commuters and other workers by occupation and working status is presented in Tables 11 and 12.

Occupational structure of labor demand in urban areas is different from that in rural areas (Table 12). Both in Latvia and Lithuania urban markets require more managers and technicians and less semiskilled and unskilled manual workers than the rural ones; sales workers in Latvia and skilled manual workers in Lithuania are also relatively more demanded in urban areas. Differences in labor supply are even more pronounced: share of people with university education in the labor force is 3 times higher in Vilnius than in Lithuanian rural areas, and 2.5 times higher in Riga than in Latvian countryside, while for less than secondary education the ratios are 1:2.5 and 1:3 respectively.

Both *F* test and mismatch index (see Table 14) confirm that rural - urban and urban - rural flows of commuters in Latvia are much closer to host than to source demand pattern. In Lithuania such relationship is hard to observe; here professionals and technicians, but also skilled manual workers are over-represented in the urban – rural flow (compared to rural demand structure), while semiskilled and unskilled manual workers are over-represented in the (4 times larger) rural – urban flow (see Table 12). Nevertheless, net result in both countries is decrease of average skills level of labor supplied to rural markets, although insignificant in Lithuania. Given very high by international standards employment share in (low productive) agriculture in Latvia and Lithuania (OECD, 2002), such a shift can be viewed as improvement both from normative perspective and in terms of average productivity.

Labor demand in Riga and Vilnius is clearly more skill biased than in other cities, although difference in structure is not big (Tables 12, 13). Occupational structure of commuters from other urban areas to capital city in Latvia is closer to the host than to the source structure, while this is not the case in Lithuania (Table 14). Although occupational distribution of commuters in both countries is not significantly different from that in the capital, there are some noteworthy deviations. In Latvia, professionals are over-represented, especially among those who commute from Riga district, and unskilled manuals under-represented compared to demand in Riga (despite 1.5 times lower proportion of labor force with university education and 2 times higher proportion with basic education in other cities than in Riga). By contrast, flow from other cities to Vilnius carries "too many" (28 percent compared to 18 among employees in Vilnius) skilled manual workers.

Commuters both from and to Riga (disregarding destination or source) are on average more educated than resident labor force (or employed) in Riga; the same is true for other cities (taken together). Given that inflow exceeds outflow more than 4 times in the case of Riga, while for other urban areas outflow is bigger than inflow (3.6 times for urban areas in Riga district, 1.3 times for other cities), commuting slightly improves quality (and significantly increases quantity) of labor supplied to Riga market and has an opposite (although very weak) effect on other urban markets. A different picture emerges in Lithuania: net effect of commuting on Vilnius labor market is increase in quantity but drop in average skills level, while other urban areas see increase in quantity of labor (xcept for urban markets in Vilnius county) with virtually identical educational distribution (see Tables 3, 12 and 14).

How do earnings of commuters compare to those of non-commuters? Table 15 shows that in most cases commuters earn, on average, more than 'stayers' from the same type of residential area (exceptions are commuters between different rural municipalities in Lithuania and from rural to urban areas nearby Vilnius). Commuters from urban areas also earn, on average, more than local employees at their workplaces. In Latvia the same is true for commuters from the countryside (except those working in cities nearby Riga) while in Lithuania they earn less than locals, be it in Vilnius, other cities or rural areas. A more detailed comparison of earnings is provided in the next two sections.

**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 Lithuania): with geographical variables (like capital city, rural etc.) measured at the job location and at the place of residence. Earning 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 earning 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 urban 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 16 percentage points in Estonia and by more than 10 percentage points in Latvia. The gap between capital and other cities is reduced by 9 percentage points in Estonia and by 8 percentage points in Latvia. This suggests that residents of rural areas and of small cities both gain from commuting. The gains are statistically significant (standard errors of the ratios reported in Table 7 fall in the range between 0.02 and 0.03).

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 occupational structure of rural-urban and urban-rural flows of commuters in Lithuania (explored in Section 3) and partly in wage discrimination against commuters from the countryside in urban markets (see below).

Table 6b suggests also that for rural residents of Estonia and Latvia during the 1999 recession commuting had less impact on wage differentials than in 2000. This is true also for residents of small cities in Estonia, while it goes the other way around in Latvia.

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 (especially 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).

To account for the special role of capital districts, where commuting towards capital cities is much more intensive than elsewhere (see Table 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 significantly reduced by commuting is the one between Vilnius and urban areas in Vilnius county (a reduction by almost 10 percentage points). 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, 7, and 10 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.

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 17 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. By contrast, there is no evidence of such discrimination in Latvian urban markets. On the other hand, in both 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 22 percent in

Lithuania and 10 percent in Latvia, but without industry and occupation controls - respectively 29 and 19 percents.

**5. Individual gains to commuting and job location**

When residence is controlled for (or if sample is limited to employees residing in a certain type of area, e. g. urban or rural), the dummy for being a commuter can be viewed as an endogenous decision variable, and effect of this variable on earnings has to be estimated jointly with the decision model. A conventional tool is treatment effects model (Maddala, 1983), consisting of two equations with correlated errors:

(i) Probit with dependent variable COMMUTE (a dummy for commuters) and the following explanatory variables: education, gender, ethnicity, age groups, marital status and children dummies, local unemployment rate and/or local average wage at residence, distance from the capital city;

(ii) Earnings equation regressing log wages on age and its square, education, gender, ethnicity dummies, unemployment rate at job location, relevant regional dummies by residence, and dummy COMMUTE.

Notice that returns estimated in this model are conditional on being hired. 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). Results are reported in Table 9. In the case of Latvia 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. Maximum likelihood estimate of returns to commuting is about 50 percent in urban areas (Riga excluded) and about 70 percent in the countryside. In other words, commuters earn 1.5 to 1.7 times more than they could potentially make being employed at their residence places. Notice that simply estimating earning functions with dummy COMMUTE gives much lower (although also significant at 1% level) returns (15 to 19 percent, see row "Independent equations estimate" in Table 9).

In Lithuania results are similar for rural areas taken together, but in contrast with Latvia, returns to commuting are much lower outside capital region. In urban areas both treatment effects model and independent earnings functions produce insignificant wage returns to commuting (suggesting that commuters from urban areas gain mainly in terms of employability). However, when cities in Vilnius county are included, the preferred estimate (the independent one) is positive and "almost significant", confirming

once again that employees commuting from these cities gain more than other urban commuters.

Latvian data allow a direct estimation of the effect of distance between capital city and working place on wages, as well as returns to commuting in terms of the distance between residence and workplace (see Table 10). Other things equal, every 10 kilometers of distance between the job location and Riga decrease wages by 1.2 percent (unless the job is in the port of Ventspils); this effect is only slightly reduced when controlling for the local unemployment rate. Commuting, on the other hand, appears to raise earnings quite substantially: when geographic variables are measured according to residence rather than workplace and other variables are held constant, every 10 kilometers of commuting increases the wage on average about 2.5 to 3.7 percent, depending on presence of occupation controls and on which of the alternative variables – living in Latgale, distance from living place to Riga or local unemployment rate is included in the model. These estimates do not account for endogeneity of commuting distance; when this is taken into account, returns to commuting increases further and reaches 9 to 12 percent per 10 kilometers when occupation and industry are not controlled, but becomes insignificant when such controls included.

## 6. Determinants of the commuting decision

Tables 16 and 17 present estimated logit models, which measure impact of individual and regional characteristics on the commuting decision in Latvia and Lithuania. Four models compare (i) employees-commuters with other employees (Results of this model are of course consistent of the probit equation in treatment effects model); (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)[ix]. Other things equal, likelihood of commuting increases with education (except for Lithuanian rural sub-sample) 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 than Lithuanians. In Latvia as the whole ethnicity does not matter for the commuting decision; however, ethnic minorities tend to commute for shorter distances,

as it is seen from tobit model, otherwise consistent with logit results. On the other hand, 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 commute, 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 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 residence (except the model where selfemployed and employers are added to the employees) 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 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. 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 significantly 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.

Commuting in Lithuania has some features supporting *spatial mismatch* hypothesis (in its general form, without reference to reverse commuting): ethnic minorities[x] are more likely to commute; unskilled labor prevails in rural-urban flows, and skilled labor in the opposite flows; mismatch index between flow and host is not smaller than between flow and source. 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; ethnic minorities tend to commute for shorter distances; 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.

Two more differences between the countries is that individual gains to commuting are uniformly big in Latvia but on average negligible in Lithuanian urban areas outside Vilnius county, and that commuters from the countryside are discriminated against in terms of pay in Lithuanian labor markets.

We claim that commuting thus improves national welfare in the Baltics. Our analysis shows that without commuting 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, while wages of employees would increase in the capitals and fall in rural areas, thus increasing urban-rural income gap 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 in Latvia and Lithuania) to capital cities (with above average productivity). 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 13), 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 are positively related to per capita income and negatively to income inequality.[xi] By showing that commuting raises the former and reduces the latter (at least its socially disturbing urban – rural component) 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 has to be considered as well.

**Acnowledegements**

Part of the results were obtained while working on OECD (2002) survey on Labor markets in the Baltic States. Author is grateful to Kenneth Smith and Torben Andersen for useful comments on the previous versions of the paper. Remaining errors are mine.

**Footnotes**

[i] 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.

[ii] 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.

[iii] 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.

[iv] Capital city of Latvia consists of 6 districts, and for many employees who live and work in Riga distance from home to work is 10 – 15 km.
[v] Distance data are not available for Lithuania.
[vi] Notice that both net outflow from rural areas and difference in job access between capital city and countryside is largest in Lithuania (Table 5).
[vii] 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.
[viii] Our estimates of the earning functions confirm existence of wage curve in Latvia and Estonia.
[ix] As the focus of this paper is on earnings differentials, 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 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) mixed logit model (McFadden and Train (2000)) with random coefficients can be used.
[x] In Lithuania ethnic minorities are, on average, less educated than Lithuanians: among minority full-time employees 16 percent hold university education, compared to 26 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 ( OECD (2002)).
[xi] See Grun and Klasen (2001).

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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] | | |
|---|---|---|---|---|---|---|---|---|---|
| Residents | All | Urban | Rural | All | Urban | Rural | All | Urban | Rural |
| Commuters/employed | 21.7 | 13.2 | 42.5 | 17.3 | 12.7 | 28.4 | 23.1 | 10.6 | 45.5 |
| Unemployment rate | 13.7 | 13.6 | 13.8 | 14.5 | 15.8 | 10.9 | 14.7 | 16.7 | 11.0 |

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

**Table 2 Distance commuted to the main job.**
**Estonia (by gender) and Latvia (by residence), 2000**

*Percent*

| | All employed | | | | | | Full-time employees | | |
|---|---|---|---|---|---|---|---|---|---|
| | Estonia [a] | | | Latvia [b] | | | Latvia [b] | | |
| | Males | Females | Total | Total | Urban | Rural | Total | Urban | Rural |
| n. a. | 9.0 | 1.5 | 5.4 | 0.8 | 1.1 | 0.5 | 0.0 | 0.0 | 0.1 |
| up to 10 km | 66.0 | 82.6 | 74.0 | 81.5 | 82.1 | 79.8 | 79.3 | 81.9 | 67.6 |
| 11 – 20 km | 13.7 | 10.3 | 12.1 | 10.6 | 10.1 | 11.8 | 12.5 | 11.4 | 17.5 |
| 21 – 30 km | 6.1 | 2.8 | 4.5 | 2.8 | 2.6 | 3.2 | 2.9 | 2.5 | 4.6 |
| 31 – 50 km | 2.4 | 1.3 | 1.9 | 2.5 | 2.5 | 2.5 | 3.2 | 2.8 | 5.2 |
| 51 – 100 km | 1.5 | 0.8 | 1.1 | 1.4 | 1.2 | 1.9 | 1.7 | 1.1 | 4.4 |
| > 100 km | 1.3 | 0.7 | 1.0 | 0.4 | 0.4 | 0.3 | 0.4 | 0.3 | 0.6 |

*Notes:* [a] Annual average. *Source*: [a] Statistical office of Estonia. [b] Author's calculations based on LFS data.

**Table 3 Distribution of full-time employees by residence and workplace**
**The Baltic States, 2000**

*Percent of all full-time employees*

| Country | Estonia | | Latvia | | Lithuania | |
|---|---|---|---|---|---|---|
| | Residence | Workplace | Residence | Workplace | Residence | Workplace |
| Capital city | 34.5 | 38.2 | 39.5 | 45.2 | 21.2 | 24.9 |
| Capital district [a] | - | - | 6.6 | 4.3 | 8.6 | 5.3 |
| 'Special' cities [b] | - | - | 1.9 | 2.0 | 20.6 | 22.3 |
| Other cities | 38.3 | 41.4 | 33.9 | 32.8 | 29.9 | 34.5 |
| Rural | 27.2 | 20.4 | 21.7 | 18.1 | 24.3 | 15.2 |

*Notes* [a] Riga district excluding Riga (Latvia), Vilnius county excluding Vilnius (Lithiuania). Due to data limitations we do not separate Harju county (surrounding Tallinn) in Estonia.
[b] Port of Ventspils (Latvia); Kaunas and port of Klaipeda (Lithuania). Categories do not sum up to 100 because Capital district includes some rural areas. *Source:* Author's calculations based on LFS data.

**Table 4a Distribution of full-time employees by residence and workplace. Estonia, 2000**

*Percent within given residence*

| Job location | Residence | | |
|---|---|---|---|
| | Total | Urban | Rural |
| Same municipaliy | 76.6 | 86.0 | 51.4 |
| Other place, including: | 22.8 | 13.4 | 48.2 |
| Tallinn | 16.4 | 7.9 | 39.2 |
| other urban | 5.6 | 2.4 | 14.4 |
| rural | 6.4 | 5.4 | 9.0 |
| abroad | 0.6 | ... | ... |

*Source*: Statistical office of Estonia

**Table 4b Distribution of full-time employees by residence and workplace. Latvia and Lithuania, 2000**

*Percent within given residence*

| Job location | Latvia | | | | Lithuania | | | |
|---|---|---|---|---|---|---|---|---|
| | Residence | | | | Residence | | | |
| | Riga | Riga district urban | Other urban[b] | Rural | Vilnius | Vilnius county urban | Other urban[c] | Rural |
| Capital city | 95.4 | 44.5 | 9.5 | 13.7 | 98.2 | 23.5 | 0.9 | 8.6 |
| Capital district urban | 0.8 | 46.1 | (0.1)[d] | 0.7 | 0.0 | 64.3 | 0.0 | 1.7 |
| 'Special' cities[a] | 0.0 | 0.0 | 0.2 | 0.4 | (0.5)[d] | 1.2 | 2.1 | 7.2 |
| Other urban | 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 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Different from residence | 4.6 | 54.7 | 19.0 | 43.3 | 1.8 | 66.2 | 14.4 | 67.5 |

*Notes:* [a] Port of Ventspils (Latvia); Kaunas and port of Klaipeda (Lithuania). [b] All urban areas excluding: Riga, urban areas in Riga district and port of Ventspils. [c] All urban areas excluding: Vilnius, urban areas in Vilnius county, Kaunas and port of Klaipeda. [d] Based on less than 10 observations.

**Table 5. Access to Paid Jobs and Impact of Commuting in Urban and Rural Labor Markets. The Baltic States, 2000.**

| | Estonia [e] | | | Latvia [f] | | | Lithuania [f] | | |
|---|---|---|---|---|---|---|---|---|---|
| | Tallinn | Other Urban | Rural | Riga | Other Urban | Rural | Vilnius | Other Urban | Rural |
| Access to Jobs [a] | 91.0 | 79.2 | 57.1 | 92.8 | 72.3 | 49.4 | 93.9 | 81.5 | 30.5 |
| Net Inflow: | | | | | | | | | |
| All employed [b] | 9.0 | 6.1 | -18.2 | 12.8 | -5.0 | -9.3 | 14.8 | 5.9 | -15.8 |
| Full-time [b] | 8.0 | 6.3 | -16.7 | 11.1 | -4.0 | -8.7 | 12.4 | 6.0 | -14.8 |
| Employees [c] | 10.7 | 8.1 | -24.6 | 14.5 | -5.8 | -16.6 | 16.3 | 8.6 | -35.2 |
| Share of commuters [d] | 11.0 | 26.0 | 27.9 | 16.7 | 16.3 | 32.0 | 15.6 | 20.6 | 46.6 |
| Unemployment | 12.1 | 14.8 | 13.8 | 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 labor force. [b] Commuting inflow less outflow as percent of resident labor 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:* [e] Statistical office of Estonia (annual average data) and author's calculations. [f] LFS (May 2000) data and author's calculations.

**Table 6a *Ceteris paribus* urban-rural wage ratios [a] in the Baltic states, 1999-2000**

| Model | Country | Estonia | | Latvia | | Lithuania | | |
|---|---|---|---|---|---|---|---|---|
| | Net monthly wage ratios | Job location [b] | Residence [c] | Job location [b] | Residence [c] | Job location [b] | Residence [c] | Year |
| Model 1 (without occupation controls) | *Capital city/ Other Cities* [d] | 1.260 | 1.181 | 1.179 | 1.055 | | | 1999 |
| | | 1.233 | 1.136 | 1.191 | 1.115 | 1.132 | 1.103 | 2000 |
| | *Other Cities/ Rural* | 1.099 | 1.098 | 1.100 | 1.138 | | | 1999 |
| | | 1.122 | 1.072 | 1.073 | 1.074 | 1.083 | 1.103 | 2000 |
| | *Capital city/ Rural* | 1.390 | 1.296 | 1.297 | 1.200 | | | 1999 |
| | | 1.380 | 1.220 | 1.278 | 1.197 | 1.226 | 1.217 | 2000 |
| Model 2 (with occupation controls) | *Capital city/ Other Cities* | 1.250 | 1.180 | 1.166 | 1.062 | | | 1999 |
| | | 1.210 | 1.117 | 1.193 | 1.114 | 1.117 | 1.095 | 2000 |
| | *Other Cities/ Rural* | 1.087 | 1.073 | 1.087 | 1.107 | | | 1999 |
| | | 1.099 | 1.055 | 1.069 | 1.051 | 1.091 | 1.079 | 2000 |
| | *Capital city/ Rural* | 1.354 | 1.267 | 1.268 | 1.175 | | | 1999 |
| | | 1.340 | 1.180 | 1.275 | 1.171 | 1.219 | 1.181 | 2000 |

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

| Model | | Reduction of wage ratios due to commuting, percentage points | | | Reduction (Model 1) less Reduction (Model 2), percentage points | | | |
|---|---|---|---|---|---|---|---|---|
| | Net monthly wage ratios | EE | LV | LT | EE | LV | LT | Year |
| Model 1 (without occupation controls) | *Capital city/ Other cities* [d] | 7.9 | 12.5 | n.a. | 0.9 | 2.0 | n.a. | 1999 |
| | | 9.7 | 7.6 | 2.9 | 0.4 | -0.3 | 0.6 | 2000 |
| | *Other Cities/ Rural* | 0.1 | -3.9 | n.a. | -1.1 | -1.9 | n.a. | 1999 |
| | | 4.2 | -0.1 | -2.0 | 0.4 | -1.8 | -3.3 | 2000 |
| | *Capital city/ Rural* | 9.4 | 9.6 | n.a. | 0.7 | 0.4 | n.a. | 1999 |
| | | 16.0 | 8.0 | 0.9 | 0.0 | -2.3 | -3.0 | 2000 |
| Model 2 (with occupation controls) | *Capital city/ Other cities* | 7.0 | 10.4 | n.a. | | | | 1999 |
| | | 9.3 | 7.9 | 2.3 | | | | 2000 |
| | *Other Cities/ Rural* | 1.2 | -2.0 | n.a. | | | | 1999 |
| | | 3.8 | 1.7 | 1.2 | | | | 2000 |
| | *Capital city/ Rural* | 8.7 | 9.2 | n.a. | | | | 1999 |
| | | 16.0 | 10.4 | 3.8 | | | | 2000 |
| Model 1 | # obs. | 2678 | 3620 | 2440 | | | | 2000 |
| | R-squared | 0.307 | 0.459 | .405 | | | | 2000 |
| Model 2 | # obs. | 2670 | 3581 | 2400 | | | | 2000 |
| | R-squared | 0.391 | 0.568 | .499 | | | | 2000 |

*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, 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 ratio is calculated as $\exp(\beta)$, where $\beta$ 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. Other ratios are obtained in a similar way, and *Capital city/Rural* ratio is derived. Only full-time employees included. All ratios in Table 6a are significantly different from 1 at 1% level, with (heteroscedasticity consistent) standard errors between 0.02 and 0.03.

**Table 7 *Ceteris paribus* urban-rural wage ratios [a]. Latvia and Lithuania. 2000**

| | Country | Latvia | | | | Lithuania | | | |
|---|---|---|---|---|---|---|---|---|---|
| Model | Net monthly wage ratios | Job location | Residence [c] | Reduc-tion | Reduction (Model 1) less Reduction (Model 2) | Job location | Residence [c] | Reduc-tion | Reduction (Model 1) less Reduction (Model 2) |
| Model 1 (without occupation controls) | *Capital city/ Urban1* | 1.151 | *1.022* | 12.9 | 1.3 | 1.231 | 1.137 | 9.4 | -0.3 |
| | *Capital city/ Urban2* | 1.219 | 1.148 | 7.1 | 0.0 | 1.118 | 1.093 | 2.5 | 0.7 |
| | *Capital city/ Rural1* | *0.945* | *1.066* | *-12.1* | -16.3 | 1.262 | 1.269 | *-0.7* | -4.4 |
| | *Capital city/ Rural2* | 1.347 | 1.256 | 9.1 | -1.2 | 1.215 | 1.200 | *1.5* | -2.7 |
| | *Urban2/ Rural2* | 1.105 | 1.094 | *1.1* | -1.1 | 1.086 | 1.098 | *-1.2* | -3.2 |
| Model 2 (with occupation controls) | *Capital city/ Urban1* | 1.130 | *1.014* | 11.6 | | 1.217 | 1.120 | 9.7 | |
| | *Capital city/ Urban2* | 1.222 | 1.150 | 7.1 | | 1.103 | 1.084 | *1.8* | |
| | *Capital city/ Rural1* | *1.078* | *1.036* | *4.2* | | 1.288 | 1.251 | *3.7* | |
| | *Capital city/ Rural2* | 1.336 | 1.233 | 10.3 | | 1.200 | 1.158 | *4.2* | |
| | *Urban2/ Rural2* | 1.093 | 1.072 | *2.2* | | 1.088 | 1.068 | *2.0* | |

*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 Riga district (Latvia) or Vilnius county (Lithuania). Only full-time employees included. Ratios are derived as explained in Notes to Table 6. Ratios shown in *italic* are not significantly different from 1 at 10% level, other ratios are significantly different from 1 at 1% level, with (heteroscedasticity consistent) standard errors between 0.02 and 0.03.

**Table 8 *Ceteris paribus* commuters-residents wage ratios by job location. Latvia and Lithuania. 2000**

| | Country | Latvia | | | | Lithuania | | |
|---|---|---|---|---|---|---|---|---|
| | | Job location | | | | Job location | | |
| Model | Commuters from | Riga | Other cities | Rural | Commuters from | Vilnius | Other cities | Rural |
| Model 1 (without occupation controls) | *Riga* | | 0.987 | [c] | *Vilnius* | | [d] | [d] |
| | *t-value* | | -0.13 | | | | | |
| | *Urban 1*[a] | 1.068 | [c] | [c] | *Other Urban* | 1.032 | 0.943 | 1.292 |
| | *t-value* | 1.18 | | | | 0.32 | -0.82 | 3.68*** |
| | *Urban 2* | 0.974 | 1.056 | 1.194 | | | | |
| | *t-value* | -0.61 | 0.88 | 2.74*** | | | | |
| | *Rural areas* | 0.933 | 0.948 | 1.134 | *Rural areas* | 0.833 | 0.909 | 1.095 |
| | *t-value* | -1.25 | -1.40 | 2.04** | | -3.00*** | -3.17*** | 1.50 |
| | # obs. | 1584 | 1382 | 724 | # obs. | 617 | 1532 | 367 |
| | *R-squared* | 0.2472 | 0.3109 | 0.2659 | *R-squared* | 0.3012 | 0.2766 | 0.3809 |
| Model 2 (with occupation controls) | *Riga* | | 0.994 | [c] | *Vilnius* | | [d] | [d] |
| | *t-value* | | -0.08 | | | | | |
| | *Urban 1*[a] | 1.065 | [c] | [c] | *Other Urban* | 1.058 | 0.958 | 1.217 |
| | *t-value* | 1.19 | | | | 0.66 | -0.64 | 3.23*** |
| | *Urban 2* | 0.961 | 1.017 | 1.097 | | | | |
| | *t-value* | -1.04 | 0.29 | 1.60 | | | | |
| | *Rural areas* | 0.995 | 0.961 | 1.086 | *Rural areas* | 0.828 | 0.921 | 1.045 |
| | *t-value* | -0.10 | -1.40 | 1.56 | | -3.11*** | -2.89*** | 0.79 |
| | # obs. | 1584 | 1382 | 724 | # obs. | 617 | 1532 | 367 |
| | *R-squared* | 0.4911 | 0.5166 | 0.4366 | *R-squared* | 0.4584 | 0.3781 | 0.5029 |

*Notes:* Ratios are derived from earnings functions controlling for: 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).

[a] Urban areas in Riga district. [b] Urban areas outside Riga and Riga district. [c] Merged with *Urban 2*.

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

***, **, * - significant at 1%, 5%, 10% level respectively.

**Table 9 Individual gains to commuting:**
***ceteris paribus* wage ratios compared to non-commuters**
**from the same residential area [a]. Latvia and Lithuania, 2000.**

| | Full-time employees, by residence | | | | |
|---|---|---|---|---|---|
| | All | Urban, excl.: capital city, "special" cities [b] | Urban, excl.: capital region [c], "special" cities [b] | Rural | Rural outside capital region [c] |
| **Latvia** | | | | | |
| # obs. | 3690 | 1430 | 1188 | 920 | 849 |
| # commuters | 707 | 336 | 209 | 349 | 305 |
| **Treatment effects model: MLE** | **1.507** | **1.501** | **1.452** | **1.678** | **1.716** |
| *z - value* | *6.3**** | *6.6**** | *4.3**** | *4.0**** | *5.0**** |
| Wald test of indep. eqns.: p-value | 0.000 | *0.000* | 0.003 | 0.000 | 0.0005 |
| **Independent equations estimate** | **1.136** | **1.187** | **1.153** | **1.147** | **1.173** |
| *t- value* | 5.2*** | 5.2*** | *3.8**** | 3.5*** | *4.2**** |
| **Lithuania** | | | | | |
| # obs. | 2551 | 913 | 814 | 586 | 469 |
| # commuters | 602 | 165 | 129 | 407 | 291 |
| **Treatment effects model: MLE** | **0.918** | **0.996** | **0.936** | **1.638** | **1.310** |
| *z - value* | *-0.7* | *-0.05* | *-0.7* | 3.7*** | 1.8* |
| Wald test of indep. eqns.: p-value | 0.16 | 0.29 | 0.08* | 0.015** | 0.004*** |
| **Independent equations estimate** | **1.116** | **1.069** | **1.054** | **1.143** | **1.146** |
| *t- value* | *3.5**** | *1.4* | *1.0* | 3.5*** | 3.5*** |

***Notes:*** [a] Controls for wage equations include: education (5 categories), gender, ethnicity, age and its square, regional dummies by residence; controls for selection equation include education, gender, ethnicity, age groups, marital status and children dummies and local unemployment rate.
[b] Port of Ventspils (Latvia); Kaunas and port of Klaipeda (Lithuania).
[c] For Latvia: Riga, Riga district and city of Jurmala (sea resort nearby Riga); For Lithuania: Vilnius county (incl. Vilnius).

**Table 10 *Ceteris paribus*[a] regional wage differentials[b] and effects of commuting in Latvia, 2000 (alternative specifications)**

**Percent**

| | Variables[c] refer to job location | | | Variables[c] refer to residence | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Riga (capital city) | 16 | 13 | 25 | 10 | 17 | 19 | 12 | 15 | 15 | 10 |
| Ventspils (port city) | 37 | 37 | 27 | 38 | 23 | 27 | 40 | 43 | 42 | 34 |
| Rural | -8 | -6 | -8 | -8 | -7 | -6 | -10 | -12 | -13 | -9 |
| Latgale (Eastern Latvia) | | | -11 | | | -13 | | | | |
| Distance to Riga (per 10 km) | -1.2 | -1.2 | | -1.4 | | | -1.4 | -1.3 | -1.1 | -1.4 |
| Commuting (per 10 km) | | | | 2.9 | 2.5 | 2.8 | 3.7 | 9.4 | 12 | 3.7 |
| Unemployment[d] control | no | no | no | no | yes | no | no | yes | no | no |
| Occupation controls | no | yes | no | yes | yes | yes | no | no | no | no |
| Industry controls | yes | yes | yes | yes | yes | yes | no | no | no | yes |
| Method | Survey linear regression (single equation) | | | | | | | 3 SLS [e] | | |

*Notes*: [a] Education, age, gender, ethnicity and sector of economic activity are controlled for. [b] Excluded category: cities (other than Riga and Ventspils) outside Riga district for specifications without variable Latgale; cities (other than Riga and Ventspils) outside Riga district and Latgale for specifications with variable Latgale All differentials are significant at 1% level, except for Commuting in the rightmost model. [c] Riga, Ventspils, Rural, Latgale, distance to Riga. [d] Registered unemployment rate at the job location (in all models). [e] Commuting distance endogenous, controlling via tobit model for education, age group, gender, ethnicity, marital status, children, distance to Riga.

**Table 11 Commuters and other employed persons by occupation and working status. Latvia and Lithuania, 2000** ***Percent***

| | Latvia | | Lithuania | |
|---|---|---|---|---|
| Occupation | job in the same municipality as residence | job in other municipality | job in the same municipality as residence | job in other municipality |
| managers | 10.1 | 9.9 | 9.0 | 6.8 |
| professionals | 10.9 | 11.0 | 14.6 | 10.4 |
| technicians | 13.2 | 15.1 | 7.5 | 7.0 |
| clerks | 4.8 | 3.8 | 5.4 | 5.4 |
| shop/sales workers | 13.1 | 15.6 | 11.4 | 12.4 |
| skilled agricultural | 9.5 | 4.0 | 17.0 | 16.7 |
| other skilled manual | 14.0 | 15.4 | 16.3 | 15.0 |
| semi-skilled manual | 10.1 | 13.2 | 8.4 | 11.5 |
| elementary | 14.3 | 12.0 | 10.4 | 14.9 |
| **Working status** | | | | |
| employer | 4.4 | 2.9 | 1.8 | 1.2 |
| employee | 83.6 | 94.0 | 77.4 | 78.0 |
| self-employed | 7.3 | 2.0 | 16.2 | 14.1 |
| family worker | 4.5 | 1.0 | 3.2 | 3.8 |

**Table 12 Full-time employees by job location, commuting patterns and occupation. Latvia, 2000** *Percent*

| Occupation | All employees by job location | | | | Commuters [a] | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Riga | Other urban [b] | Other urban [c] | Rural | Urban - Riga [b] | Urban - Riga [c] | Urban - rural all | Urban - rural [c] | Rural-urban all | Rural-urban [c] |
| managers | 10.1 | 7.4 | 7.8 | 6.0 | 10.9 | 7.3 | 2.6 | 1.6 | 7.3 | 5.6 |
| professionals | 13.8 | 10.8 | 10.5 | 9.9 | 17.2 | 13.7 | 8.7 | 8.7 | 10.4 | 9.5 |
| technicians | 18.1 | 15.0 | 15.3 | 11.2 | 16.1 | 15.1 | 19.1 | 17.7 | 18.5 | 16.2 |
| clerks | 5.2 | 5.8 | 6.0 | 4.7 | 4.7 | 5.6 | 4.1 | 3.8 | 4.0 | 4.8 |
| shop/sales workers | 16.8 | 16.0 | 16.1 | 8.7 | 20.1 | 22.7 | 7.4 | 8.2 | 20.4 | 16.8 |
| skilled agricultural | 0.4 | 0.7 | 0.7 | 6.0 | 0.2 | 0.3 | 5.2 | 5.6 | 1.0 | 1.7 |
| other skilled manual | 15.8 | 18.6 | 18.6 | 11.6 | 16.5 | 19.2 | 14.5 | 17.2 | 14.6 | 17.2 |
| semi-skilled manual | 8.8 | 13.0 | 12.8 | 20.6 | 9.3 | 10.1 | 20.6 | 20.9 | 12.2 | 15.5 |
| elementary | 11.0 | 12.8 | 12.4 | 21.3 | 5.1 | 6.0 | 17.7 | 16.3 | 11.6 | 12.7 |
| **Percent of total** | **45.2** | **36.7** | **32.8** | **18.1** | **4.6** | **3.2** | **3.7** | **2.5** | **7.4** | **4.1** |

**Lithuania, 2000** *Percent*

| Occupation | All employees by job location | | | | Commuters [a] | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Vilnius | Other urban [b] | Other urban [d] | Rural | Urban - Vilnius [b] | Urban - Vilnius [d, e] | Urban - rural all | Urban - rural [d] | Rural-urban all | Rural-urban [d] |
| managers | 8.8 | 10.3 | 9.2 | 5.2 | 4.2 | 0.0 | 5.3 | 3.0 | 8.2 | 7.3 |
| professionals | 23.5 | 14.2 | 14.6 | 16.3 | 23.3 | 0.0 | 18.5 | 19.7 | 10.5 | 11.4 |
| technicians | 10.4 | 10.2 | 9.5 | 4.4 | 12.2 | 10.0 | 7.2 | 8.2 | 11.1 | 14.2 |
| clerks | 6.2 | 7.6 | 7.3 | 5.2 | 6 | 16.0 | 5.6 | 7.0 | 7.4 | 7.3 |
| shop/sales workers | 13.9 | 12.1 | 12.6 | 10.0 | 10 | 12.5 | 5.6 | 5.4 | 13.5 | 12.7 |
| skilled agricultural | 0.2 | 0.5 | 0.8 | 7.9 | 1.6 | 0.0 | 4.4 | 5.5 | 1.1 | 1.0 |
| other skilled manual | 17.9 | 21.3 | 21.9 | 13.9 | 27.7 | 38.8 | 21.7 | 21.2 | 16.9 | 15.1 |
| semi-skilled manual | 8.8 | 12.1 | 11.3 | 17.4 | 4.3 | 0.0 | 17.7 | 21.1 | 14.5 | 12.4 |
| elementary | 10.3 | 11.7 | 12.8 | 19.8 | 10.9 | 23.3 | 14.0 | 8.9 | 17.0 | 18.7 |
| **Percent of total** | **24.9** | **59.9** | **34.5** | **15.2** | **1.7** | **(0.3)** | **2.8** | **2.3** | **11.1** | **6.8** |

*Notes:* [a] Excluding those commuting between rural areas or between urban areas outside capital. [b] Urban areas excluding capital city. [c] Urban areas excluding Riga, Riga district, Ventspils. . [d] Urban areas excluding Vilnius, Vilnius county, Kaunas, and Klaipeda. [e] Based on small number of observations.
*Source:* LFS (May 2000) data and author's calculations.

**Table 13 Full-time employees by residence or job location and education. Latvia and Lithuania, 2000** *Percent*

| Education | Latvia | | | | | | Lithuania | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Residence ([a]), job location ([b]) | | | | | | Residence ([a]), job location ([b]) | | | | | |
| | Riga | | Other urban | | Rural | | Vilnius | | Other urban | | Rural | |
| | a | b | a | b | a | b | a | b | a | b | a | b |
| University | 27.7 | 28.2 | 19 | 18 | 17 | 14 | 35 | 32 | 24 | 24 | 18 | 17 |
| Secondary [c] | 63.7 | 63.2 | 66 | 67 | 62 | 62 | 56 | 58 | 65 | 64 | 65 | 66 |
| Less than secondary [d] | 8.6 | 8.6 | 15 | 15 | 21 | 24 | 9 | 10 | 11 | 12 | 17 | 17 |

*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. *Source:* LFS (May 2000) and author's calculations.

**Table 14 Chi square tests for independence of occupational distribution of full-time employees from job location and commuting patterns[a] and dissimilarity indices (DI)[b]**

| | Latvia | | | Lithuania | | |
|---|---|---|---|---|---|---|
| **Job locations compared** | **chi2(8)** | **P-value** | **DI** | **chi2(8)** | **P-value** | **DI** |
| Capital city vs other urban | 48.13 | 0.0000 | 9.6 | 40.26 | 0.0002 | 11.5 |
| Capital city vs other urban[b] | 41.13 | 0.0001 | 9.1 | 31.20 | 0.0031 | 11.3 |
| Capital city vs rural | 303.27 | 0.0000 | 27.7 | 110.99 | 0.0000 | 26.0 |
| Other urban vs rural | 321.98 | 0.0000 | 21.6 | 150.49 | 0.0000 | 22.8 |
| Other urban[b] vs rural | 218.47 | 0.0000 | 22.1 | 98.73 | 0.0000 | 21.9 |
| **Commuters vs source** | | | | | | |
| From other urban to capital | 32.48 | 0.0439 | 15.1 | 6.47 | 0.7501 | 14.4 |
| From other urban[b] to capital | 13.10 | 0.2713 | 10.4 | too few observations | | |
| From urban to rural | 59.31 | 0.0000 | 23.0 | 30.45 | 0.0022 | 16.2 |
| From other urban[b] to rural | 60.28 | 0.0000 | 19.4 | 25.23 | 0.0104 | 19.8 |
| From rural to urban | 114.08 | 0.0000 | 23.9 | 39.49 | 0.0003 | 18.3 |
| From rural to other urban[b] | 49.19 | 0.0000 | 18.8 | 33.27 | 0.0022 | 17.9 |
| **Commuters vs host** | | | | | | |
| From other urban to capital | 10.56 | 0.3213 | 6.3 | 8.08 | 0.6062 | 14.8 |
| From other urban[b] to capital | 9.25 | 0.2391 | 11.8 | too few observations | | |
| From urban to rural | 32.63 | 0.0351 | 13.7 | 10.86 | 0.3570 | 16.8 |
| From other urban[b] to rural | 23.92 | 0.0800 | 14.4 | 13.52 | 0.1800 | 23.5 |
| From rural to urban | 12.92 | 0.2669 | 8.5 | 29.39 | 0.0073 | 13.5 |
| From rural to other urban[b] | 10.60 | 0.3498 | 6.6 | 19.98 | 0.0865 | 14.9 |

*Notes:* [a] Occupational distributions are presented in Table 9. The test is based on (not reported in the table) *F* statistic of Rao and Kramer (1989) which is obtained from chi2(8) after correction for weights, strata and PSUs.

[b] The *dissimilarity* (or *mismatch*) *index* is a number between 0 and 100, with 0 indicating equal distribution of the two categories between occupations and 100 indicating complete segregation. It shows the minimal percentage of employees of the first category that would have to change occupations to make the distribution equal (assuming that employees of the 2nd category stay where they are).

**Table 15 Average net monthly wages of full-time employees (percent of national average) by job location and patterns of commuting. Latvia and Lithuania, 2000**

| | Latvia | | | Lithuania | | |
|---|---|---|---|---|---|---|
| | Residence | | | Residence | | |
| Job location | Same as job location | Urban, other than job location | Rural, other than job location | Same as job location | Urban, other than job location | Rural, other than job location |
| *Capital city* | 113.6 | 122.7 | 116.1 | 112.8 | 123.5 | 79.4 |
| *Cities in capital district* | 89.9 | 132.1 | 81.9 | 84.5 | 110.1 | (69.6)[b] |
| *Other cities* [a] | 81.1 | 115.0 | 84.7 | 95.8 | 108.7 | 92.2 |
| *Rural* | 74.5 | 92.5 | 84.5 | 76.7 | 88.0 | 73.9 |

*Notes:* [a] *Other cities* here stand for all urban areas excluding: Riga, urban areas in Riga district and port of Ventspils (Latvia); Vilnius, urban areas in Vilnius county, Kaunas and port of Klaipeda (Lithuania). [b] Just 6 obs.

## .Table 16 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 |
| Secondary techn./special educ. | 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 education | 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 | 7224 | | 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).

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

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

[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(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 White's heteroskedastic standard errors adjusted for clustering within households.

## Table 17 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 |
| Secondary techn/special educ. | 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* | 1.9 | 2.093*** | 4.04 |
| Vocational education | 0.841 | -0.5 | 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 | 0.7 | 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 | 1.013*** | -3.36 | 0.208*** | -5.31 | 0.347*** | -5.24 | 0.504*** | -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*** | -7.6 | 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 counties (Vilnius, Kaunas, Klaipeda) separated from respective cities.
Reference categories: basic (or below basic) education; males; ethnic Lithuanians; age 55+; married or cohabited; urban areas excluding Vilnius, Vilnius county and the 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 (P(commuting)/(1 - P(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 White's heteroskedastic standard errors adjusted for clustering within households.
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