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Working Paper

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WIFO Working Papers, No. 407

Provided in Cooperation with:
Austrian Institute of Economic Research (WIFO), Vienna

Suggested Citation: Huber, Peter (2011) : Are Commuters in the EU Better Educated than Non-Commuters but Worse than Migrants?, WIFO Working Papers, No. 407, Austrian Institute of Economic Research (WIFO), Vienna

This Version is available at:
https://hdl.handle.net/10419/128952

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November 2011

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2011/325/W/0

Medieninhaber (Verleger), Hersteller: Österreichisches Institut für Wirtschaftsforschung • 1030 Wien, Arsenal, Objekt 20 • Tel. (43 1) 798 26 01-0 • Fax (43 1) 798 93 86 • http://www.wifo.ac.at/ • Verlags- und Herstellungsort: Wien

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Are Commuters in the EU Better Educated than Non-Commuters but Worse than Migrants?

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Abstract

I analyze the skill and age structure of commuters in 14 EU countries. Theory implies that commuters can be either more or less able than stayers, but are always less able than migrants and that they are also always older than migrants but younger than stayers. Empirically all types of commuters are younger and have higher education than non-commuters. Internal commuters are better educated and younger than cross-border commuters, education decreases while age increases with distance commuted and recent migrants are younger but also more highly educated than commuters.

JEL Codes: J61, R23

Keywords: Commuting, Selectivity, Migration

[1] I thank Liv Oswald, Klaus Nowotny and two anonymous referees for helpful comments and the Austrian National Bank (Jubiläumfondsprojekt 13804) for financial support. The usual disclaimer applies.

1. Introduction

Increased geographical mobility of labor in the EU could have important repercussions on the skill distribution of the workforce residing and working in a region. This has long been recognized by the migration literature where the determinants of the skill structure of migrants have been a central concern of both empirical and theoretical research (e.g. Chiswick, 1999, Hunt, 2004, Borjas 1999). Similar research with respect to commuters, by contrast, has been rare. Empirical results for individual countries and regions (e.g. Eliasson et al. 2003, VanOmmeren et al. 1999 Rouwendahl, 1999, Gottholmseder and Theurl, 2007, Paci et al, 2007, Huber and Nowotny, 2011) often find that commuters are more highly educated than non-commuters, but offer little theoretical explanation for this.

Sorek (2009) argues that this implies that effects of infrastructure investments, reducing travelling times between regions, on settlement structures cannot be analysed. He therefore considers a general equilibrium model of two distant, disconnected geographical zones using different technologies to find that the least able live and work in the (sending) region with low returns to ability, while those with intermediate ability commute and the most able migrate to the (receiving) region with high returns to ability. This finding is slightly in contrast to results of migration theory, which predicts that the most able migrate from places with low to places with high returns to ability, while the least able migrate in the opposite direction (Borjas, 1987). The reason for this is that Sorek (2009) assumes equal wages for the least able in both regions, so that there are no incentives for them to migrate or commute.

This paper extends Sorek's model in two directions and uses data from the European Labor Force Survey (ELFS) to test the predictions of the extended model.

The theoretical analysis first of all allows for ability independent wage components to differ across regions and thus accounts for potential incentives of low ability individuals to commute. Second it considers selection of commuters with respect to age. I show that in this version of the model commuters can be either more or less able than stayers, but are always less able than migrants and that commuters are also always older than migrants but younger than stayers.

The empirical analysis tests these hypotheses and differentiates between cross-border and within-country commuters as well as between commuters across different distances and commuters to capital cities and other regions. In accordance with theory it finds that commuters in most of the 14 EU countries analyzed are more highly educated and younger than region stayers. Deviations from this pattern arise only in the EU member states which joined the EU after May 2004. In addition internal commuters are more highly educated but slightly younger than cross-border commuters and persons commuting larger distances are less strongly positively self-selected on education but younger. Finally, cross-border and internal commuters are compared to recent cross-border and internal migrants. As predicted by theory both cross-border and internal commuters are older but also less highly educated than migrants.

2. Theory

As a starting point for the analysis, following Sorek (2009), I consider an economy consisting of two regions (denoted by f and n, respectively) and focus on the decision of a resident of n to work and live in n, or to commute or migrate to f. Individuals differ with respect to ability $(s > 0)$ and age $(T > a > 0)$ with T the retirement age. Each individual commands one unit of time which is split between commuting (τ_{ij}) from the region of work (j) to the region of residence (i) and working. Since I consider only two regions I assume that time spent commuting is

zero if the person lives and resides in the same region and τ if the person resides in region f but lives in n (i.e. $\tau_{ij} = 0$ if $i = j$ and $\tau_{ij} = \tau$ if $i \neq j$),

Aside from allowing for heterogeneity with respect to age I also differ from Sorek (2009) by assuming that individuals working in region j receive income from an ability independent base wage rate (w_j) (i.e. a subsistence wage level for the least able workers) which net of commuting costs is higher in f than in n (i.e. $w_f (1-\tau) > w_n$). Therefore in this model, in the absence of commuting and migration costs, the least able prefer to work in f, while in Sorek (2009), who assumes $w_f = w_n = 0$, the least able have no incentive for mobility. In addition wages as in Sorek (2009) also depend on an ability dependent component (λ_j s) with λ_j a parameter measuring returns to ability, which differ among regions, to allow for differences in technology[2] as well as (in a cross-border context) for potential difficulties in transfering skills across borders. The expected lifetime income of an individual of age a and ability s working in region j is therefore $(T-a)\big(w_j + \lambda_j s\big)\big(1-\tau_{ij}\big)$. In addition migrants incur migration costs of k while commuting is associated with fixed costs c, where to assure viability of commuting $k > c$.

Individuals residing in region n are therefore faced with a choice between working and residing in region n (i.e. staying), which gives an income of:

$$y^S = (T-a)(w_n + \lambda_n s) \tag{1}$$

residing in n and working in f (i.e. commuting), with income:

$$y^C = (T-a)\big(w_f + \lambda_f s\big)(1-\tau) - c \tag{2}$$

[2] Sorek (2009) argues that these may result from geographical attributes, institutional or cultural differences, and differences in infrastructure or in the adoption of new technologies between regions.

and working and residing in f (i.e. migrating), which yields income:[3]

$$y^M = (T - a)(w_f + \lambda_f s) - k \tag{3}$$

Asumming that $\lambda_f > \lambda_n$ and (without loss of generality) normalizing λ_f to unity as well as letting $\lambda = \frac{\lambda_n}{\lambda_f}$, income maximizing individuals are indifferent between migrating and commuting at ability:

$$s^{CM} = \frac{\mathrm{k-c}}{(T-a)\tau} - w_f \tag{4}$$

with the individual preferring to migrate if $s > s^{CM}$ or $\tau(s + w_f) > \frac{\mathrm{k-c}}{(T-a)}$.

Equation (4) defines the ability at which individuals of a given age are indifferent between commuting and migration and highlights the central trade-off driving the decision between migrating and commuting. If the difference between (annualised) costs of migration and commuting (i.e. $\frac{\mathrm{k-c}}{T-a}$) are large relative to the foregone income arising from the time spent commuting (i.e $\tau(w_f + \mathrm{s})$) individuals prefer commuting over migrating. In consequence the most able, which have the highest opportunity costs for time spent commuting, migrate rather than commute and the critical ability at which migration is preferred to commuting increases with age.

Similarly, the combinations of ability and age at which individuals are indifferent between staying and commuting is given as:

$$s^{SC} = \frac{[w_n - w_f(1-\tau)][\mathrm{T-a}]+\mathrm{c}}{[1-\tau-\lambda][\mathrm{T-a}]}, \tag{5}$$

with individuals preferring to stay if $s^{SC} \geq s$ if $1 - \tau > \lambda$ and if $s^{SC} \leq s$ if $1 - \tau < \lambda$.[4]

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[3] The possibility of residing in f but working in n is dominated by staying, since it is associated with an expected income of $y^R = (\mathrm{T-a})(w_n + \lambda s)(1 - \tau) - k - c$ which is always lower than y^S.

[4] I assume throughout that λ is either strictly larger or smaller than $1 - \tau$, and that if $y^S = y^C$ or $y^S = y^M$ individuals prefer staying while if $y^C = y^M$ they prefer commuting.

Equations (4) and (5) state that with respect to selection on ability, two possible situations can arise. The first, occurs when returns to ability are larger in f than in n and commuting time is not too large (i.e. $1-\tau > \lambda$). In this case individuals with an ability of $s^{CM} \geq s$ prefer commuting over migration and individuals with $s^{SC} < s$ prefer commuting over staying. Thus for commuting to be preferred over both migration and staying $s^{CM} \geq s > s^{SC}$ must apply and commuters are more able than stayers, but less able than migrants. The reason for this is that when $1-\tau > \lambda$ returns to education abroad are higher both for migrants and commuters than at home. This creates an incentive for the able to either migrate or commute to f. In deciding between migration and commuting, however, those with the highest ability have most to gain from higher returns to ability in f but also have the highest costs due to foregone earnings during time spent commuting. For them therefore migration is most attractive. For the medium ability groups, which also gain from working abroad, but for whom foregone earnings due to time spent commuting are lower than for the high ability groups commuting is more attractive. For the least able incentives to commute or migrate are lowest, since they do not profit from high returns to ability in the receiving region.

The second case occurs when returns to ability are low in f relative to n or commuting time is large (i.e. when $(1-\tau) < \lambda$). In this case comuting is optimal for individuals with the lowest ability (i.e. with $s < \min[s^{SC}, s^{CM}]$). The reason for this is that if $1-\tau < \lambda$ returns to ability net of commuting time are lower in f than in n although returns to education excluding commuting costs are higher. Therefore the most able lack incentives to commute, while the least able have such an incentive if base incomes net of commuting costs (as assumed above) are higher in f than in n.

Furthermore, rearranging equations (4) and (5) we can derive the age at which individuals are indifferent between migration and commuting (a^{CM}) as $a^{CM} = \mathrm{T} - \frac{\mathrm{k}-\mathrm{c}}{(w_f+s)\tau}$ with the individual preferring to commute if $a \leq a^{CM}$, as well as the age at which individuals are indifferent between staying and commuting (a^{SC}) as $a^{SC} = \mathrm{T} - \frac{\mathrm{c}}{(1-\tau-\lambda)s-(w_n-w_f(1-\tau))}$ with the individual preferring to commute if $a^{SC} < a$. Thus irrespective of whether $1-\tau < \lambda$ or $1-\tau > \lambda$ staying is optimal for the oldest since for them higher returns to education abroad do not justify paying the fixed costs of commuting or migrating. For the youngest migration is optimal since annualized fixed migration costs are low due to a long remaining working life time ($T-a$). For those in the middle age groups, however, lower fixed costs of commuting relative to fixed costs of migration make commuting attractive.

Thus from equations (4) and (5) it follows that commuters are always younger than stayers but older than migrants as well as less able than migrants. Depending on commuting time and relative returns to ability in the receiving and sending region they may, however, be less or more able than stayers. A full description of the model, however, has to also consider the decision to stay or migrate. By equations (1) and (3) the level of ability at which individuals are indifferent between staying and migrating is given by:

$$s^{SM} = \frac{\mathrm{k}+(T-a)(w_n-w_f)}{(1-\lambda)(T-a)} \tag{6}$$

with the individual preferring to stay if $s^{SM} \geq s$. This after rearranging gives a critical age at which individuals are indifferent between migrating and staying of $a^{SM} = \frac{\mathrm{k}}{(1-\lambda)s+w_n-w_f}$ with the individual preferring to stay if $a^{SM} \leq a$. So that for migration to be preferred both to commuting and staying $s > \max[s^{CM}, s^{CM}]$ and

$a < \min[a^{CM}, a^{CM}]$ must apply. Therefore for a given age migrants are always the most able and for a given ability they are the youngest. [5]

In sum theory predicts that commuters can be either more or less able than stayers, but are always less able than migrants and that commuters are always older than migrants but younger than stayers. For a given ability therefore the probability of a person to commuting should be highest for the medium age groups, while for a given age commuters should always be less able than migrants but more able thanstayers if $1 - \tau > \lambda$, which means that commuting time is not too large (i.e. τ is small) and relative returns to ability in f relative to n are large (i.e. λ is small). By contrast if $1 - \tau < \lambda$, which means large commuting times but low returns to ability in f relative to n (i.e. large λ), commuters should be less able than stayers. Therefore also all else equal commuters to regions that are closer together or commuters to regions with higher returns to education should be more able than stayers, at a given age, while commuters over longer distances or to regions with lower returns to ability should be less strongly positively self-selected. Furthermore by taking derivatives of the expressions for a^{CM} and a^{SC} with respect to τ and λ it is easy to see that an increase in λ also reduces a^{SC} which makes the average commuter younger. By contrast an increase in τ, which implies commuting over greater distances, increases a^{SC} but increases a^{CM} so that the impact of increasing commuting distances on commuter age is ambiguous.

[5] If I also allow $1 < \lambda$ a third situation would arise, where commuters are still older than migrants but younger than stayers as well as the least able, but stayers are more able than migrants. This is the case of negative self-selection of migrants discussed in Borjas (1987). I do not describe this here, since my primary focus is on commuters.

3. Data and Method

To empirically test these predictions, using education as a proxy for ability, I estimate logit models of the choice between residing and working in a region and commuting for different types of commuters. I differentiate between cross-border and internal commuters, since these may differ from internal commuters with respect to traveling times, differences in returns to education and difficulties in transfering human capital across regions. This could lead to cross-border commuters being more highly educated and younger than internal commuters if differences in returns to education are larger for cross-border commuters and older and but less educated if highly educated commuters face greater problems of skill-transfer when commuting across borders. In addition, among internal commuters, commuters to capital cities and other regions are considered separately, since the little evidence available on regional differences in returns to education (e.g, Cabral-Vieira et al 2006, Hazans, 2003a) suggests that these are higher in capitals than elsewhere[6] which should make commuters to capital cities more able and older than those to other regions. Finally, commuters are also differentiated by distance covered in commuting, since theory suggests that commuters over larger distances are less able but may be either older or younger than commuters over shorter distances.

The data are taken from the ELFS for the year 2006. They contain information on the region of work and residence (where the lowest regional disaggregation is NUTS1 for Austria, Germany and the UK and NUTS2 for all other countries) as well as a number of demographic and workplace characteristics of persons in paid employment in 14 EU countries (Austria, Belgium, Bulgaria, Czech Republic,

[6] I use capital cities as a proxy for urban agglomerations. I would have preferred to analyze commuting to large cities in more detail. Given the regional aggregation of our data, however, this is impossible.

Finland, France, Germany, Hungary, Italy, Poland, Slovakia, Spain, Romania, UK).[7] In these data therefore commuters can be defined as persons that live in one region and work in another, with cross-border commuters working in another country than they live in, and internal commuters working in a different region than they live in, but in the same country. Furthermore, by comparing the current region of residence to the region of residence one year ago it is also possible to define both recent internal and cross-border migrants as persons, who have moved region of residence in the last year, and to compare these to commuters as well as to stayers (i.e. persons that neither migrated nor commuted).

Table 1 provides descriptive statistics for all groups considered (i.e. stayers, commuters, migrants, cross-border and internal migrants and commuters and commuters to capital cities and other regions). According to these data around 0.6% of the employed commuted across borders and 4.2% commuted across regions within their respective countries in 2006. Similarly, the share internal migrants was 0.6%, while cross-border migrants accounted for 0.1% of the employed. Commuters differ most significantly from stayers by a high share of males and a larger share of persons aged 20-39. Cross-border commuters often have intermediate education and work in manufacturing (including construction). Internal commuters are more often highly educated and often work in market services. Relative to migrants, however, both cross-border and internal commuters more often have intermediary education and are also older. Finally, migrants are more often single than either commuters or stayers, while differences between these groups with respect to having children are small.

[7] Malta, Cyprus, Luxemburg, Denmark and the Baltic countries are omitted as they only have one region. Swedish, Dutch, Greek, Portuguese, Slovene and Irish data are omitted due to missing data and/or low data reliability.

{Figure 1: Around Here}

{Table 1: Around Here}

Both internal and cross-border commuting are, however, also highly dependent on a country's geography (see Figure 1). High rates of outbound cross-border commuting primarily occur in regions close to the border and in small countries (e.g Belgium and Austria), where most regions are located close to the border. High rates of outbound internal commuting are found primarily in the vicinity of large urban agglomerations (London, Madrid, Prague and Bratislava) and countries with smaller regions. In addition cross-border commuting is most prevalent at borders of countries which either share a common language (e.g. France, Belgium and Switzerland or Austria, Germany and Switzerland) or have been a single country until recently (i.e. Czech Republic and Slovakia) but also at the Austrian-Hungarian and Czech-German border where wage differences are large.

In the logit analysis I therefore include a set of dummy variables for each of the 158 regions considered, to capture any effects of differences in size, geographic position and economic development between regions on commuting. In addition based on the results of the emprical literature, which finds that commuters are often young and male and also establishes an impact of marital status and having children on the probabilty to commute in some cases (e.g. Hazans, 2003, Benito and Oswald, 2000, Paci, 2007 and White, 1986), controls for gender, marital status and presence of children in the household and dummy variables for the sector of employment (agriculture, manufacturing and private or public services) are included. Finally, two dummy variables measuring whether a person has completed an intermediate (ISCED 3 or 4) or a high (ISCED 5 or 6) education, respectively, with compulsory

education (ISCED 2 or less) as the excluded base group, and five dummies for the age of respondents (measuring whether individuals are 20-29, 30-39, 40-49, 50-59 and 60 or more years old, with 15-19 year olds as a base category), are included. These are our variables of interest, with education dummies proxying ability and age dummies accounting for potential non-linearities of the impact of age on commuting. A positive coefficient of these variables signifies that commuters are positively self-selected from this group relative to stayers and a negative coefficient indicates negative self-selection of commuters.

In addition, I also seperately compare cross-border and internal commuters to cross-border and internal migrants and stayers by means of a multinomial logit analysis of the choice between migrating, commuting and staying, controlling for the same explanatory variables as above. For cross-border migrants and commuters this is, however, only possible at national level, since these groups are not asked on their region but only on their country of previous residence in the ELFS. When considering cross-border migrants and commuters, therefore, all those living and working in the same country (irrespective whether they commute within the country or not) are defined as stayers and I can only control for country dummies (rather than region dummies) as explanatory variables.

4. Results

Table 2 shows the results for all commuters, cross-border commuters, internal commuters, commuters to capital city regions and to other regions, respectively, by presenting odds-ratios of the estimates.[8] It provides strong evidence of positive

[8] For dummy variables these report by what factor the probability of commuting relative to the probability of not commuting changes as the variable changes from 0 to 1. Thus a value of 1 implies that the relative probability of commuting for this group is the same as in the base category, while values larger (smaller) than 1 imply a higher (lower) relative probability.

self-selection of commuters relative to stayers on education irrespective of commuting type. In all of the estimates the coefficients on both the dummy variable for intermediary as well as for high education are highly significantly different from 1 and increase with educational attainment.[9]

{Table 2: Around Here}

There are, however, differences among commuter types. The coefficients imply that internal commuters are more positively self-selected on education than cross-border commuters. Persons with intermediary education have a by a factor of 1,9 higher probability to commute across borders relative to staying than persons with compulsory education. The probability for internal commuting relative to the probability of staying is, however, only by a factor of 1.3 higher for persons with intermediary education than for persons with compalsory education. Similarly persons with tertiary education have an by a factor of 1.8 higher odds to commute within a country but only by a factor of 1.5 higher probability to commute across borders. In terms of the theoretical model presented above this could be explained by larger problems of cross-border commuters in transfering education across borders (e.g. due to language problems) or by the longer travelling times in cross-border commuting leading to a weaker selection of cross-border commuters.

Furthermore, - consistent with the theoretical model and the assuption that returns to ability are highest in large cities - among internal commuters those commuting to capital cities are more positively selected on education than those commuting elsewhere. A person with intermediary education is by a factor of 1.3

[9] In this regression we omit recent (cross-border and internal) migrants from the comparison group of non-commuters.

more likely to commute to the capital city (relative to staying) than a person with at most completed compulsory education. For persons with completed tertiary education the relative probability increases by a factor of 2.6. For internal commuters to other regions these gains are 1.2 and 1.8, respectively.

Table A.1 in the appendix augments these results, by estimates for all commuters on a country by country basis. It suggests that these patterns apply in almost all countries of the EU.[10] The odds ratios on the education variables are significantly larger than one in all countries except for secondary educated in the new member states (NMS) of the EU, which joined the EU after May 2004 (i.e. the Czech Republic, Hungary, Poland, Sloavkia as well as Bulgaria and Romania - where also the coefficient for tertiary education is smaller than one). Thus the education structure of commuters differs between the NMS and the pre-existing member states. This may be a consequence of the substantial regional restructuring in the NMS in past decades (see: Huber, 2007, Ferragina and Pastore 2008 for surveys).

Highly significant coefficients which are consistent with theory are also found for age. For all commuting types, the commuting probability (relative to the staying probability) attains a maximum for the 20 to 29 year olds, with odds ratios suggesting a 2.2 times higher relative commuting probability for this age group than for the 15-19 year olds, among internal commuters and a 1.3 times higher probability among cross-border commuters. By contrast coefficients for the age groups older than 50 years remain insignificant. Thus, as predicted by theory, commuters are

[10] In an earlier version of the paper (Huber, 2011), using a slightly different data set, I show that differences with respect to selectivity between cross-border and internal commuters and commuters to the capital city and other regions apply also to most countires except for the new member states.

yonger than stayers. Furthermore the longer travel times implied by cross-border commuting lead to cross-boder commters being older than internal commuters, while higher returns to education make commuters to capital cities slightly older (with commuting odds, being higher relative to the base group of the very young for each age group for commuters to capital cities). Once more these results also hold for most EU countries except for the NMS (where results suggest that commuters are mostly 15 to 19 years old or do not differ significantly in age from stayers) considered in table A.1.

Aside from providing strong evidence for positive self-selection of commuters on education and a negative one on age, table 2 also suggests that commuters are significantly less often female than male, with the coefficients, however, varying only marginaly for different types of commuters. Once more this result is highly consistent across countries (see table A.1). Although in our model gender differences are not modelled, this is consistent with the conjecture of White (1986) that due to higher opportunity costs of time spent commuting for women (which may result from the traditional role of women in household production or alternatively lower wages in market production due to discrimination), women commute less.

Finally, results also suggest that having children significantly reduces the probability of cross-border commuting, while married persons less often commute to capital cities than singles. With respect to these variables, however, results vary somewhat across countries. This rather inrobust impact of these variables on commuting behavior is consistent with the literature. For instance Paci et al (2007) in a comparative study of 8 countries find that marital status has a significant impact on the probability to commute in only 3 countries and according to Hazans (2003) having children has a significant impact on the probability of commuting in only one of three Baltic countries.

4.1 Commuting across different distances

Table 3 takes this analysis one step further by considering the probability to commute across different distances (i.e flows where the capital cities of the sending and receiving regions are less than 50 kilometers, 50 to 100 kilometers, 100 to 150 kilometers and more than 150 kilometers apart).[11] This is interesting, because theory suggests that commuters over longer distances should be less able than short distance commuters and because also the self-selection on age of commuters may change with distance covered (although we cannot unambiguously sign this effect).

{Table 3: Around Here}

In these regressions, in accoordance with theory, short distance commuters are younger than long distance commuters, since for each age dummy the impact on the probability to commute decreases for each consecutive distance category. Similarly, the impact of the educational variables on the probability to commute decreases for each consecutive distance category. For instance, the 30 to 39 year olds have a by a factor of 2.2 higher probability to commute less than 50 kilometres (relative to staying) than the 15-19 year olds, while for those commuting in excess of 150 kilometers this effect is only 1.2 and statistically insignificant. Similarly, persons with intermediary education have a by a factor of 1.4 higher relative probability to commute across a distance of 50 or less kilometers but a by a factor of 1.2 higher relative probability to commute more than 150 kilometers than persons with low education. For persons with high education the odds ratio is 2.2 for commuting distances below 50 kilometers but 2.0. for commuting in excess of 150 kilometers.

[11] Since the data lack reliable information on receiving regions for cross-border commuters I conduct this analysis for internal commuters only.

Furthermore, gender differences in commuting increase slightly with distance. Females have a by a factor of 0,6 lower commuting probability than males for moves below a distance of 50 kilometers but a by a factor of 0.5 lower probability to commute more than 150 kilometers. This is once more consistent with the results of White (1986), since women's higher opportunity costs of commuting would lead women to be particulary reluctant to commute over long distances. In addition, children in the household significantly reduce the probabilty to commute more than 150 kilometers and being married remains insignificant throughout.

4.2 Selection of Commuters and Migrants

Finally, the analysis can be extended to consider the selection of migrants relative to commuters. Table 4 reports results of multinomial logit regressions on the decision to migrate, commute and stay for both internal as well as cross-border migrants and commuters. These suggest that migrants are usually younger and more highly educated than commuters. The odds ratios imply that a completed tertiary education increases the probability of being a migrant relative to staying by a factor of 3.3 over that of a person with compulsory education for cross-border migrants and by factor of 2.7 for internal migrants.[12] The respective odds ratios are 1.6 for cross-border and 1.9 for internal commuters. In addition, for cross-border commuters, odds ratios are higher than for cross-border migrants for intermediary education, but lower for tertiary education. This does, however, does not apply to internal migrants and commuters. Cross-border commuters are therefore

[12] These results are highly consistent with the findings of the literature on international migrant self-selection. For instance Chiswick (2000) in a survey argues that most studies find international migrants are positively self-selected (see also Hunt, 2004 Brücker and Trübswetter (2007) for evidence in this direction), with respect to internal migration, however, results are be more mixed (see e.g. Gries et al. 2011).

predominantly drawn from medium education levels, while internal commuters have a lower education than migrants (but a higher one than stayers) throughout.

Similarly, the probability of migrating as well as commuting is largest for the age group of the 20-29 year olds for both internal and cross-border migrants and commuters (although insignificantly so for cross-border migrants) but for the age groups older than 40 the probability of migration relative to staying is already significantly lower than 1 for both cross-border and internal migrants, while it is still larger than 1 (although insignificantly so for internal commuters) for cross-border and internal commuters. Thus, consistent with theory, both internal and cross-border commuters are younger than migrants but older than stayers.

{Table 4: Around Here}

In addition both cross-border and internal commuters are less often female than stayers. This does, however, not apply to cross-border migrants. By contrast, being married significantly reduces only the probability to migrate (relative to staying) internaly while having children reduces only the relative probability of commuting internaly and migrating across borders (although the later coefficient is only on the margin of significance).

5. Conclusions

Increased geographical mobility of labor may have important repercussions on the skill distribution of the workforce residing and working in a region. Aside from migration, commuting is another mechanism by which this population sorting may be encouraged. This paper analyses the education and age structure of commuters in 14 EU countries. Theory implies that commuters are always younger than stayers but older than migrants as well as less able than migrants. Depending on the commuting

time between regions and relative returns to education, they may, however, be less or more able than stayers.

The empirical results indicate that all types of commuters in most countries are younger and have higher education than residents of the same region that do not commute. Deviations from this pattern only occur in the EU member states which joined the EU in May 2004, where in particular workers with completed secondary or vocational education tend to have a lower probability of commuting, and internal commuters are often younger than in the other EU countries. In addition internal commuters are more strongly positively self-selected on education (in particular when commuting to capital city regions) and younger than cross-border commuters, persons commuting larger distances are usually less highly educated and older and recent migrants are younger but also more highly educated than commuters. In addition commuters are often young and male, with gender differences being largest for shorter distance commuting.

From a policy perspective this implies that measures to reduce traveling times between regions (such as investments in transport infrastructure or in the European context integration of cross-border labor markets) aside from leading to increased commuting, will also lead to a larger share of highly educated commuting and could thus impact on population sorting. Relative to policies focusing on migration such policies are, however, also likely to disproportionately affect the medium skilled.

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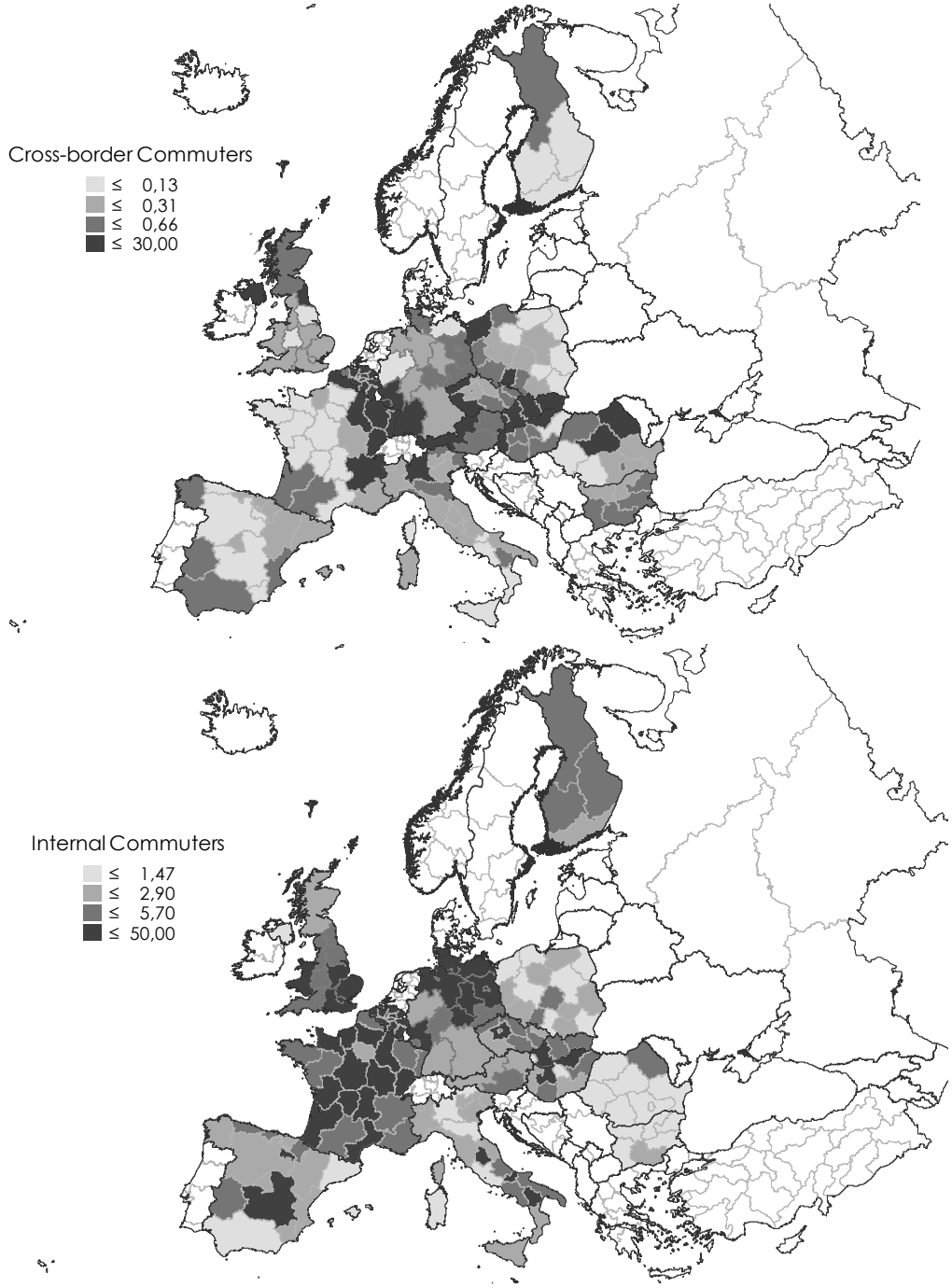
Figure 1: Out-commuting in the EU27 by NUTS2-regions (2006)



S: Eurostat. ELFS, Figure shows out-commuting in % of employed at place of residence. Top panel = cross-border commuting. Bottom panel= internal commuting.

Table 1: Descriptive statistics for different types of commuters and migrants (in %)

	Stayers	Commuters					Migrants			
				Internal Commuters						
		Overall Commuters	Cross-Border Commuters	Total	To Capital	to other regions	Overall Migrants	Cross-border Migrants	Internal Migrants	Total
Total (% of resident population)	94.2	5.2	0.6	4.6	3.7	0.9	0.7	0.1	0.6	100.0
	Age									
15-19 years	2.5	2.3	1.2	2.4	2.8	1.1	3.1	2.5	3.1	2.5
20-29 years	19.2	22.9	26.5	22.4	21.8	25.0	51.5	54.3	51.5	19.3
30-39 years	26.7	27.8	26.9	27.9	27.9	28.0	25.7	30.4	25.7	26.8
40-49 years	27.3	26.6	27.3	26.5	26.2	27.6	14.6	6.6	14.6	27.2
50-59 years	19.6	17.6	15.5	17.8	18.2	16.5	4.5	6.2	4.5	19.5
60 or more years	4.7	2.9	2.6	2.9	3.2	1.8	0.6	0.1	0.6	4.6
	Education									
Low Education[1)]	24.0	16.5	15.4	16.6	17.2	14.0	12.3	12.3	12.3	23.6
Medium Education[2)]	50.7	48.7	58.0	47.5	48.0	45.7	42.4	38.6	42.4	50.6
High Education[3)]	25.2	34.8	26.7	35.9	34.8	40.2	45.3	49.1	45.3	25.7
	Gender									
Female	45.3	33.4	28.1	34.1	33.7	35.7	43.2	44.6	43.2	44.6
Married	58.8	53.7	53.8	53.7	54.0	52.6	30.1	32.3	30.1	58.5
Child	45.4	44.4	46.4	44.1	42.0	52.6	41.9	31.7	41.9	45.3
	Sector									
Agriculture	5.9	1.6	2.4	1.5	1.5	1.2	0.9	7.5	0.9	5.7
Manufacturing[4)]	27.6	31.3	43.6	29.7	30.9	24.9	22.4	23.4	22.4	27.8
Market Services	36.6	41.4	36.2	42.1	41.4	45.2	42.1	45.1	42.1	36.8
Non-Market Services	29.9	25.7	17.7	26.7	26.2	28.7	34.7	24.0	34.7	29.7

S: ELFS (2006), Notes 1) ISCED 2 or less,)2 ISCED 3-4 3) ISCED 5 or more 4) including construction. Note standard deviations of dummy variables are given by $\sqrt{s * (1 - s)}$, where s is the share of persons with the respective attribute.

Table 2: Regression results for different types of commuting

	Overall Commuters	Cross-Border Commuters	Internal Commuters	Internal Commuters	
				to capital	to other region
Age 20-29 years	1.40***	1.34***	2.19***	1.72***	1.28***
	(0.10)	(0.11)	(0.38)	(0.42)	(0.11)
Age 30-39 years	1.26***	1.24***	1.71***	1.46 **	1.21**
	(0.10)	(0.10)	(0.30)	(0.26)	(0.10)
Age 40-49 years	1.17***	1.13	1.80***	1.47	1.08
	(0.09)	(0.09)	(0.32)	(0.36)	(0.09)
Age 50-59 years	1.06	1.03	1.44	1.18	1.02
	(0.08)	(0.08)	(0.36)	(0.29)	(0.09)
age 60 or more	0.75	0.71	1.43	0.80	0.69***
years	(0.07)	(0.07)	(0.35)	(0.23)	(0.07)
Medium	1.27***	1.25***	1.42***	1.32***	1.23***
Education	(0.04)	(0.04)	(0.12)	(0.09)	(0.04)
High Education	1.89***	1.51***	1.79***	2.60***	1.77***
	(0.06)	(0.06)	(0.16)	(0.18)	(0.07)
Female	0.60***	0.61***	0.53***	0.58***	0.62***
	(0.01)	(0.01)	(0.03)	(0.03)	(0.02)
Married	0.97	0.97	0.90	0.84***	1.01
	(0.02)	(0.03)	(0.06)	(0.05)	(0.03)
Child	0.93***	0.93***	0.93	0.95	0.92***
	(0.02)	(0.03)	(0.07)	(0.05)	(0.03)
	(0.16)	(0.20)	(0.16)	(0.90)	(0.18)
Observations	1043689	1033444	994456	752145	1018415
Log-Likelihood	-32591.6	-29411.8	-5401.5	-6207.8	-25186.8
Pseudo R2	0.12	0.13	0.18	0.27	0.12

Notes: Table reports odds ratios for weighted logit regressions on the probability to commute relative to the probability to stay (sample excludes recent migrants), values in brackets are cluster robust standard errors, ***(**)(*) signify odds ratios significantly different from 1 at the 1% (5%) (10%) level, respectively. Base categories for dummy variables are 15-19 year old males with completed compulsory education. Results for fixed effects of region of residence and sector of employment not reported.

Table 3: Regression results for different commuting distances of internal commuters

	Distance travelled			
	to 50km	50 to 100 km	100-150km	150+km
Age 20-29 years	1.93***	1.90***	1.79***	1.49**
	(0.40)	(0.36)	(0.18)	(0.25)
Age 30-39 years	2.21***	2.17***	1.92***	1.20
	(0.42)	(0.46)	(0.16)	(0.20)
Age 40-49 years	1.95***	1.79***	0.91	1.13
	(0.41)	(0.34)	(0.16)	(0.19)
Age 50-59 years	1.66**	1.64*	0.77	1.07
	(0.35)	(0.32)	(0.13)	(0.18)
Age 60 or more years	0.91	0.87*	0.69*	0.69*
	(0.22)	(0.19)	(0.14)	(0.14)
Medium Education	1.37***	1.32***	1.27***	1.21***
	(0.08)	(0.08)	(0.09)	(0.08)
High Education	2.15***	2.02***	2.00***	1.97***
	(0.14)	(0.13)	(0.15)	(0.14)
Female	0.61***	0.59***	0.55***	0.53***
	(0.03)	(0.03)	(0.03)	(0.03)
Married	1.07	1.01	1.03	0.94
	(0.06)	(0.06)	(0.06)	(0.05)
Child	0.96	0.94	0.93	0.84***
	(0.06)	(0.05)	(0.05)	(0.05)
Observations	240952	543699	861599	877202
Log-Likelihood	-5013.61	-7396.13	-8230.70	-9813.73
Pseudo R2	0.22	0.18	0.12	0.11

Notes: Table reports odds ratios for weighted logit regression on the probability to commute (sample excludes recent migrants), values in brackets are cluster robust standard errors, ***(**)(*) signify odds ratios significantly different from 1 at the 1% (5%) (10%) level, respectively. Base categories for dummy variables are 15-19 year old males with a completed compulsory education. Results for fixed effects of region of residence and sector of employment not reported.

Table 4: Multinomial logit regression results for the choice of commuting, migrating and staying for cross-border and internal commuters

	Cross-Border[1)]		Internal[2)]	
	Commute vs. Stay	Migrate vs. Stay	Commute vs. Stay	Migrate vs. Stay
	Coefficient	Coefficient	Coefficient	Coefficient
age 20-29 years	2.04***	1.97	1.34***	1.63**
	(0.35)	(1.46)	(0.11)	(0.40)
age 30-39 years	1.64***	1.05	1.24***	0.61*
	(0.29)	(0.80)	(0.10)	(0.16)
age 40-49 years	1.73***	0.26*	1.14	0.37***
	(0.31)	(0.20)	(0.09)	(0.10)
age 50-59 years	1.39*	0.31	1.03	0.16***
	(0.25)	(0.26)	(0.09)	(0.05)
age 60 or more years	1.39	0.02***	0.68***	0.11***
	(0.35)	(0.02)	(0.07)	(0.05)
Medium Education	1.42***	1.00	1.24***	1.37***
	(0.12)	(0.24)	(0.04)	(0.16)
High Education	1.59***	3.27***	1.90***	2.68***
	(0.15)	(0.78)	(0.06)	(0.31)
Female	0.56***	0.95	0.60***	0.75***
	(0.03)	(0.18)	(0.02)	(0.06)
Married	0.91	0.69	0.99	0.62***
	(0.06)	(0.18)	(0.03)	(0.06)
Child	0.95	0.62*	0.90***	1.16
	(0.07)	(0.16)	(0.03)	(0.12)
Observations	1041296		1027617	
Log-Likelihood	-6954.19		-33105.29	
Pseudo R2	0.35		0.13	

Notes: Table reports odds ratios for weighted multinomial logit regression on the probability to commute and migrate relative to the probability to stay, values in brackets are cluster robust standard errors, ***(**)(*) signify odds ratios significantly different from 1 at the 1% (5%) (10%) level, respectively. Base categories for dummy variables are 15-19 year old males with a completed compulsory education. 1) Results for fixed effects of country of residence and sector of employment not reported. 2) Results for fixed effects of region of residence and sector of employment not reported.

Table A1: Regression results for overall commuting by country

	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.
	Austria		Belgium		Bulgaria		Czech Rep.		Germany		Spain		Finland	
Age 20-29 years	2.12***	0.27	1.97***	0.31	1.16	0.47	1.32*	0.22	1.42***	0.13	2.75***	0.85	2.25***	0.70
Age 30-39 years	2.01***	0.27	2.04***	0.32	1.07	0.43	0.90	0.15	1.39***	0.13	1.93**	0.61	1.26	0.40
Age 40-49 years	1.81***	0.25	2.01***	0.32	1.12	0.45	0.63***	0.11	1.22	0.19	1.98**	0.64	1.70*	0.53
Age 50-59 years	1.81***	0.26	1.87***	0.30	0.87	0.35	0.58***	0.10	1.00	0.24	1.77	0.62	1.34	0.42
Age 60 or more years	1.22	0.38	1.06	0.19	0.58	0.26	0.61***	0.11	0.89	0.24	1.24	0.52	1.52	0.56
Medium Education	1.30***	0.10	1.20***	0.05	0.79**	0.08	0.96	0.07	1.72***	0.19	1.45***	0.18	1.34**	0.14
High Education	1.69***	0.12	2.14***	0.07	0.61***	0.08	2.30***	0.18	2.31***	0.28	2.17***	0.22	1.98***	0.15
Female	0.73***	0.03	0.66***	0.02	0.45***	0.04	0.57***	0.02	0.64***	0.04	0.53***	0.05	0.43***	0.05
Married	1.03	0.05	0.93	0.03	1.02	0.10	0.80***	0.03	0.99	0.07	0.83	0.11	0.63***	0.07
Child	0.74***	0.04	0.95***	0.04	1.02	0.09	0.88***	0.04	0.90	0.06	0.89	0.10	1.17	0.22
Observations	-586.20		-2015.11		-245.15		-880.88		-8091.71		-1930.41		-296.86	
Log-Likelihood	93823		47494		52349		112871		22429		41540		17668	
Pseudo R2	0.02		0.10		0.04		0.12		0.09		0.08		0.06	
	France		Hungary		Italy		Poland		Romania		Slovakia		UK	
Age 20-29 years	1.14***	0.06	1.09	0.16	1.49**	0.23	1.36	0.41	0.72*	0.14	0.70***	0.09	1.22**	0.10
Age 30-39 years	1.13***	0.06	0.76*	0.11	1.06	0.17	1.14	0.35	0.61**	0.12	0.39***	0.05	1.25**	0.10
Age 40-49 years	1.09*	0.05	0.62***	0.09	0.86	0.14	0.94	0.29	0.57***	0.11	0.31***	0.04	1.03	0.10
Age 50-59 years	1.19	0.17	0.52***	0.08	0.65***	0.10	0.71	0.22	0.31***	0.06	0.28***	0.04	0.91	0.09
Age 60 or more years	0.64	0.22	0.52***	0.10	0.65**	0.12	0.71	0.26	0.05***	0.03	0.20***	0.04	0.55***	0.07
Medium Education	1.15**	0.08	0.86***	0.04	1.31***	0.05	1.19	0.15	0.38***	0.04	0.83**	0.07	1.30***	0.06
High Education	1.46***	0.12	1.42***	0.08	2.56***	0.12	1.91***	0.26	0.30***	0.04	1.17**	0.0.8	2.06***	0.11
Female	0.66	0.04	0.51***	0.02	0.48***	0.02	0.40***	0.03	0.41***	0.03	0.62***	0.02	0.60***	0.02
Married	0.96	0.07	0.81***	0.03	0.83***	0.04	1.15*	0.09	0.78***	0.06	0.52***	0.02	1.18***	0.05
Child	0.96	0.07	0.82***	0.03	0.82***	0.04	1.06	0.09	0.90	0.07	0.99	0.04	1.00***	0.04
Observations	-5862.60		-640.66		-2480.85		-1191.45		-401.57		-720.72		-7007.43	
Log-Likelihood	22229		113219		235107		78483		105560		45412		55505	
Pseudo R2	0.06		0.09		0.05		0.07		0.20		0.10		0.08	

Notes: Table reports odds ratios for weighted logit regression on the probability to commute relative to the probability to stay (sample excludes recent migrants), S.E.= cluster robust standard errors, ***(**)(*) signify odds ratios significantly different from 1 at the 1% (5%) (10%) level, respectively. Base categories for dummy variables are 15-19 year old males with a completed compulsory education. Results for fixed effects of region of residence and sector of employment not reported.