

The impact of non-cognitive skills and risk preference on rural-to-urban migration: Evidence from Ukraine

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Abstract

This paper provides evidence on the impacts of non-cognitive skills and attitudes towards risk on the decision to migrate from rural to urban areas. Our analysis is based on a unique four-wave panel of Ukrainian Longitudinal Monitoring Survey for the period between 2003 and 2012. We adopt the Five Factor Model of personality structure, which was elaborated in the personal psychology literature, and use it in the evaluation of non-cognitive skills. Our results suggest that such personality traits as openness to new experience and the willingness to take risks increase the probability of migration. On the other hand, the non-cognitive skills conscientiousness and extraversion are found to be negatively associated with the propensity to migrate. The effects are statistically and quantitatively significant, and mainly driven by movements from rural areas into cities. Our results are robust to several sensitivity checks, including tests for reverse causality.

JEL classifications: J61, D03, D81, R23.

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1 Introduction

A growing body of economics literature has been investigating the role of non-cognitive skills, often referred to soft skills or personality traits, in predicting micro-economic behavior. In this literature non-cognitive skills, besides cognitive abilities, are documented as important determinants of labor productivity, wages, occupational choices and job search behavior (see Kautz et al., 2014 for a summary). Conceivably, geographic mobility is among those life outcomes which non-cognitive skills might predict. Yet only little is known about the role of non-cognitive skills for individual migration decisions (e.g., Bütikofer and Peri, 2016). The current study contributes to this scarce literature by providing evidence on the impact of non-cognitive skills on the decision to migrate within a country.

Considering migration behavior within a resource allocation framework, people migrate to realize their labor market potentials as far as its benefits outweigh the costs. The costs of migration increase with greater uncertainty about other locations, particularly about the housing market, labor market and education opportunities. In this respect, risk attitudes have a high predicting power in explaining the migration decision as recently documented by Jaeger et al. (2010) and Bauernschuster et al. (2014). In an early study, Sjaastad (1962) asserts non-monetary costs as a key determinant in migration decision. These costs include the emotional burden of leaving the familiar surrounding behind, building up new social relations, adapting to a new social environment, and so on (Sjaastad, 1962). Following this line of thought, we argue that these so-called ‘psychic costs’ might be the channel through which non-cognitive skills¹ predict the migration propensity. Each person evaluates these costs subjectively, and hence the size of the costs depends on the individual’s characteristics in handling these costs. Certain non-cognitive skills such as openness to new experience may help people perceive these costs to be lower, while other skills may make people strongly attached

¹One may argue that non-cognitive skills comprise both personality traits and risk preference. To avoid conceptual confusion, in this text we use the term ‘non-cognitive skills’ only to indicate personality traits, particularly the big five factors.

to their communities and thus perceive the costs of leaving as higher.

Although we speculate the channel that the relationship between non-cognitive skills and migration probability is through the costs of migration, we do not ignore the role of expected returns in the decision to migrate. It is likely that people might expect to get higher returns to their non-cognitive skills in big urban centers and this expectation supports their motivation to change the place of residence. This paper highlights these channels to help our understanding of the reason why non-cognitive skills can predict migration behavior, without aiming a theoretical model in explaining them.

The focus of this study is rural-to-urban migration in Ukraine. The rural-to-urban migration is an especially important type of mobility in the developing country context, since it has a large potential to foster economic growth by reallocating labor force from the economically lagging-behind regions to the large urban centers, where returns to human capital are higher. For the empirical analysis, we use the four-wave-panel data of the Ukrainian Longitudinal Monitoring Survey (ULMS), launched in 2003. In addition to rich information on individual and labor market characteristics, the ULMS includes direct measures of attitudes towards risk in the survey years of 2007 and 2012 and a 24-item module on non-cognitive skills added in 2012. Using this skill module we assess non-cognitive skills based on the widely accepted ‘Big Five’ taxonomy in the personal psychology literature –openness, conscientiousness, extraversion, agreeableness, and neuroticism (Goldberg, 1990; John and Srivastava, 1999; Lang et al., 2011). We propose a mapping of the 24 items into the big five taxonomy, utilizing the facets of the big five domains characterized by John and Srivastava (1999).

Our results suggest that non-cognitive skills such as openness to new experience and willingness to take risks, which help reduce the perceived cost of migration, increase the probability of an individual migrating from rural to urban areas. On the other hand, our estimates show conscientiousness and extraversion to be negatively correlated with the propensity to migrate. The effects are mainly driven by movements from rural areas into cities. The marginal effects from the estimation of a probit

model indicate that one standard deviation increase in openness is associated with a 0.3 percentage point higher probability of moving into cities, controlling for individual characteristics, preferences and regional macro conditions. The effect is larger for conscientiousness, in that individuals who rate themselves as one standard deviation more conscientious have a 0.6 percentage point lower probability of moving into cities. As of risk preferences, the probability of rural-to-city migration is about 0.4 percentage points higher among relatively more risk-loving people. The magnitudes of the impacts are substantial considering the unconditional rural-to-city migration probability of about 1.5 percent. On the other hand, we find no consistent evidence supporting an association of neuroticism and agreeableness with the migration propensity.

Our results also indicate that a full model, which includes the big five factors and risk preferences together, fits the data substantially better than models including them separately. Moreover, we provide evidence that the estimated effects of personality and risk attitudes are not driven by reverse causality. To the best of our knowledge, this study is the first one that explores simultaneously the effects of the big five factors and risk preferences on migration decisions and, in addition, focuses on these effects in a developing country context. Our findings are in line with the findings from the psychology literature that indicate a strong impact of openness and conscientiousness on migration behavior, whilst either very little or no effect of extraversion. Our results are also consistent with the previous evidence by Jaeger et al. (2010) and Bauernschuster et al. (2014), showing that risk loving people are more likely to migrate.

The rest of the paper is organized as follows. In the following section, we provide some background information about migration patterns in Ukraine. Section 3 presents a brief summary of the pertinent literature on the link between non-cognitive skills and life outcomes. Section 4 introduces the data, variables used in the regression analysis, and the empirical specification. While Section 5 discusses the basic estimation results, Section 6 provides some extensions and robustness checks. Finally, Section 7 concludes.

2 Internal migration in Ukraine

In the last three decades, very little research has been done on internal labor mobility in Ukraine and many questions related to its different aspects remain unanswered. Most studies rely on the data coming from official statistics that are often criticized for being not accurate enough since they reflect only registered population moves. Below, to put our paper into context, we provide a brief overview of the major economic and demographic developments and of internal migration trends in Ukraine.

During the independence years Ukraine's population contracted by roughly 9 million people from 51,9 million in 1991 to 42,8 million in 2016 (State Statistics Service of Ukraine²). This enormous population drop may jointly be explained by a combination of three major factors: low fertility rates (1.5 children per woman³), high mortality levels (deficit of births over deaths reached 158711 persons in 2013) and international out-migration (Danzer and Dietz, 2014). Apparently, these demographic trends were nurtured by unfavorable economic conditions that led to overall impoverishment of the population. In the 1990s, the country experienced a period of hyperinflation and an enduring economic recession with real GDP falling by over 60%, resulting in high rates of poverty. Among especially affected population groups were families with children and the less educated as well as the rural population (Brück et al., 2010). Although the situation slightly improved in the period of moderate economic growth in the later years, economic shocks such as the global financial crisis and the Great Recession, which hit Ukraine in 2008-2009, and military conflict with Russia, which started with the Russian annexation of Crimea in 2014, led again to a sharp drop in the welfare of the population. The latter conflict resulted in a large number of internally displaced people.⁴ Problems caused by these internal movements, such as, for instance, labor market integration of newcomers and their access to housing market, pointed

²<http://www.ukrstat.gov.ua/>, retrieved on 25 January 2017.

³Fertility rate for 2013 according to the State Statistics Service of Ukraine. The fertility rate is traditionally lower in urban (1.365) than in rural areas (1.825).

⁴According to the Ministry of Social Policy of Ukraine, by August 2016, there were 1.8 million internally displaced people registered in the country.

to the multiple institutional shortcomings and obstacles that greatly discourage internal mobility in Ukraine. Although it is generally acknowledged that open and free labor markets are among important determinants of economic welfare, no consequential promotion of efficient labor resource allocation through optimization of internal migration took place in Ukraine in the last three decades. Currently, Ukrainians encounter a number of barriers to internal mobility including a complicated population registry system, weak formal labor market institutions, underdevelopment of housing and credit markets, non-portability of social benefits and wide-spread skills mismatch⁵ (Koettl et al., 2014). As a result, the population of Ukraine is considerably less geographically mobile than one would expect given the high economic disparities across regions and between rural and urban areas.

From a regional perspective, Ukraine is characterized by relatively low incomes in the predominantly agricultural oblasts (regional districts) in the West and higher incomes in the industrialized and more urbanized oblasts in the East (Mykhnenko and Swain, 2010). However, as is typical for post-Soviet countries marked by high levels of centralization, the largest differences in earnings persist between the capital city and the rest of the country. According to official statistics, the capital city of Ukraine, Kyiv, accounted for 22.5% of total GDP in 2014. This share grew substantially since 1996, when it made up only 7.4%. Not surprisingly, Kyiv is the largest magnet for internal labor migrants in the country. At the same time, scholars acknowledge, that internal migration in Ukraine is not always directed from economically lagging to better developed industrial regions but happens mostly within the same region (rural-urban migration) or between neighboring regions with similar levels of socioeconomic development (Koettl et al., 2014, Kupets, 2014).

The share of the urban population in Ukraine has been slowly growing in the last decades: it increased from 66.9% in 1989 to 69.2% in 2016. This process is

⁵Lack of appropriate skills in rural areas is one of the factors that hinder internal migration, which otherwise would be an expected response to spatial earnings differentials. Some agriculture-dominated regions employ low-skilled workers that cannot easily become qualified for employment in high-wage industrial sectors in other regions.

driven by internal movements of mostly young people from rural areas to the cities in search of better economic opportunities. In general, rural areas in Ukraine provide a much poorer standard of living, worse quality of facilities and infrastructure and fewer opportunities for skills acquisition and employment as compared to large urban centers. Hence, economic disparities between rural and urban settlements encourage many people to engage in one of two popular types of internal mobility: permanent movements from rural areas to larger urban centers or commuting⁶ between the (rural) place of residence and the (urban) location of work.

3 Embedding our study into the literature on non-cognitive skills and life outcomes

Economic research analyzing the impact of non-cognitive skills on life outcomes has rapidly expanded since the 2008 special issue of *Journal of Human Resources* edited by Weel (2008). In this special issue, Borghans et al. (2008a) link the evidence from the psychology of personality traits to economics. They focus on several areas where progress has been made but also address a number of issues that need further research. In another study by Borghans et al. (2008b) in the same issue the focus is on the relationship between interpersonal styles (caring and directness) and labor market outcomes. Cunha and Heckman (2008) have contributed to this growing literature through a theoretical model formulating the technology of cognitive and non-cognitive skill formation and the contribution of family investment to this formation in early versus older childhood. They further elaborate the identification and estimation of the technology of skill formation in a follow up study (Cunha et al., 2010). Kautz et al. (2014) present a summary of evidence from the economics literature on the predictive power of non-cognitive skills for a wide range of life outcomes, including educational achievement, labor market outcomes, health, and criminality.

⁶The total number of commuters reached 2.6 million individuals in 2010, which is 13.2% of the total number of employed persons.

In contrast, much less is known about the impact of non-cognitive skills on migration behavior which constitutes the purpose of the current study. To the best of our knowledge, there is only one economic paper on the impact of non-cognitive skills on the decision to migrate. Bütikofer and Peri (2016) investigate the importance of cognitive and non-cognitive skills on the probability of migrating out of one's region of origin for the male population in Norway. Focusing on the two aspects of non-cognitive skills, namely 'adaptability' and 'sociability', they find that adaptability has a particularly strong impact on migration for individuals with low cognitive skills. This finding is interpreted as the evidence that adaptability skills reduce the non-monetary costs of migration.

In contrast to the scarce evidence on non-cognitive skills and migration in economic research, it has been relatively extensively studied in the psychology literature. Those studies generally rely on the Big Five factor model. In their study using a sample of Finnish twins, Silventoinen et al. (2008) find extraversion and neuroticism positively correlated with the migration propensity to neighboring Sweden. In another study using Finnish subjects, Jokela et al. (2008) point to sociability as an important determinant of internal rural-to-urban migration. On the other hand, some evidence from the U.S. suggests that high openness and low agreeableness increase the propensity to migrate within- and between-states, while extraversion can only predict within-state migration (Jokela, 2009). Focusing on two facets of the Big Five, Canache et al. (2013) find only a modest positive influence of openness and extraversion on the intention to emigrate from Latin American countries. While for openness the greatest effect is seen among relatively well-educated respondents, for extraversion it is rather a compensating effect in that low-educated respondents are less likely to intend to emigrate, but the education gap shrinks as extraversion rises. Another study, examining the impact of the Big Five factors on the intention to emigrate and using a Lithuanian student sample, finds no evidence for extraversion to have predictive power. The results of Paulauskaite et al. (2010) suggest conscientiousness and openness the only two traits to be linked with migratory intentions.

Following the psychology literature we rely on a Big Five factor model for the analysis of the impact of non-cognitive skills on rural-to-urban migration. The focus of our study is not limited to this, since we analyze the impact of non-cognitive skills together with the attitudes towards risk on migration behavior. Our study has largely benefited from Jaeger et al. (2010) who provide direct evidence on risk attitudes and internal migration. Using data from the German Socio-Economic panel they find that individuals who are more willing to take risks are more likely to migrate between labor markets in Germany. Non-monetary costs due to general uncertainty (imperfect information) about other locations are considered to be the channel through which risk attitudes determine intra-country mobility. A more recent study by Bauernschuster et al. (2014) using the same data source focuses on internal migration in order to explore the reason why more educated and risk-friendly persons move more easily over longer distances. Their findings suggest less sensitivity among those people to the cultural costs of migration proxied by linguistic variation within Germany, while costs related to geographical distance do not play a role in explaining the higher mobility of higher educated and risk-loving persons.

Inspired by Jaeger et al. (2010) we consider the ability to bear the non-monetary costs as the main motive why non-cognitive skills might be important for the migration decision. Apart from the mobility costs due to market imperfections or the time and effort spent to search for and get familiar with a new job, there are other non-monetary considerations involved in migration such as the emotional burden of leaving familiar surroundings, family and friends, and adapting to a different cultural environment. These so-called "psychic" costs might increase the costs of moving perceived by individuals (Sjaastad, 1962; Bauernschuster et al., 2014). Unlike travel costs it is not possible to quantify the magnitude of these costs, which is subject to a subjective evaluation by each person. Assessment of these costs may be quite different even among persons with very similar demographic and socio-economic characteristics. We argue that how individuals perceive these costs might be related to personality characteristics. Here, we pursue the question what types of non-cognitive skills might make

individuals perceive a lower (higher) cost and thus generate more (less) willingness to migrate.

As documented by Jaeger et al. (2010) and Bauernschuster et al. (2014), because risk lovers are more able to deal with uncertainties connected to moving to a new place, the obvious expectation would be to find a positive relationship between the willingness to take risk and migration propensity. For non-cognitive skills the relationship is not such self-evident given the ambiguity of the previous evidence from the psychology research. Arguably, we may anticipate that skills that reduce the cost of mobility would increase the probability of migration. For instance, openness to experience is expected to help adapt to a new environment and a different culture, and hence decrease the psychic costs of migration and increase the probability of moving. On the other hand, a skill such as conscientiousness described by the tendency to be organized, responsible, and hard-working as well as by a high valuation of persistence and predictability is expected to be negatively associated with the decision to migrate (John and Srivastava, 1999; Kautz et al., 2014). Moving to another place per se contains unpredictability (uncertainties) and inconsistency as it opens a new episode in life. Therefore, conscientious people might perceive moving as relatively costly.

It is not straightforward to anticipate the direction of the relationship for every trait. For extraversion the first effect that comes to mind is to increase the migration propensity, because extraverted people have better communication abilities which would help them easily adapt to a new environment and perceive a lower (psychic) cost. On the other hand, gregariousness is a typical characteristic of rural societies. It is reasonable to argue that social people feel more attached to their own communities as well as more able to increase their well-being in their villages given that kinship plays a key role in every sphere of life including the professional life. In this respect, for extraverted people it might be more costly to leave their familiar surroundings behind. Consistent with this argument, it is documented in the psychology literature that positive emotionality and high level of activity typically possessed by extraverted people enable them to be better-off in their present places and to be satisfied with their cur-

rent lives (John and Srivastava, 1999; Jokela, 2009; Paulauskaite et al., 2010). Taken together, these facets of extraversion might counterbalance the stimulating effect of extraversion on the migration decision.

Countervailing effects might also arise for agreeableness and neuroticism. More agreeable individuals can more easily conform to different norms of a new environment so that the cost of adaptation would be lower for them. However, those people are also likely to be pleasant and satisfied with their existing lives and have a stronger emotional attachment to their own communities (Jokela, 2009). The latter facet would make them less willing to leave their current place. Similarly, some facets of neuroticism (emotional instability) such as proneness to anxiety and fear, low self-esteem, and vulnerability to stress are expected to make individuals less able to start over a life in a new place. Meanwhile, some other facets of neuroticism such as pessimism, hostility, and irritability might bring about a lower level of satisfaction with their current jobs, neighborhoods or lives as a whole, which would instigate the decision to migrate (Jokela, 2009). Our regression analysis sheds light on the facets of the big five factors that dominate in our data regarding the decision to migrate.

4 Data and empirical method

4.1 Data

For the estimation of the impacts of non-cognitive skills and preferences on the rural-to-urban migration decision we make use of panel data from the Ukrainian Longitudinal Monitoring Survey (ULMS). The panel survey launched in 2003 was also carried out in 2004, 2007 and 2012. The ULMS is the first attempt to create a panel data set for Ukraine and is representative at the national level (see Lehmann et al., 2012). The ULMS interviews with individuals of the ages between 15 and 72, who make up our sample of analysis. The survey contains an individual questionnaire soliciting information on socio-demographic and labor force characteristics, labor market status,

skills, preferences and attitudes, as well as a household questionnaire on the structure of household, housing conditions, income, assets and expenditures. It is arguably the richest panel data set regarding labor market issues in the transition region.

For the outcome variable of interest, namely rural-to-urban migration, we exploit the survey question related to the “type of settlement of the current place of residence” which is asked in all four waves of the panel survey. Possible answer categories include six types of settlement: village, rural-type settlement, small town (population up to 20 thousands), medium town (population of 20-99 thousands), city (population of 100-499 thousands) and large city (population more than 500 thousands). While we consider villages and rural-type settlements as belong to a ‘rural’ area, towns (small- and medium-size) and cities (medium- and large-size) are categorized as an ‘urban’ area. The dependent variable thus comprises a binary indicator which takes a value of 1 if the respondent changes the type of settlement from a rural area to an urban area between two survey periods and a value of 0 if the respondent resides in a rural area both in the current and last survey period.⁷

Another important feature of the ULMS is its collection of information on non-cognitive skills and risk preferences. In the latest wave of 2012 a set of questions on non-cognitive skills was added to the survey. The questions, based on the World Bank’s 24-item STEP survey questions regarding non-cognitive skills, asks respondents how they perceive themselves. Specifically, respondents are asked their perception of themselves, for instance, whether they are talkative, are interested in learning new things, tend to worry, and so on. Responses are ranked on a 4-point scale: “1 Almost always”, “2 Most of the time”, “3 Some of the time” and “4 Almost never”. In the assessment of non-cognitive skills, we map these 24 items into the Big Five Factor model –openness, conscientiousness, extraversion, agreeableness, and neuroticism. The

⁷A potential concern is measurement error in the dependent variable due to ‘round-tripping’. Given that there are up to 5-year brackets between two survey periods, it is possible to experience multiple movements within such a relatively long period. Therefore, our dependent variable could underestimate the rural-to-urban migration if movers migrate back to the rural area between two survey periods. A preliminary check performed by us, however, shows that ‘round-tripping’ seems to be very limited.

Big Five personality constructs represent a widely accepted, comprehensive, and ample frame for delineating the structure of core personality traits over adulthood (Lang et al., 2011: 550). Given its universal structure validated by numerous empirical studies from different cultures as well as its rank order stability over the life cycle, the Big Five Factor model is preferred to the usage of single traits such as self-efficacy or self-esteem (Goldberg, 1990; John and Srivastava, 1999; Lang et al., 2011).

Our mapping into the big five factor model largely benefits from the domains characterized by John and Srivastava (1999) and Kautz et al. (2014). Table 1 presents the original table of the 24 items and the corresponding big five factors into which these items are mapped. For the regression analysis the scale of some items –those denoted by ‘*’– is reversed in a way that a higher ranking would refer to a higher value for the corresponding characteristic (1=Almost never – 4=Almost always). Furthermore, each of the big five factor is the standardized average of the corresponding items (with a mean of zero and standard deviation of 1). Because the information on non-cognitive skills is only available in the survey year of 2012, we treat the big five personality constructs as fixed over the sample period. Whether this assumption distorts the results is taken up in section 6.

The ULMS introduced a module on preferences in 2007 and 2012, identical to the module in the German Socio-Economic Panel (SOEP), which asks respondents about their willingness to take risks.⁸ The general risk question asks: “How do you see yourself: are you generally a person who is willing to take risks or do you try to avoid taking risks?” The answer can be on an 11-point scale, from 0 “completely unwilling to take risks” to 10 “completely willing to take risks”. The regression analyses mainly rely on dichotomous variables to measure the willingness to take risks, which mitigates potential problems from different use of scales, as explained by Jaeger et al. (2010). The risk preference indicator takes the value of 1 if the respondent chooses a value of 6 or higher on the scale.

⁸Risk questions were asked in general but also in life-specific domains. In our empirical analysis we only use the general risk measure as covariate.

Similar to the big five measures, we treat preferences –partly– fixed over the sample period. In particular, we assign the values of risk preferences measured in 2007 to the previous survey years of 2003 and 2004.⁹ We analyze the potential problem of reverse causality through robustness checks in section 6.

4.2 Descriptive statistics

Table 2 presents summary statistics of the variables used in the regression analysis for rural-to-urban movers, rural stayers, and the urban sample. The former two compose our analysis sample. As the 2012 survey is the only year with complete information on both non-cognitive skills and preferences, the statistics reported in Table 2 are for 2012. However, we also present summary statistics of other years for the available variables in Table A.1. in the appendix.¹⁰

The urban sample is composed of those who were born and currently reside in urban areas as well as those who moved into urban areas. Table 2 demonstrates that the urban sample is significantly younger than the rural sample. Furthermore, about 70% of the urban sample prefer to communicate in Russian; these respondents are likely to be concentrated in the center and east of the country. In line with expectations, the education level and employment rate among the urban sample is higher than among rural stayers. Consistent with these patterns, compared to rural stayers, the movers into urban areas are much younger, relatively more educated, more likely to be married but have less children, more likely to be employed and less likely to prefer Ukrainian for communication.

Table 2 also shows the average values of the big five factors (on a 4-point scale)

⁹In fact, we allow for variation in preferences between 2007 and 2012. However, if a respondent is not surveyed in 2007 but in 2012, then we assign the risk value of 2012 to the years of 2003 and 2004. In this case, the preferences would totally be treated as fixed over the sample period.

¹⁰Table 2 shows those rural-to urban movers who moved between 2007 and 2012, the period encompassing the Great Recession. If we compare this table with Table A.1. in the appendix, we see that between 2007 and 2012 the number of moves was particularly small compared to the periods between 2003 and 2004 and between 2004 and 2007. This lower number could be related to less mobility in times of economic crisis but it could also point to the problem of ‘round-tripping’. While we are not able to really disentangle these two potential causes our preliminary check of ‘round-tripping’ mentioned in footnote 7 makes us, however, lean towards the first explanation.

separately for movers and stayers. We see a positive and statistically significant difference in the average value of openness and agreeableness for movers relative to stayers. As for conscientiousness and neuroticism movers score, on average, lower than stayers. The negative difference for each of these two skills is also statistically significant. However, as far as extraversion is concerned, the difference between movers and stayers is not statistically significant. Next, we present how attitudes towards risk are distributed between rural-to-urban movers versus stayers. As shown in Table 2, 23% of movers score their risk attitudes 6 or higher on an 11-point scale, which is about 5 percentage points higher than rural stayers. Risk preferences are relatively lower scored among movers compared to stayers in 2007. The difference between the two survey years are mainly driven by movers who scored significantly lower in 2007 than 2012. The difference is more apparent for the index measure, thus we rely in our analysis on the dichotomous indicator variables as they can better mitigate the potential measurement error problem. A relevant concern can also be reverse causality, in that the migration experience might have led to an increase in the risk preferences. We discuss this potential endogeneity problem due to the reverse causality in section 6 where we perform robustness checks of our estimation results that address this issue.

As a final descriptive exercise, we examine the distribution of the responses to the general risk questions for the rural and urban samples in 2007 and 2012. As shown in Figure 1, the average of the risk index is higher in the urban than in the rural sample in both survey years. While the largest difference between the rural and urban is among the most risk-averse group in 2007, we do not see such a remarkable difference in 2012. More specifically, in 2007 one out of four rural residents are completely unwilling to take risk in general, whereas about 18% of the urban residents are represented in this group.

4.3 Empirical specification

To investigate the impact of non-cognitive skills and preferences on the probability of migration, we estimate the following basic specification of a probit model:

$$Y_{i,t} = \alpha + N_i' \beta + \gamma P_{i,t} + X_{i,t-1}' \nu + \epsilon_{i,t} \quad (1)$$

where $Y_{i,t}$ indicates a dummy variable which takes the value of 1 if the respondent i resides in the urban area during the reference week of survey period t , but was residing in a rural area during the reference week of the previous survey period, at time $t - 1$. It takes the value of 0 if the respondent's current and last settlements are both in the rural area. N_i is a vector of non-cognitive skills represented by the big five which are standardized to have a mean of 0 and standard deviation equal to 1. Because we observe responses to non-cognitive skill questions only in 2012, we assume them as time-invariant characteristics of the individual. In section 6 we perform robustness checks that show that this is a reasonable assumption. The variable $P_{i,t}$ is the risk indicator which takes the value of 1 for values greater than 5 (on a scale of 0-10). The risk measure is observed in 2007 and 2012 surveys. Thus, we assign the values of risk preferences measured in 2007 to the previous survey years of 2003 and 2004 (see footnote 9). In the most extant basic specification, $X_{i,t-1}$ is a vector of individual characteristics including dummy variables for female, married, employed, educational attainment and Ukrainian as the preferred language of the interview, as well as continuous variables including age, age squared, the number of children in the household and the log of household income. For the time-varying covariates we rely on information from the previous survey year in order to rule out reverse causality problem, i.e., the covariates are measured at time $t - 1$, before migration happens. Finally, $\epsilon_{i,t}$ is a mean zero error term.

The estimated coefficients of β capture the impact of non-cognitive skills on the propensity to move from rural to urban areas, holding risk attitudes and other individual characteristics constant. A concern would be that measurements of non-cognitive

skills might be correlated with risk preferences, and this could yield biased coefficient estimates on the non-cognitive skills covariates. For instance, if those who have a higher score of conscientiousness are more risk averse, then the impact of the conscientiousness might be overestimated by controlling for risk attitudes. We therefore include them separately as well as together in specifications in order to provide bounds on the potential bias (Bütikofer and Peri, 2016:16).

5 Basic results

Table 3 presents marginal effects of a probit model that estimates the probability to migrate from rural to urban areas. Because of substantial differences in the institutional and economic structures of cities and towns –although we classify both as urban–, the decision to move into a city may require distinctive personality characteristics than moving into a town. Therefore, we break down results by rural-to-city and rural-to-town migration, presented in Table 3 in columns (4)-(6) and columns (7)-(9), respectively. Table 3 displays results for different sets of control variables. While in columns (1), (4) and (7) we do not control for any demographic and socio-economic characteristics but only the Big Five, columns (2), (5) and (8) also include pre-determined (demographic) characteristics such as sex, age, age squared and Ukrainian language¹¹ as covariates, and columns (3), (6) and (9) additionally include socio-economic controls that may be jointly determined with the migration decision, including marital status, number of kids, type of educational attainment and employment status.

In all nine specifications we find statistically significant evidence that conscientiousness is negatively related to rural-to-urban migration. For instance, in column (2) where we only control for the pre-determined characteristics, we estimate that one standard deviation increase in conscientiousness is associated with a 0.8 percentage

¹¹We consider the pre-determined characteristics exogenous, bearing in mind that the language may determine an individual’s initial place of residence. On the other hand, we take language chosen for the interview as a good proxy of ethnicity, a characteristic certainly exogeneous to the migration decision.

point lower probability of moving from rural to urban areas. Breaking the results down, this corresponds to a 0.5- and 0.2- percentage point lower probability of rural-to-city migration and rural-to-town migration, respectively (columns 5 and 8). The estimated effects are substantial given the unconditional migration probability of 3 percent from rural-to-urban and of about 1.5 percent from both rural-to-city and rural-to-town. We also find that individuals who rate themselves as (one standard deviation) more open to new experiences have a 0.4 percentage point higher probability of moving from rural-to-urban. A similar coefficient size of agreeableness, however, is linked to a 0.5 percentage point decrease in the probability of moving into an urban area. The effect of agreeableness on the rural-to-urban migration is mostly attributable to the decision to moving into towns. We also estimate a negative impact of extraversion on the migration behavior, which is salient only for the rural-to-city migration. On the other hand, neuroticism is found uncorrelated with any type of migration.

As for demographic and socio-economic characteristics, the inclusion of them as control variables substantially reduces the size of the marginal effects of personality traits. For some traits, such as openness, the effect becomes statistically insignificant when both demographic and socio-economic characteristics are included in the model (e.g., columns 3, 6, 9). On the other hand, the signs of the marginal effects of the controls are generally in line with the theory. The older individuals the less likely they migrate and the effect has the expected concave shape. Net household income, education level and the Ukrainian language are the variables which have the highest and most consistent explanatory power. The probability of rural-to-urban migration is approximately 3 percentage point lower among those who prefer to communicate in Ukrainian rather than Russian (Table 3; columns 2-3). As for moving into the city or town, the effect is smaller, yet strongly significant. The probability of migration increases with the education level, and it is the highest among university graduates (Table 3; columns 3, 6, 9). The impact of household income is also positive: members of financially better-off families are more likely, arguably more able to migrate into cities. On the other hand, gender, marital status and having a child do not predict the

migration propensity, and neither does the employment status in many specifications.

Table 4 extends the model presented in Table 3 by including the risk preference measure as a covariate. The inclusion of the risk variable in the analysis does not bring about a substantial change in the impact of personality traits. This suggests that the Big Five traits, and risk preferences represent distinctive features of personality and they operate as complements in determining the propensity to migrate. In particular, the marginal effects of the big five reported in Table 4 are quantitatively similar to those in Table 3, where we do not control for preferences.

In line with the previous literature, we find that individuals who are relatively more willing to take risks are more likely to migrate. This effect is however present only for rural-to-city migration (Table 4, columns 4-6). The probability of moving into cities is almost half a percentage point higher for relatively more risk-loving people, controlling for demographic and socio-economic characteristics. We find a negative association between risk willingness and rural-to-town migration. This might be an indication that the differences in institutional and economic structures between rural areas and towns cannot be well defined, whereas such differences between rural areas and cities are clear cut.

We furthermore include the unemployment rate and the log of GDP both at the *oblast* level, in order to control for local macroeconomic and labor market conditions that may be relevant for migration decision¹². To capture the systematic differences across regions, we additionally control for oblast fixed effects. Table 5 presents the impact of the big five together with risk preferences conditioning on pre-determined (demographic) characteristics. Columns (1), (4) and (7) present baseline results without any regional controls, while the other columns additionally include either the unemployment rate or the log of GDP at the oblast level. A comparison with the baseline results makes it clear that the inclusion of either of the macro indicators does

¹²There are 24 Oblasts in Ukraine, forming the largest administrative units. Oblasts are larger than, e.g., counties in the U.S. but smaller than, e.g., lands in Germany. The macro-economic measures introduced in Table 7 are hence only rough proxies for local macro-economic and labor market conditions. Since most migration is, however, intra-oblast migration, we can suppose that macro-economic conditions in the oblast are push factors regarding internal migration in Ukraine.

not change the coefficient estimates on non-cognitive skills. This suggests the orthogonality of the regional controls to the big five and preferences. So, attitudes towards risk and a subset of the big five, namely openness, conscientiousness and extraversion do predict internal migration behavior. However, these ‘soft-skills’ are only relevant for the decision of rural-to-city migration (columns 4-6). Table 5 also demonstrates that the regional unemployment rate is positively associated with the decision to migrate, whereas regional GDP is negatively and more strongly correlated with the migration propensity. As previously suggested, the adverse macro-economic conditions at the oblast level play a role as push factors in the migration decision. Macro economic conditions, however, do not affect the rural-to-town migration. In line with the finding discussed above, this evidence suggests an ambiguity in economic and institutional differences between towns and rural areas. The skills affecting the decision to move into cities are likely to have higher returns in big urban areas, whereas those skills seem not to pay off in towns where the economic structuring is not so different from the rural areas. Similarly, the skills helping perceive a lower cost of mobility urge the people move into cities, while they do not play such a role in the rural-to-town migration.

Finally, we investigate whether non-cognitive skills and preferences contribute together to the explanation of the migration behavior by providing two goodness-of-fit measures, the Akaike’s information criterion (AIC) and the Bayesian information criterion (BIC). Given two models fit on the same data, the model with the smaller value of the information criterion is considered to be better¹³. Each row in Table 6 shows, besides the pre-determined characteristics (i.e., age, age squared, gender and language), which of the two sets of regressors –Big Five measures, risk measures– are separately or together included in the regression analysis. The explanatory power is

¹³The AIC and the BIC are two measures for comparing maximum likelihood models. AIC and BIC are defined as:

$$\text{AIC} = -2 \cdot \ln(\text{likelihood}) + 2 \cdot k$$

$$\text{BIC} = -2 \cdot \ln(\text{likelihood}) + \ln(N) \cdot k$$

where

k = number of parameters estimated

N = number of observations.

considerably larger, namely the AIC (BIC) is smaller, when adding the Big Five or the risk variable to the estimation. The Big Five has a larger explanatory power, improving the goodness-of-fit measures more than the risk variable. Consistent with this finding, as shown in appendix Table A.2., the adjusted R-squares obtained from the OLS estimation are considerably larger in models where the Big Five is included compared to the models controlling only for the risk variable. More importantly, the explanatory power is maximized (AIC is the smallest) when the two concepts are included in the regression together. This finding is consistent with the evidence by Becker et al. (2012) who show the low correlations between the big five and preferences and their complementarity in explaining life outcomes in Germany.

6 Extensions and robustness checks

A potential concern is that most of the moves observed in the data occur before the risk preferences were first measured in the 2007 wave and that our results might possibly be subject to a reverse causality problem. As stated by Jaeger et al. (2010), successful migration could make individuals apt to rate themselves as more risk lovers, which would yield an upward bias in the risk estimates from the regression of rural-to-city migration. To check the relevance of this concern, following Jaeger et al. (2010)'s method, we estimate similar models from Table 4, using as the dependent variable a binary indicator for those who migrated from the rural to urban areas between 2007 and 2012, and regressing it on risk indicators measured in 2007. We compare these results with coefficient estimates from a regression where the dependent variable is an indicator for those who ever migrated between 2003 and 2007, considering the same preference variable that is again measured in 2007. The results of the rural-to-city are particularly illuminating and shown in columns 4-6 in Table 7. When the dependent variable is the probability of migration between 2007 and 2012, i.e. after the risk attitude has been revealed, the marginal effect of the risk indicator is significant in all specifications while this significance is not given when the dependent variable is

the probability of migration between 2003 and 2007, i.e. before the risk attitude has been revealed. That the impact of risk attitudes is only important when we focus on migrations that occurred after the risk questions were asked mitigates our worries about reverse causality.

As a further and more direct check of reverse causality, exploiting the panel feature of the ULMS, we construct a variable for the change in risk indexes between 2007 and 2012. This change-in-risk variable is regressed on the migration indicator (for moves between 2007 and 2012). Similarly, in a separate regression, we use as a dependent variable the risk index in 2012, and look at the impact of rural-to-city migration (between 2007 and 2012), conditioning on the risk index measured in 2007 –before the move occurred. The results are provided in Table 8. The statistically insignificant coefficient estimates in the table reveal that the rural-to-city migration between 2007 and 2012 do neither affect the observed change in the risk index over the period nor the level of risk attitudes in 2012 once we control for the risk index in 2007. We therefore conclude that reverse causality does not bias our results concerning the impact of risk attitudes on migration.

We also assume the stability of the big five personality traits over the panel period. Reverse causality could also be a concern for these skills, despite the sound evidence in the personal psychology literature regarding rank order stability over time and relatively little malleability of these skills after adolescence (Lang et al., 2011). However, we cannot internally check the validity of our assumption given the lack of repeated information on personality traits in the ULMS, in contrast to the risk measure. We instead implement a different approach to validate our results following Groves (2005) and Heineck and Anger (2010). We predict residuals from the regression of big five factors on age and age squared and estimate the impact of these predicted residuals on the migration behavior. The idea behind this approach is to net out the age effect on non-cognitive skills, so that the estimated impact is a time-invariant (age-free) component of personality. Table 9 shows very similar results to our basic specification in Table 3; so, after we have 'de-aged' our measures of non-cognitive skills, openness,

conscientiousness and extraversion remain important predictors of rural-to-city migration. Hence our initial assumption of the time-invariance taken from the psychology literature, seems to hold with our data.

7 Conclusion

Using the rich panel data set of the Ukrainian Longitudinal Monitoring Survey we analyze the link between non-cognitive skills and risk preferences and rural-to-urban migration in Ukraine. To this purpose we map 24 facets of non-cognitive skills into the Big Five personality traits, i.e., openness to new experiences, conscientiousness, extraversion, agreeableness and neuroticism. We estimate probit models with the Big Five personality traits as covariates and investigate whether some of the Big Five personality traits have predictive power. We also analyze the importance of attitudes towards risk in general for internal migration behavior.

Our results show that three of the Big Five, namely openness to new experiences, conscientiousness and extraversion, as well as attitudes towards risk in general are consistently correlated with rural-to-urban migration. These results are driven by rural-to-city migration, whilst moving from a rural area to a town is not consistently correlated with the mentioned subset of the Big Five personality traits and with risk attitudes. The estimated effect of a one standard deviation increase in a personality trait that has some predictive power changes the probability of moving from a rural area to a city by between 0.3 and 0.5 percentage points. The size of the effects are substantial in that the unconditional rural-to-city migration probability amounts to 1.5 percent. We also show that personality traits and risk preferences are complementary in explaining rural-to-urban migration.

Finally, reverse causality tests demonstrate that we can interpret our results as being causal as far as risk attitudes are concerned, i.e., risk preferences are determinants of internal migration in Ukraine, whilst internal migration does not seem to influence these preferences. We also perform a robustness check for non-cognitive skills that

demonstrates that the assumption of the time-invariant nature of these skills is reasonable. In the final analysis it is at any rate striking that non-cognitive skills are very consistent predictors of rural-to-city migration.

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Figures and Tables

Figure 1: General risk index in urban and rural areas, in 2007 and 2012

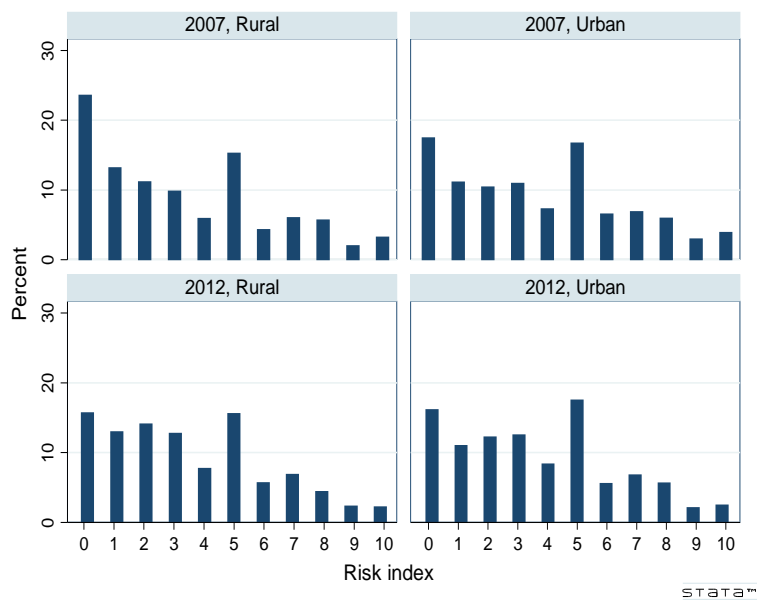


Table 1: Mapping 24 items into big five

<i>How do you see yourself?</i>	
3 Do you come up with ideas other people haven't thought of before? 11 Are you very interested in learning new things? 14 Do you enjoy beautiful things, like nature, art and music?	Openness
2 When doing a task, are you very careful? 6 Do you finish whatever you begin? 8 Do you work very hard? For example, do you keep working when others stop to take a break? 12* Do you prefer relaxation more than hard work? 13 Do you enjoy working on things that take a very long time (at least several months) to complete? 17 Do you work very well and quickly? 21 Do you think carefully before you make an important decision?	Conscientiousness
1 Are you talkative? 4* Do you like to keep your opinions to yourself prefer to keep quiet when you have an opinion? 20 Are you outgoing and sociable, for example, do you make friends very easily?	Extraversion
9 Do you forgive other people easily? 16 Are you very polite to other people? 19 Are you generous to other people with your time or money? 23 Do you ask for help when you don't understand something?	Agreeableness
5* Are you relaxed during stressful situations? 7 Do people take advantage of you? 10 Do you tend to worry? 15* Do you think about how the things you do will affect you in the future? 18 Do you get nervous easily? 22 Are people mean/not nice to you? 24* Do you think about how the things you do will affect other?	Neuroticism

Table 2: Summary statistics (2012)

	Urban			Rural stayers			Movers into urban		
	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.
Age	3644	42.84	16.13	2309	47.31	14.98	48	32.44	13.00
Female	3644	0.56	0.50	2309	0.59	0.49	48	0.58	0.50
Ukrainian language	3644	0.30	0.46	2309	0.68	0.47	48	0.42	0.50
Married	3643	0.62	0.48	2309	0.66	0.47	48	0.77	0.42
No. kids	3640	1.23	0.95	2309	1.66	1.05	48	0.88	0.87
Education level	3637	3.03	0.88	2306	2.77	0.86	48	3.23	0.93
Employed	3644	0.51	0.50	2309	0.45	0.50	48	0.71	0.46
Household income	3644	4894.72	3484.40	2309	3647.29	2497.23	48	4198.10	2212.40
Risk indicator	3527	0.22	0.42	2270	0.18	0.39	48	0.23	0.42
Risk index	3527	3.62	2.71	2270	3.20	2.64	48	3.75	2.61
Openness	3643	3.05	0.54	2308	3.01	0.57	48	3.19	0.52
Conscientiousness	3643	2.87	0.47	2308	2.99	0.44	48	2.94	0.48
Extraversion	3643	2.63	0.62	2308	2.65	0.60	48	2.66	0.61
Agreeableness	3641	2.85	0.52	2303	2.96	0.49	48	3.05	0.52
Neuroticism	3643	2.09	0.41	2308	2.10	0.40	48	2.02	0.41

Source: Authors' tabulations from the 2012 panel of the ULMS.

Table 3: Effects of the big five on internal migration

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	rural-urban	rural-urban	rural-urban	rural-city	rural-city	rural-city	rural-town	rural-town	rural-town
Openness	0.008*** (0.002)	0.004** (0.002)	0.002 (0.002)	0.004*** (0.001)	0.002** (0.001)	0.001 (0.001)	0.003** (0.001)	0.001 (0.001)	0.000 (0.001)
Conscient.	-0.013*** (0.002)	-0.008*** (0.002)	-0.008*** (0.002)	-0.008*** (0.001)	-0.005*** (0.001)	-0.004*** (0.001)	-0.005*** (0.001)	-0.002** (0.001)	-0.002** (0.001)
Extraversion	-0.002 (0.002)	-0.002 (0.002)	-0.000 (0.001)	-0.002* (0.001)	-0.002** (0.001)	-0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
Agreeable.	-0.008*** (0.002)	-0.005*** (0.002)	-0.005*** (0.002)	-0.003** (0.002)	-0.002 (0.001)	-0.001 (0.001)	-0.004*** (0.001)	-0.003*** (0.001)	-0.003*** (0.001)
Neuroticism	-0.004* (0.002)	-0.003 (0.002)	-0.002 (0.002)	-0.002 (0.002)	-0.001 (0.001)	-0.001 (0.001)	-0.003* (0.001)	-0.002* (0.001)	-0.001 (0.001)
Age		-0.001* (0.001)	-0.002** (0.001)		-0.001** (0.000)	-0.001* (0.000)		0.000 (0.000)	-0.000 (0.000)
Age square		0.001 (0.001)	0.002* (0.001)		0.001 (0.001)	0.001 (0.001)		-0.000 (0.000)	0.000 (0.001)
Female		0.001 (0.003)	0.002 (0.003)		0.001 (0.002)	0.001 (0.002)		0.000 (0.002)	0.001 (0.002)
Ukrainian language		-0.030*** (0.003)	-0.025*** (0.003)		-0.010*** (0.002)	-0.007*** (0.002)		-0.017*** (0.002)	-0.014*** (0.002)
Married			0.000 (0.003)			-0.002 (0.002)			0.002 (0.002)
Number of kids			-0.002 (0.002)			-0.002 (0.001)			-0.000 (0.001)
Employed			0.001 (0.003)			-0.001 (0.002)			0.002 (0.002)
Log of household income			0.007*** (0.002)			0.003*** (0.001)			0.003** (0.001)
Education: Secondary			0.002 (0.003)			0.005** (0.002)			-0.004* (0.002)
Education: Vocational			0.010*** (0.003)			0.006*** (0.002)			0.002 (0.002)
Education: Higher			0.018*** (0.006)			0.007** (0.003)			0.007* (0.004)
Observations	6,164	6,153	5,729	6,079	6,068	5,644	6,077	6,066	5,649

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Note: The table shows marginal effects from probit estimation, evaluated at sample mean. The big five factors –openness, conscientiousness, extraversion, agreeableness, neuroticism– are standardized averages with a mean of 0 and standard deviation of 1. The covariates of *age*, *age square*, *number of kids* and *log of household income* are continuous variables, while *female*, *Ukrainian language*, *married* and *employed* refer to dummy variables. The control for *education* is a categorical variable with the reference category of basic secondary level education. These control variables are lagged with respect to the previous wave. All specifications also include year fixed effects.

Table 4: Effects of the big five & risk on internal migration

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	rural-urban	rural-urban	rural-urban	rural-city	rural-city	rural-city	rural-town	rural-town	rural-town
Openness	0.007*** (0.002)	0.003* (0.002)	0.002* (0.002)	0.004*** (0.001)	0.002** (0.001)	0.002* (0.001)	0.003** (0.001)	0.001 (0.001)	0.000 (0.001)
Conscientiousness	-0.013*** (0.002)	-0.008*** (0.002)	-0.008*** (0.002)	-0.008*** (0.001)	-0.005*** (0.001)	-0.004*** (0.001)	-0.005*** (0.001)	-0.002** (0.001)	-0.002** (0.001)
Extraversion	-0.002 (0.002)	-0.001 (0.002)	-0.000 (0.001)	-0.003** (0.001)	-0.002** (0.001)	-0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
Agreeableness	-0.008*** (0.002)	-0.005*** (0.002)	-0.005*** (0.002)	-0.003** (0.002)	-0.002 (0.001)	-0.001 (0.001)	-0.004*** (0.001)	-0.003*** (0.001)	-0.002*** (0.001)
Neuroticism	-0.004* (0.002)	-0.003 (0.002)	-0.002 (0.002)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.002* (0.001)	-0.002* (0.001)	-0.001 (0.001)
Risk indicator	-0.001 (0.005)	-0.001 (0.004)	-0.001 (0.003)	0.007** (0.003)	0.004** (0.002)	0.004** (0.002)	-0.011*** (0.004)	-0.006** (0.003)	-0.005** (0.002)
Covariates									
Set 1	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Set 2	No	No	Yes	No	No	Yes	No	No	Yes
Observations	6,125	6,114	5,692	6,041	6,030	5,608	6,038	6,027	5,612

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Note: The table shows marginal effects from probit estimation, evaluated at sample mean. The big five factors –openness, conscientiousness, extraversion, agreeableness, neuroticism– are standardized averages with a mean of 0 and standard deviation of 1. The *risk indicator* is a dummy variable for values greater than 5 on a 11-point scale. *Set 1* represents covariates of age, age square, female and Ukrainian language, while *Set 2* refers to covariates of married, number of kids, education level, employed, and log of total household income. The covariates are lagged variables with respect to the previous wave. All specifications also include year fixed effects.

Table 5: Effects of the big five & risk on internal migration –controlling for regional macro indicators and region-level fixed effects

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	rural-urban	rural-urban	rural-urban	rural-city	rural-city	rural-city	rural-town	rural-town	rural-town
Openness	0.003** (0.002)	0.003** (0.001)	0.003** (0.002)	0.003** (0.001)	0.003** (0.001)	0.003** (0.001)	0.001 (0.002)	0.001 (0.002)	0.001 (0.002)
Conscientiousness	-0.006*** (0.002)	-0.006*** (0.002)	-0.006*** (0.002)	-0.006*** (0.002)	-0.006*** (0.002)	-0.006*** (0.001)	-0.002 (0.002)	-0.002 (0.002)	-0.002 (0.002)
Extraversion	-0.003* (0.001)	-0.003* (0.001)	-0.003* (0.001)	-0.003** (0.001)	-0.003** (0.001)	-0.003** (0.001)	0.000 (0.002)	0.000 (0.002)	0.000 (0.002)
Agreeableness	-0.002 (0.002)	-0.002 (0.002)	-0.002 (0.002)	-0.000 (0.002)	-0.000 (0.001)	-0.001 (0.001)	-0.003* (0.002)	-0.003* (0.002)	-0.003* (0.002)
Neuroticism	-0.002 (0.002)	-0.002 (0.002)	-0.002 (0.002)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.003 (0.002)	-0.003 (0.002)	-0.003 (0.002)
Risk indicator	0.004 (0.003)	0.004 (0.003)	0.003 (0.003)	0.007** (0.003)	0.007** (0.003)	0.006** (0.003)	-0.006 (0.005)	-0.006 (0.005)	-0.006 (0.005)
<i>Regional covariates</i>									
Unemployment rate		0.005*** (0.002)			0.005*** (0.002)			0.003 (0.002)	
Log GDP			-0.027*** (0.007)			-0.023*** (0.006)			-0.003 (0.011)
Observations	5,080	5,080	5,080	3,768	3,768	3,768	3,390	3,390	3,390

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Note: The table shows marginal effects from probit estimation, evaluated at sample means. The big five factors –openness, conscientiousness, extraversion, agreeableness, neuroticism– are standardized averages with a mean of 0 and standard deviation of 1. The *risk indicator* is a dummy variable for values greater than 5 on a 11-point scale.

Regional controls include *unemployment rate* and *log of GDP at oblast* level. All specifications also include individual-level controls of age, age square, female and Ukrainian language, as well as year and oblast-level fixed effects. The covariates are lagged variables with respect to the previous wave.

Table 6: Complementarity between the big five and risk

	Obs	ll(null)	ll(model)	df	AIC	BIC	Pseudo R2
Rural-to-urban migration							
Set 1	8459	-1140.583	-1031.569	7	2077.137	2126.438	0.096
Set 1, risk	7656	-987.142	-901.428	8	1818.857	1874.403	0.087
Set 1, big five	6153	-784.852	-682.816	12	1389.633	1470.329	0.130
Set 1, big five, risk	6114	-780.197	-679.842	13	1385.683	1473.021	0.129
Rural-to-city migration							
Set 1	8328	-640.556	-598.742	7	1211.484	1260.676	0.065
Set 1, risk	7548	-570.117	-531.221	8	1078.443	1133.875	0.068
Set 1, big five	6068	-455.678	-398.783	12	821.565	902.095	0.125
Set 1, big five, risk	6030	-455.127	-396.706	13	819.411	906.570	0.128
Rural-to-town migration							
Set 1	8336	-674.027	-589.834	7	1193.667	1242.866	0.125
Set 1, risk	7547	-565.875	-497.974	8	1011.948	1067.379	0.120
Set 1, big five	6066	-447.165	-384.948	12	793.896	874.422	0.139
Set 1, big five, risk	6027	-442.360	-378.874	13	783.748	870.900	0.144

Note: AIC and BIC refer to the Akaike's information criterion and the Bayesian information criterion, respectively. The AIC and the BIC are two goodness-of-fit measures calculated through the estimation of probit models. The model with the smaller value of the information criterion is considered to be better.

Table 7: Reverse causality check for risk:
Risk is measured in 2007, after and before migration occurred

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	rural-urban	rural-urban	rural-urban	rural-city	rural-city	rural-city	rural-town	rural-town	rural-town
(a) Migration of 2007-2012									
Openness	0.008** (0.003)	0.002 (0.002)	-0.001 (0.001)	0.004** (0.002)	0.002** (0.001)	0.001 (0.000)	0.004** (0.002)	0.001 (0.001)	-0.000 (0.000)
Conscientiousness	-0.009*** (0.003)	-0.003 (0.002)	-0.003 (0.002)	-0.005*** (0.002)	-0.002** (0.001)	-0.000 (0.000)	-0.005*** (0.002)	-0.002 (0.001)	-0.000 (0.000)
Extraversion	-0.001 (0.003)	-0.002 (0.002)	-0.000 (0.001)	-0.002 (0.002)	-0.002* (0.001)	-0.000 (0.000)	-0.002 (0.002)	-0.002* (0.001)	-0.000 (0.000)
Agreeableness	0.003 (0.003)	0.003 (0.002)	0.002 (0.001)	0.001 (0.002)	0.001 (0.001)	0.000 (0.000)	0.001 (0.002)	0.001 (0.001)	0.000 (0.000)
Neuroticism	-0.004 (0.003)	-0.003 (0.002)	-0.001 (0.001)	-0.001 (0.001)	-0.000 (0.001)	0.000 (0.000)	-0.001 (0.001)	-0.000 (0.001)	0.000 (0.000)
Risk 2007	0.011* (0.006)	0.003 (0.004)	0.002 (0.002)	0.010*** (0.003)	0.004** (0.002)	0.002** (0.001)	0.010*** (0.003)	0.004** (0.002)	0.001 (0.001)
Observations	2,074	2,074	1,971	2,051	2,051	1,948	2,051	2,051	1,948
(b) Migration of 2003-2007									
Openness	0.007*** (0.003)	0.005** (0.002)	0.004* (0.002)	0.004*** (0.002)	0.003** (0.001)	0.002** (0.001)	0.004*** (0.002)	0.003** (0.001)	0.002** (0.001)
Conscientiousness	-0.015*** (0.003)	-0.012*** (0.003)	-0.011*** (0.003)	-0.007*** (0.002)	-0.006*** (0.002)	-0.005*** (0.002)	-0.007*** (0.002)	-0.006*** (0.002)	-0.005*** (0.002)
Extraversion	-0.005* (0.003)	-0.004* (0.002)	-0.004 (0.002)	-0.003** (0.001)	-0.003** (0.001)	-0.002** (0.001)	-0.003** (0.001)	-0.003** (0.001)	-0.002** (0.001)
Agreeableness	-0.009*** (0.003)	-0.006** (0.003)	-0.006** (0.003)	-0.003* (0.002)	-0.002 (0.001)	-0.001 (0.001)	-0.003* (0.002)	-0.002 (0.001)	-0.001 (0.001)
Neuroticism	0.004 (0.003)	0.004 (0.003)	0.003 (0.002)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
Risk 2007	-0.003 (0.007)	-0.003 (0.006)	-0.003 (0.005)	0.003 (0.003)	0.002 (0.002)	0.001 (0.002)	0.003 (0.003)	0.002 (0.002)	0.001 (0.002)
Observations	1,825	1,814	1,709	1,801	1,790	1,685	1,801	1,790	1,685
Covariates									
Set 1	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Set 2	No	No	Yes	No	No	Yes	No	No	Yes

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Note: The table shows marginal effects from probit estimation, evaluated at sample mean. The big five factors –openness, conscientiousness, extraversion, agreeableness, neuroticism– are standardized averages with a mean of 0 and standard deviation of 1. In the upper panel, the outcome variable, measured in 2012, captures the migration that occurred between 2007 and 2012. In the bottom panel, the outcome variable, measured in 2007, captures the migration that occurred any time between 2003 and 2007. The *risk* indicator, measured in 2007, denotes a dummy variable for values greater than 5 on a scale from 0 to 10. *Set 1* represents covariates of age, age square, female and Ukrainian language, while *Set 2* refers to covariates of married, number of kids, education level, employed, and log of net household income. The covariates are measured in 2007.

**Reverse causality check for risk:
Risk is measured in 2007, after and before migration occurred**

	(1) rural-urban	(2) rural-urban	(3) rural-urban	(4) rural-city	(5) rural-city	(6) rural-city	(7) rural-town	(8) rural-town	(9) rural-town
(a) Migration of 2007-2012									
Risk 2007	0.013** (0.007)	0.004 (0.004)	0.002 (0.003)	0.012*** (0.004)	0.004** (0.002)	0.002** (0.001)	0.012*** (0.004)	0.004** (0.002)	0.001 (0.001)
Observations	2,079	2,079	1,976	2,056	2,056	1,953	2,056	2,056	1,953
(b) Migration of 2003-2007									
Risk 2007	-0.002 (0.008)	-0.006 (0.007)	-0.004 (0.006)	0.004 (0.006)	-0.001 (0.005)	-0.000 (0.004)	0.004 (0.006)	-0.001 (0.005)	-0.000 (0.004)
Observations	2,634	2,621	2,469	2,601	2,588	2,436	2,601	2,588	2,436
Covariates									
Set 1	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Set 2	No	No	Yes	No	No	Yes	No	No	Yes

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Note: The table shows marginal effects from probit estimation, evaluated at sample mean. In the upper panel, the outcome variable, measured in 2012, captures the migration that occurred between 2007 and 2012. In the bottom panel, the outcome variable, measured in 2007, captures the migration that occurred any time between 2003 and 2007. The *risk* indicator, measured in 2007, denotes a dummy variable for values greater than 5 on a scale from 0 to 10. *Set 1* represents covariates of age, age square, female and Ukrainian language, while *Set 2* refers to covariates of married, number of kids, education level, employed, and log of net household income. The covariates are measured in 2007.

**Table 8: Reverse causality check for risk:
The impact of internal migration on a measure of risk**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
(a) Dependent variable: Change in risk index btw. 2007-12										
(i) Rural-urban migration btw. 2007-2012		-0.065 (0.199)	-0.089 (0.201)	0.070 (0.207)						
(ii) Rural-city migration btw. 2007-2012					-0.340 (0.354)	-0.368 (0.349)	-0.022 (0.438)			
(iii) Rural-town migration btw. 2007-2012							0.158 (0.199)	0.137 (0.250)	0.119 (0.205)	
Observations	1,596	1,596	1,521	1,580	1,580	1,505	1,583	1,583	1,512	
(b) Dependent variable: Risk index in 2012										
(i) Rural-urban migration btw. 2007-2012		0.052 (0.176)	-0.116 (0.173)	-0.157 (0.178)						
(ii) Rural-city migration btw. 2007-2012					-0.080 (0.309)	-0.273 (0.301)	-0.354 (0.317)			
(iii) Rural-town migration btw. 2007-2012							0.160 (0.191)	0.013 (0.224)	-0.008 (0.185)	
Risk index 2007		0.250*** (0.025)	0.209*** (0.026)	0.209*** (0.026)	0.249*** (0.025)	0.208*** (0.026)	0.208*** (0.026)	0.253*** (0.025)	0.212*** (0.023)	0.212*** (0.026)
Observations	1,596	1,596	1,585	1,580	1,580	1,569	1,583	1,583	1,573	
Covariates										
Set 1		No	Yes	Yes	No	Yes	Yes	No	Yes	
Set 2		No	No	Yes	No	No	Yes	No	Yes	

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Note: Rows (i), (ii) and (iii) display *OLS* estimation results from separate regressions, based on a balanced panel sample of 2007 and 2012. In panel (a) the outcome variable is the change in the risk index between 2007 and 2012, which is regressed on (one of the three) migration variable measured in 2012, capturing the moves between 2007 and 2012. In panel (b) the outcome variable refers to the risk index measured in 2012, which is regressed on the migration variable measured in 2012 as well as the risk index measured in 2007. The *risk index* is measured on a scale of 0 to 10. The top and bottom panel regressions also condition on two sets of controls variables. While *Set 1* represents covariates of age, age square, female and Ukrainian language, *Set 2* refers to covariates of married, number of kids and education level, employed, and log of net household income,. The covariates are measured in 2007.

Table 9: Age-free effects of the big five on internal migration

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	rural-urban	rural-urban	rural-urban	rural-city	rural-city	rural-city	rural-town	rural-town	rural-town
Openness	0.005** (0.002)	0.003* (0.002)	0.001 (0.002)	0.003** (0.001)	0.002* (0.001)	0.001 (0.001)	0.002* (0.001)	0.001 (0.001)	-0.000 (0.001)
Conscient	-0.011*** (0.002)	-0.008*** (0.002)	-0.008*** (0.002)	-0.006*** (0.002)	-0.005*** (0.001)	-0.004*** (0.001)	-0.004*** (0.001)	-0.002** (0.001)	-0.002** (0.001)
Extraversion	-0.003 (0.002)	-0.002 (0.002)	-0.000 (0.001)	-0.003** (0.001)	-0.002** (0.001)	-0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
Agreeable	-0.007*** (0.002)	-0.005*** (0.002)	-0.005*** (0.002)	-0.003* (0.002)	-0.002 (0.001)	-0.002 (0.001)	-0.004*** (0.002)	-0.003*** (0.001)	-0.003*** (0.001)
Neuroticism	-0.003	-0.003	-0.002	-0.001	-0.001	-0.001	-0.002	-0.002*	-0.001
Observations	6,164	6,153	5,729	6,079	6,068	5,644	6,077	6,066	5,649
Covariates									
Set 1	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Set 2	No	No	Yes	No	No	Yes	No	No	Yes

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Note: The table shows marginal effects from probit estimation, evaluated at sample mean. The big five factors –openness, conscientiousness, extraversion, agreeableness, neuroticism– are standardized averages with a mean of 0 and standard deviation of 1. *Set 1* represents covariates of age, age square, female and Ukrainian language, while *Set 2* refers to covariates of married, number of kids, education level, employed, and log of total household income. The covariates are lagged variables with respect to the previous wave.

Appendix A Tables

Table A.1. Summary statistics (2004 & 2007)

2004	Urban			Rural stayers			Movers into urban		
	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.
Age	3800	43.20	16.69	3234	44.96	16.46	133	42.20	16.02
Female	3800	0.59	0.49	3234	0.58	0.49	133	0.52	0.50
Ukrainian language	3799	0.36	0.48	3233	0.69	0.46	133	0.16	0.37
Married	3782	0.60	0.49	3218	0.67	0.47	131	0.69	0.47
No. kids	3799	1.27	0.98	3232	1.65	1.17	133	1.32	1.00
Education level	3797	2.72	1.02	3232	2.32	1.00	133	2.66	0.89
Employed	3800	0.51	0.50	3234	0.40	0.49	133	0.51	0.50
Household income	3639	866.30	741.70	3094	579.76	509.54	131	784.64	439.27
2007	Urban			Rural stayers			Movers into urban		
	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.
Age	3606	43.70	16.91	2676	46.78	15.86	73	41.30	15.31
Female	3606	0.58	0.49	2676	0.59	0.49	73	0.44	0.50
Ukrainian language	3595	0.38	0.49	2663	0.67	0.47	73	0.41	0.50
Married	3603	0.62	0.48	2675	0.69	0.46	73	0.71	0.46
No. kids	3603	1.22	0.96	2675	1.67	1.09	73	1.41	1.07
Education level	3585	2.98	0.82	2658	2.69	0.87	73	2.85	0.72
Employed	3606	0.53	0.50	2676	0.45	0.50	73	0.67	0.47
Household income	3438	2452.01	1717.34	2570	1769.28	1250.33	68	2241.60	1570.78
Risk indicator	3533	0.26	0.44	2561	0.20	0.40	73	0.19	0.40
Risk index	3533	3.77	2.90	2561	3.18	2.89	73	2.89	2.78

Source: Authors' tabulations from the 2004-2007 waves of the ULMS.

Table A.2. Effects of the big five & risk on internal migration:
OLS estimation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	rural-urban	rural-urban	rural-urban	rural-urban	rural-city	rural-city	rural-city	rural-city	rural-town	rural-town	rural-town	rural-town
Age	-0.002** (0.001)	-0.002* (0.001)	-0.002** (0.001)	-0.002* (0.001)	-0.002*** (0.001)	-0.002*** (0.001)	-0.002*** (0.001)	-0.002*** (0.001)	0.000 (0.000)	0.000 (0.001)	-0.000 (0.001)	0.000 (0.001)
Age square	0.001* (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.002*** (0.001)	0.002** (0.001)	0.002** (0.001)	0.002** (0.001)	-0.000 (0.001)	-0.001 (0.001)	-0.000 (0.001)	-0.001 (0.001)
Female	-0.006* (0.004)	0.003 (0.005)	-0.008** (0.004)	0.002 (0.005)	-0.004 (0.003)	0.002 (0.003)	-0.004 (0.003)	0.003 (0.004)	-0.003 (0.003)	0.001 (0.003)	-0.005* (0.003)	-0.000 (0.003)
Ukrainian language	-0.052*** (0.005)	-0.049*** (0.006)	-0.046*** (0.005)	-0.048*** (0.006)	-0.018*** (0.003)	-0.018*** (0.004)	-0.016*** (0.003)	-0.018*** (0.004)	-0.036*** (0.004)	-0.033*** (0.004)	-0.032*** (0.004)	-0.032*** (0.004)
Openness		0.004* (0.002)		0.004 (0.002)		0.002 (0.002)		0.002 (0.002)		0.002 (0.001)		0.002 (0.001)
Conscientiousness		-0.011*** (0.003)		-0.011*** (0.003)		-0.008*** (0.002)		-0.008*** (0.002)		-0.004*** (0.001)		-0.004*** (0.001)
Extraversion		-0.003 (0.002)		-0.002 (0.002)		-0.003** (0.002)		-0.004* (0.002)		0.001 (0.001)		0.001 (0.001)
Agreeableness		-0.009*** (0.003)		-0.008*** (0.003)		-0.004* (0.002)		-0.004* (0.002)		-0.005*** (0.002)		-0.005*** (0.002)
Neuroticism		-0.005** (0.002)		-0.005** (0.002)		-0.002 (0.002)		-0.002 (0.002)		-0.004** (0.002)		-0.003** (0.002)
Risk indicator			-0.004 (0.005)	-0.002 (0.005)			0.005 (0.004)	0.007 (0.004)			-0.010*** (0.003)	-0.009*** (0.003)
Constant	0.114*** (0.016)	0.108*** (0.020)	0.112*** (0.017)	0.109*** (0.020)	0.073*** (0.012)	0.078*** (0.017)	0.071*** (0.013)	0.076*** (0.017)	0.045*** (0.010)	0.033*** (0.012)	0.044*** (0.011)	0.036*** (0.012)
Observations	8,459	6,153	7,656	6,114	8,328	6,068	7,548	6,030	8,336	6,066	7,547	6,027
Adjusted R-squared	0.024	0.031	0.021	0.031	0.009	0.017	0.010	0.018	0.019	0.019	0.017	0.020

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: The table shows marginal effects from OLS estimation. The big five factors –openness, conscientiousness, extraversion, agreeableness, neuroticism– are standardized averages with a mean of 0 and standard deviation of 1. The *risk indicator* is a dummy variables for values greater than 5 on a 11-point scale. The covariates of age and age square are continuous variables, while the controls of female and Ukrainian language refer to dummy variables. The control for *education* is a categorical variable with the reference category of basic secondary level education. These control variables are lagged with respect to the previous wave.