Discussion Paper Series – CRC TR 224

Discussion Paper No. 588
Project A 05

Risk Attitudes and Informal Employment in Ukraine

Thomas Dohmen[1]
Melanie Khamis[2]
Hartmut Lehmann[3]
Norberto Pignatti[4]

August 2024

[1]University of Bonn
[2]Wesleyan University
[3]Leibniz Institute for East and Southeast European Studies
[4]ISET

Support by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) through CRC TR 224 is gratefully acknowledged.

Risk Attitudes and Informal Employment in Ukraine[#]

Thomas Dohmen
University of Bonn, University of Maastricht and IZA

Melanie Khamis
Wesleyan University and IZA

Hartmut Lehmann*
Leibniz Institute for East and Southeast European Studies, University of Regensburg, University of Bologna and IZA

Norberto Pignatti, ISET, HCEO and IZA

December 2023

Abstract

Using data from the four waves of the Ukrainian Longitudinal Monitoring Survey - ULMS (2003, 2004, 2007 and 2012), we analyze whether workers with a higher willingness to take risks are more likely to select into informal employment contracts. The data permit us to distinguish between five employment states: formal and informal self-employment, formal salaried employment, voluntary informal salaried employment, and involuntary informal salaried employment. The empirical evidence reveals risk attitudes as a strong causal determinant of the incidence of all types of informal employment but involuntary informal salaried employment. We also provide evidence that our results are not driven by reverse causality: risk attitudes impact on the choice of employment state whilst this latter does not influence risk attitudes. Linking risk attitudes with selection into employment states, we also can establish that along the formal-informal divide the Ukrainian labor market is predominantly segmented for salaried workers whilst it is integrated for the self-employed.

JEL classification: D91, J42, J46, P23.

Keywords: Risk attitudes, informal employment, labor market segmentation, Ukraine.

[#]The authors are grateful to Alpaslan Akay, Andrea Ichino, David Jaeger, Olga Kupets and participants of an IZA-World Bank conference in Bonn, EALE/SOLE conference in London, 'Enforcement, Evasion and Informality: Theory and Practice' conference at University of Michigan , the IZA topic week on "The Political Economy of Labor Market Reform in Transition and Emerging Economies", the CIER-IZA First Conference in Beijing, the ASSA/ACES meetings in 2010, an IZA/World Bank/OECD workshop in Bertinoro in 2014, the ICID Development Workshop at Ravello in 2016, the Ostrom Workshop at Indiana University in 2016 as well as to seminar audiences at IZA, the IOS Regensburg, the University of Bologna, Cornell University, LSE, Stockholm University, the College of William and Mary, Wesleyan University, the University of Edinburgh and the Warsaw School of Economics for valuable comments and insights on earlier versions of the paper. The usual disclaimer applies. Norberto Pignatti is grateful to the Leibniz Institute for East and Southeast European Studies for receiving a fellowship in the summer of 2022, which facilitated some of the work on the paper. Thomas Dohmen acknowledges funding by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) through CRC TR 224 (Project A05).

*Corresponding author: Hartmut Lehmann (lehmann@ios-regensburg.de).

Risk Attitudes and Informal Employment in Ukraine

I. Introduction

There exists a large empirical literature on informal employment in developing, emerging and transition countries. However, no empirical studies investigate the link between direct measures of self-assessed workers' risk attitudes and the three types of informal employment that we identify in this study: voluntary informal dependent employment, involuntary informal dependent employment, and informal self-employment. Workers who are employed informally are exposed to risk along several dimensions: their jobs can be terminated at any instant, informally employed workers neither receive sickness pay nor retirement benefits, are not covered by health insurance, and often they are exposed to severe hazards on the job that can potentially damage their health. Informal self-employment is also risky since workers engaged in activities that are not registered with the tax authorities might be detected and penalized. If workers choose informal employment voluntarily, it seems legitimate to conjecture that their willingness to voluntarily select into informal jobs is also caused by a higher propensity to take risks in general and to take risks in career matters.

This paper attempts to establish a causal effect of risk attitudes on the incidence of informal employment with the help of a unique panel data set of the Ukrainian labor market, the Ukrainian Longitudinal Monitoring Survey (ULMS). Questions on the nature of dependent employment and self-employment are brought together with questions on self-assessed general and domain-specific risk attitudes in this survey in a unique fashion.

Our study contributes to the growing literature that empirically pins down risk preferences as an important predictor of behavior in the labor market. In this literature, self-employment, educational and occupational choice, and mobility across regions but also across labor market states are all shown to be positively associated with an increased willingness to take risks. For example, Bonin et al. (2007) and Fouarge et al. (2014) relate risk attitudes to occupational and educational choice, Caliendo et al. (2009, 2010), Koudstaal et al. (2015), and Skriabikova et al. (2014) investigate the impact of risk attitudes on the decision to become self-employed or an entrepreneur. whilst Jaeger et al. (2010), Bauernschuster et

al. (2014), Dustmann et al. (2023), and Heitmueller (2005) study the link between the proclivity to take risks and the migration decision.

Our study is to our knowledge the first that establishes a direct causal link between self-assessed risk attitudes and employment choice along the informal-formal divide. There are above all two studies that pursue a research theme close to ours. Van Huizen and Alessie (2019) analyze the effect of risk preferences on job mobility, using data on risk preferences elicited from an incentivized lottery-choice experiment and a self-assessed risk measure. Their careful analysis finds that risk averse workers are less likely to move to other jobs, no matter which measure of risk aversion is used. Falco (2014), analyzing the labor market of Ghana, looks at the nexus of constant relative risk aversion (CRRA) and selection into informal or formal employment. He finds that less risk averse workers have a higher propensity to select into informal employment. He comes closest to what we study in our paper. However, he does not really address endogeneity issues of his CRRA measure, even though he discusses the possibility that labor market status might affect workers' risk attitudes. We, on the other hand, test for reverse causality, and address endogeneity as well as attenuation bias due to measurement error by instrumenting the self-assessed risk measures that we use in our analysis.

By linking self-assessed risk attitudes from a large survey and informal employment, our paper also contributes to a better understanding of the nexus of informality and labor market structure in developing, emerging and transition economies. Looking closely at the impact of risk attitudes on selection into labor market states, we can discern whether informality is embedded in a segmented or an integrated labor market, or in a hybrid of the two.

In the next section we, therefore, briefly sketch the main paradigms in the literature on labor market structure and informality, which have been around for many years. We ask which predictions regarding the impact of risk attitudes on informality are consistent with these various paradigms. Section III discusses the ULMS data set, definitional issues related to informality and the validity of the self-assessed risk measures used in the analysis. We then discuss econometric issues related to reverse causality and potential measurement error in the risk attitudes variable in section IV. The penultimate

section is the central piece of our study: it provides some descriptive statistics on the nexus of risk attitudes and selection into labor market states, presents our estimation results and robustness checks. The last section offers some conclusions.

II. Paradigms on informality and the risk attitudes of workers – theoretical considerations

The existence of the informal segment of the labor market alongside the formal sector and the reasons posited for its existence have given rise to several paradigms in the literature. While these paradigms have been formulated some time ago, they still are of great relevance for the current discussion on the role of informality in labor markets in developing countries. One important question in the labor market literature for developing countries is whether informal employment reflects voluntary choice or is involuntary due to segmentation in the labor market (Guasch 1999).

The traditional dualistic view, going back at least to Harris and Todaro (1970), sees the informal segment as the inferior sector, the option of last resort. Due to barriers to entry, minimum wages, unions or other sources of segmentation, formal jobs are rationed. Workers in the informal sector are crowded out from the formal sector involuntarily, their wage being less than that in the formal sector.[1] For example, an increase in the statutory wage in the formal sector will reduce formal employment but lead to a lower informal wage and higher informal employment. During a recession informal employment and output expands because formal employment is reduced, while the informal labor market clears. In this view, labor market segmentation between formality and informality is the defining feature of the labor market.

In contrast, in a competitive labor market one would expect workers to be able to move freely between jobs, and for wages (broadly interpreted) to equalize accordingly. In this view, the formal and informal labor markets are not segmented, but integrated, if workers move voluntarily into or out of informal employment. Voluntary choice regarding jobs and particular attributes of these jobs, such as

[1] In this school of thought, formal sector jobs not only command higher wages but also provide fringe benefits that are absent with informal sector jobs.

flexible hours, working as a self-employed and being one's own boss as a micro-entrepreneur, and not valuing social security benefits and/or future pension benefits, can be the reasons for remaining in or moving to the informal sector (Maloney 1999, 2004; Cunningham and Maloney 2001). Here, contrary to the segmentation case, formal and informal employment are not necessarily negatively correlated over the business cycle.

Segmentation and integration of the formal and informal labor markets are two polar views regarding the interaction of formality and informality. However, as suggested by Tokman (1986) and Fields (1990), it is possible that these features co-exist in the same labor market, given the heterogeneity of the informal labor market. Tokman and Fields divide the informal sector of the labor market into two segments: an 'easy-entry' informal sector, which constitutes the involuntary segment, and an 'upper-tier' informal sector, where barriers of entry persist and in which participation is voluntary. Hence, the labor market is divided into a formal sector, a 'disadvantaged' subsistence-level informal sector and a 'small firm' and micro-entrepreneur informal sector.

Several contributions in Guha-Kasnobis, Kanbur and Ostrom (2006) question the usefulness of a dichotomous view of labor markets in developing countries along the formal-informal divide. For example, Chen (ibidem) sees exclusively formal and informal firms and employment as polar cases and stresses that there exists a continuum between these poles where most workers and firms locate. Guha-Kasnobis, Kanbur and Ostrom in their introductory remarks highlight that formal and informal are rather metaphors that have context-dependent connotations.

When assessing the issue of whether workers select themselves into informal employment relationships, their risk attitudes might be an important determinant of this selection. *A priori* one might expect that workers who are more prone to risk taking have a higher incidence of voluntary informal employment relationships. The cited literature on the link of risk attitudes and self-employment establishes convincingly that persons who are more willing to take risks have a higher propensity to take up this labor market state. However, this literature does not distinguish between formal and informal self-employment, something we can address with our data. If risk attitude is an important

predictor of selection into some labor market states but not into others, then this might provide direct evidence of labor market segmentation.

In the traditional paradigm there is little room for risk attitudes as a determinant of the incidence of informal employment. Because of imperfections in the labor market some workers are prevented to enter the formal sector. Entry into the formal labor market segment does not depend in any way on the volition of workers but is determined by the equilibrium condition which says that the expected wage in the formal sector is equal to wage in the informal sector. So, we would not expect that informally employed persons exhibit different risk attitudes compared with those who work in formal employment. Risk attitudes, on the other hand, should play a role in the paradigm that sees the labor market as integrated since workers freely choose their labor market state over their working life. If informal salaried employment and informal self-employment are riskier segments of the labor market workers with a larger proclivity to take risks will self-select more into these segments than into formal dependent employment. Risk attitudes should also play a role in the paradigm that sees the informal sector split into an easy entry part where the majority of the informally employed find themselves involuntarily and a voluntary upper tier with barriers to entry. We would moot, that workers with a greater propensity to expose themselves to risk might prefer voluntary informal to formal employment, while we would expect that risk attitudes do not predict a differential incidence in formal and involuntary informal employment.

While we assume that risk attitudes are an important determinant of the selection process into informal employment in two of the sketched paradigms, it is, however, *a priori* not clear how important risk attitudes are relative to demographic factors, human capital, and labor market status, like, e.g., age, educational attainment, and previous non-employment spells. Our empirical analysis will answer this question and will thus give us some additional insights into the importance of risk attitudes in the context of the informality paradigms.

III. Data, Definitions and Measurement Issues

Our principal source of information is the Ukrainian Longitudinal Monitoring Survey (ULMS), a nationally representative survey of the Ukrainian work force, undertaken for the first time in the spring of 2003, when it was comprised of around 4,000 households and approximately 8,500 individuals. The second wave was administered between May and July of 2004, when sample sizes fell to 3,397 households and 7,200 individuals respectively. Data of the third wave were collected in 2007 with 3101 questionnaires of households and 6774 individual questionnaires filled out. The fourth wave in 2012 saw 3142 completed household interviews and 7122 completed individual interviews.

The household questionnaire contains items on the demographic structure of the household, its income and expenditure patterns together with living conditions. The core of the survey is the individual questionnaire, which elicits detailed information concerning the labor market experience of Ukrainian workers. In the 2003 questionnaire, besides the reference week sections, there is an extensive retrospective part, which ascertains each individual's labor market circumstances beginning at specific points in time, namely December 1986, December 1991, and December 1997. The first two points are chosen to minimize recall bias, since the first date is close to the Chernobyl incident and the second date marks the end of the Soviet Union. The respective module is then structured in such a way that the data record the month and year of every labor market transition or change in circumstance between December 1997 and the date of interview. The surveys for 2004, 2007 and 2012 have a similar retrospective part covering the intervals 2003 to 2004, 2004 to 2007 and 2007 to 2012.[2]

The definition of informality is a very complex issue as nicely exposited in chapter 1 of Perry et al. (2007) and in Kanbur (2009). We concentrate in this study on the "social protection/legalistic" definition since we find that using the "productivity-based" concept that defines informal or formal sectors would be rather misleading in transition countries. For example, to take all self-employed or workers in micro firms as belonging to the informal sector, whilst even controversial in developing

[2] See Lehmann et al. (2012) for a thorough discussion of the sampling, structure, and the content of the survey instruments of the ULMS.

countries (Chen 2006), will introduce large measurement error in transition countries (see Lehmann and Pignatti, 2018, for a discussion of Ukraine on this issue). As pointed out by Kanbur (2009, 2015), it is vital to be clear what is meant by informality and stick to the criterion one has chosen. We, therefore, use the information we have for the reference weeks and define an employment relationship as formal if employees state that they have a contract and that their employment relationship is registered with state authorities. An employee is informal if the contrary holds – the precise question and the solicited answers are shown in PanelA.1 in Figure 1.

Self-employment is considered formal if self-employed respondents confirm that their activity is registered with the state, and informal if they do not register (see question in Panel A.2 in Figure 1).

The self-employed decide for themselves whether to register their activity or not. We, therefore, assume in this study that all informal self-employed are voluntary informal self-employed. For employees we, however, want to find out whether the entered informal employment relationship is of a voluntary or involuntary nature. We, therefore, ask the following question and provide 3 potential answers (see also Panel A.3 in Figure 1):

Why are you not officially registered at this job?
1. *Employer does not want to register.*
2. *I do not want to register.*
3. *Both employer and I do not want to register.*

Answer 1 classifies a person as an involuntary dependent informal employee, answers 2 or 3 as a voluntary dependent informal employee.

With registration (i.e., in the formal sector), salaried workers acquire several fringe benefits, pension rights as well as substantial job security, the latter at least on paper. We should stress that workers might be employed in the formal sector, i.e., in a registered firm, but that their job might not be registered. In other words, we identify an informal employment relationship and not necessarily employment in the informal sector.

As far as self-employment is concerned, there exist countervailing reasons for registration or non-registration of activities by the self-employed in Ukraine in the analyzed period. On the one hand,

when registering one's activity as self-employed, one must pay only a monthly flat tax, which amounts to approximately the equivalent of 60 US dollars in the analyzed period; so, on purely economic grounds registration is clearly not expensive and is beneficial. On the other hand, many might shy away from registration to avoid becoming the victim of corruption by state officials or worse.

On our measure we calculate for 2007 an incidence of informality of roughly 15% that includes informal employees and informal self-employed. However, we need to stress that our definition of informality does not capture all activities in the shadow economy, but only informal employment relationships in the primary job.[3] In addition, in Ukraine, like in other successor states of the Soviet Union, the assessment of informality is complicated by the fact that many firms pay a large part of workers' salaries as undeclared "envelope payments" even if their workers have a formal job. How to treat workers in registered jobs who receive a substantial fraction of their salaries off the books is a contentious issue. Empirically, we can only solicit information on total wages, but cannot distinguish between the "official" and "unofficial" parts of wage payments. Workers in formal employment relationships are, therefore, treated as formally employed salaried workers, even if they might receive part of their wages in an informal fashion. Lehmann and Pignatti (2007; 2018) provide a more detailed discussion of the ambiguous nature of informality in a CIS labor market. We attempt to overcome this ambiguity here by exclusively relying on the definition of a registered job as a formal employment relationship, and of a registered activity of a self-employed person as formal self-employment.

The 2007 and 2012 waves have a special module on attitudes and expectations that includes questions on self-assessed risk attitudes. These questions are identical to the questions on risk attitudes introduced for the first time in the 2004 wave of the Socio-Economic Panel (SOEP). Respondents are asked to state their willingness to take risks in general, on an 11-point scale from 0 (complete unwillingness) to 10 (complete willingness).[4] Like in the SOEP, there are additional questions about risk attitudes regarding specific life domains, among them career matters.[5] The responses in the 2004

[3] The fraction of respondents who hold a second job in 2007 or 2012 is tiny (1.66% percent and 1.30% percent respectively).
[4] The exact question is reproduced in Panel B.1 in figure 1.
[5] The other domains relate to car driving, financial matters, health matters, and sports/leisure. See Panel B.2 in Figure 1.

SOEP to the self-assessed risk attitudes questions have been experimentally validated in Dohmen et al. (2011).[6]

The usefulness of these risk measures in the analysis of the Ukrainian labor market is shown by the regressions in the comparative paper of Dohmen, Lehmann, and Pignatti (2016) where, using SOEP and ULMS data, the general risk measure and risk measures in different domains of life are regressed on determinants that are exogenous to the respondent, namely, gender, age, height, father's, and mother's education, as well as on arguably endogenous variables related to income. The estimates, performed across the two countries and over time, point to a stable relationship between risk attitudes and demographic characteristics in two very different economic environments (Ukraine and Germany) and in different phases of the business cycle. In both environments, females and older people are more risk averse, taller persons and people whose parents have better education have a propensity to take more risks.[7] This stability across economic environments and in different phases of the business cycle can be taken as a very encouraging sign regarding the validity of our risk measures in any economic context. Hence, even though the responses to the self-assessed risk attitudes questions have not been experimentally validated in the Ukrainian case, we are confident that these responses reflect genuine risk attitudes of respondents.

IV. Econometric issues

Our discussion of the impact of risk attitudes on selection into informal employment assumes that causation runs from risk attitudes to labor market states and that reverse causality can be excluded. Given the large macro shocks that occurred in the first decade of transition and the relatively muted response of the labor market in CIS countries (Boeri and Terrell 2002) and given the fact that risk

6 The study uses a sample of 450 individuals, representative of the SOEP respondents, who are first asked the general risk question and then make choices in a real-stakes lottery experiment. The responses to the general risk question predict actual risk taking in the lottery. This result can be taken as evidence that the responses given in the large SOEP survey are a validated survey measure of risk taking, reflecting above all genuine risk attitudes rather than heterogeneity in how individuals perceive the states of the world.

7 See Tables 1, 2 and A1 in Dohmen, Lehmann, and Pignatti (2016).

attitudes show a great degree of long-term persistence (Bonin et al. 2007, Mata et al., 2018; Schildberg-Hörisch, 2018), we can make the case that the observed risk attitudes are exogenous factors which impact on workers' choices.[8] So, we are convinced that in CIS labor markets it is not the experience of working in the informal sector that determines risk attitudes (as might be the case in a "regular" developing country) but risk attitudes that determine whether a worker decides to work as a salaried employee, informally or formally, or as an informal or formal self-employed. Since we have panel data on risk attitudes in Ukraine for the waves 2007 and 2012 and know the labor market history of respondents, we can directly test whether reverse causality is a concern.

Another important issue is potential measurement error of the used risk attitudes measures. Figure OA1 in the online appendix shows the time profile of the risk measure for those respondents who are in both waves of the panel. The distribution of these changes seems close to a normal distribution and, hence, to suggest that measurement error, even if seemingly orthogonal to observable characteristics, should be a major concern. In the presence of measurement error of the risk measure ordinary least squares (OLS) estimation of linear probability models produces coefficients that suffer from attenuation bias. Instrumental variables (IV) estimation is one approach to address the errors-in variables problem (Reiersøl, 1941; Bound et al., 2001). We, therefore, instrument the risk measure to eliminate, or at least reduce the bias due to measurement error. Furthermore, instrumenting the risk measure will also minimize endogeneity bias by excluding causality going from informality to risk attitudes, i.e., to eliminate the possibility of reverse causality that we discussed above.

Ideally, we would like to instrument the respondents' risk measure with the risk measures of

[8] Mata et al. (2018) document that the test-retest correlations self-reported willingness to take risk measured after 10 years in the SOEP, which uses the same measure that we employ, are still very close to 0.5. These test-retest correlations do not decline much over the entire 10-year interval. In fact, the test-retest correlations over a 1-year and 2-year horizon are typically in the range of 0.45 and 0.55. Importantly, test-retest correlations over short intervals of 4-6 weeks are about 0.62 (Dohmen et al., 2007, Beauchamp et al. (2017) and robust to controlling for major life events, indicating – assuming that risk preferences are stable over such short horizons -- sizable measurement error. This measurement error leads to attenuated test-retest correlations. Correcting for measurement error produces test-retest estimates that are much closer to 1. In fact, Salamanca et al. (2023) adjust test-retest correlations of risk preferences measured in eight large representative panel data sets from developed and developing countries and find correlations extremely close to one for Germany, 0.962 for Australia, 0.964 for the Netherlands, 0.88 for the U.S. and 0.85 for Kyrgyzstan, 0.72 for Thailand, 0.49 for Vietnam and 0.3 for Malawi. They conclude that risk preferences captured by self-assessment are very stable in developed countries and less stable in developing countries.

their parents. Dohmen et al. (2012) highlight the intergenerational transmission of risk attitudes showing convincingly that parents transmit their risk attitudes to their children during the socialization process. Unfortunately, the number of respondents in the ULMS who report their self-assessed risk attitudes is small (5926 in 2007 and 6292 in 2012) so that we can only get 309 parent-child pairs in 2007 and 416 parent-child pairs in 2012, a number too small to use parents' risk measures as a convincing instrument. Dohmen et al. (2012) find that the prevailing risk attitudes in the local environment also strongly influence the risk behavior of children and use the average regional willingness to take risks as a predictor of children's risk attitudes. If most respondents in the ULMS have not changed the region (oblast) since the end of their adolescence or if those who did move did not move to the region because of the prevailing risk behavior in the destination, we can use the average willingness to take risks at the oblast level as an instrument for the risk-attitudes of non-movers and the average risk measure of the oblast were the movers grew up as an instrument for the risk-attitudes of movers.

Since we have self-assessed risk measures revealed in the years 2007 and 2012 when most respondents are no longer children, we also need the assumption that after leaving the stage of adolescence respondents' risk attitudes are stable, i.e., they do not change their risk attitudes in a fundamental way. This assumption is widely accepted in the psychology literature (see e.g., Roberts, 2009). Research on personality shows high temporal stability in differences between individuals across long timespans, i.e. rank-order stability (see also discussions of rank-order stability in Schildberg-Hörisch, 2018, and Mata et al., 2018). This does not preclude population mean-level changes such as systematic changes over the life course in personality traits (Roberts and DelVecchio, 2000) or risk preferences (Dohmen et al., 2017) or changes in macroeconomic conditions (e.g., Bucciol and Miniaci, 2018; Dohmen, Lehmann and Pignatti, 2016). Rank-order stability of risk preferences does, however, imply that idiosyncratic changes in risk preferences, e.g., due to idiosyncratic shocks, are low. Importantly, Salamanca et al. (2023) do not only show a very high degree of persistence in risk preferences (see also footnote 6) but estimate that idiosyncratic shocks account for only a very small part of the variation in risk preferences over time, explaining at most eight percent of a standard

deviation.

Regarding Ukraine, this assumption is at least partially confirmed in the study by Dohmen, Lehmann and Pignatti (2016), who show that individual life events do not affect risk attitudes over time, while large economic shocks like the Great Recession lower the willingness to take risks across the board (see Table 3 ibidem).

In addition to regional (i.e., oblast-level) willingness to take risk, we use own height and father's and mother's occupations as further instruments for the risk measure since these variables can be assumed to be correlated with the propensity to take risks but not with the selection decision across the informal-formal divide. This assumption is confirmed by the insignificance of the coefficients on own height, father's, and mother's occupations when we estimate a linear probability model of being in informal employment using the individual risk measure, other observable characteristics and these three variables as explanatory variables.[9][10]

V. Empirical evidence

V.1 Risk measures, employment types and demographic characteristics – A descriptive analysis

Most members of the Ukrainian employed workforce are very reluctant to take risks in general as Figure 2 demonstrates for the wave of 2007. The modal for all employed is at the value 5, with 17% of all respondents, while the second highest frequency is found at value 0, with 16% not willing to take any risk. Roughly 20% of Ukrainian employed workers report a value that is larger than 5. In comparison, Dohmen et al. (2016) show that the German workforce in 2004 is somewhat more prone to take risks in general. About 30% of German workers assess their willingness to take on risks in general as being

[9] The results of this regression are available upon request. Also note that in our main regressions Hansen's J tests also confirm the orthogonality of these instruments with respect to the probability of being in informal employment (see Tables A1 and A2).

[10] 31 percent of (employed/all) respondents left the survey between the reference weeks of 2007 and 2012. Do risk attitudes in general have an impact on this large attrition rate? To answer this question, we regress the probability to attrite between 2007 and 2012 on the standardized general risk measure and all other covariates available in 2007; we perform such a regression for the sample of employed workers and for the entire sample. An increase in the general risk measure by one standard deviation raises the probability to attrite by 1.6 percent for the employed sample, and by 1.6 percent for the entire sample. These increases are miniscule relative to the average probability of attrition, which amounts to 31 percent in both samples. Hence, we are not concerned with attrition issues in our analysis.

larger than 5 on the eleven-point Likert scale. While the modal response is 5 in both countries, roughly 22% of the respondents in Ukraine indicate lower numbers, while only 8% of German workers report values smaller than 5. Hence, the Ukrainian distribution is much more skewed towards non-risk takers than is the German distribution.[11]

In Figure 3 we link risk attitudes with the five employment states that the ULMS data allow us to identify: formal employees, involuntary informal employees, voluntary informal employees, formal self-employed and informal self-employed. The figure clearly demonstrates that in 2007 formal employees are far more risk averse than the other employment types, concentrating much more mass in the lowest part of the risk attitudes distribution. In contrast, the voluntary informal employees, the formal and informal self-employed are associated with a higher willingness to take risks. We also find this pattern in 2012 (see Figure OA3 in the online appendix). Both Figures 3 and OA3 suggest a link between general risk attitudes and the employment type, with workers who are on average more prone to take risks in general engaging more in informal activities. A very similar picture emerges when we plot the distributions of the career risk measure by employment type for 2007 and 2012.[12]

Table 1 gives averages of the general risk measure for the five employment categories by demographic characteristics, sectors, and macro-regions for the year 2007. Inspection of these averages drives the point home that formal employees grosso modo report a lower willingness to take risks than respondents in the other employment categories, no matter which correlate we condition on. Also, those who are voluntarily informal employees making up slightly less than one third of all informal employees profess a larger willingness to take risks than the involuntarily informal employees, i.e., those among the informal employees whose jobs are not registered even though they would prefer registration. It is also striking that the self-employed who register their activity have a slightly higher propensity to take risks than the non-registered (informal) self-employed.

Looking inside the sets of demographic characteristics we see that men are more willing to take

[11] To put this strong risk aversion of Ukrainians even more in international perspective, we should note that SOEP respondents are on average substantially more risk averse than, e.g., respondents in the U.S. (Fehr et al. 2006; Falk et al. 2015).

[12] These plots are not shown here but available upon request.

risks as are younger workers and workers with basic or university education. It is striking that middle-aged workers (of age brackets 36 to 55) have a decidedly lower tendency to engage in risky behavior than younger or older workers. This age pattern holds for all employment types apart from the formally self-employed. On the other hand, the U-shaped profile by education is valid for all informal employees and the formally self-employed whilst risk attitudes increase across educational categories in a monotonic fashion for the informally self-employed. In addition, those workers, who are married and have at least one child, are more risk-loving than their childless counterparts. This somewhat counterintuitive result holds for all employment categories but formal self-employment.

Turning to risk attitudes within employment types along sectors, we see a relatively similar distribution of the risk measure across sectors among the formal employees and the involuntary informal employees. For the other employment types there is some variation across sectors, but this variation is not as pronounced as the variation across demographic characteristics. Average willingness to take risks is very similar across macro-regions among formal employees. Within the other employment types, we find stronger differences in risk attitudes across regions, although in some cases the number of observations is too small to draw meaningful conclusions. Inspection of Table OA1 in the online appendix, which shows averages of the general risk measure for the employment categories by demographic characteristics, sectors, and macro-regions for the year 2012, leads us to conclude that the relative position of the employment types is nearly the same as in 2007. While in the earlier period voluntary informal employment had the highest average risk measure, in 2012 it is formal self-employment. The relative magnitudes of the risk measure are preserved for the other employment types, with formal employees having a far lower average value in the risk measure also in 2012. The results we presented for 2007 are for the most part confirmed for 2012 when we inspect average risk attitudes across and within employment types along demographic characteristics, sectors, and macro-regions.

Before we turn to the results of our econometric analysis let us briefly look at the occupation structure of salaried employment in 2007. Table OA2 in the online appendix shows that service workers and salespersons as well as workers in unskilled occupations find themselves disproportionately in

informal employment. It is particularly striking that the percentage of these occupations is particularly high among the involuntary informal employees. On the other hand, skilled manual workers who make up a large fraction of the informally salaried employed are disproportionately represented among voluntary informal employees. Thus, it is foremost service workers, salespersons and workers in unskilled occupations who are forced to work as informal employees while among informally employed skilled manual workers there is a relatively large minority that chooses this state voluntarily.[13]

V.2 Determinants of employment states across the formal-informal divide

We begin with the summary of linear probability models that estimate the probability to be in informal employment in 2007 and 2012. All salaried employees whose job is not registered and all self-employed whose activity is not registered are considered informal and assigned the value 1, all other salaried employees and self-employed are assigned the value 0. This dichotomous 1-0 dependent variable is regressed on the general risk measure, which can take values between 0 and 10 as a measure of workers' risk attitudes, and on a battery of control variables. Table 2 shows the coefficients on the standardized general risk measure for 3 specifications using OLS and IV estimation. Before discussing the control variables, the 3 specifications and the appropriateness of our instruments in our linear probability regressions in some detail, let us highlight one of our main findings in this study presented in Table 2.

The table shows significant coefficients on the standardized risk measure for 2007 and 2012 no matter which estimation method and specification we use. Inspection of the OLS and IV results allows us to conclude that measurement error of the risk attitudes variable is an obvious concern since the magnitude of the coefficients is raised five- to six-fold in 2007, and roughly eight-fold in 2012 when we move from OLS to IV estimation. The impact of risk attitudes on being in the state of informal employment is statistically significant in 2007 at the 1 percent level, and statistical significance is somewhat weaker in 2012 with p-values of less than 0.05. The economic/behavioral impact of the standardized general risk measure on the probability of being informally employed is also large in both

[13] Inspection of the occupation structure of salaried employment along the formal-informal divide in 2012 leads to similar conclusions. The 2012 matrix, linking occupations and type of employment, is not shown here but available upon request.

years, particularly if we take the IV results as the relevant ones. In 2007, when the baseline probability of informal employment is around 12 percent, *ceteris paribus* an increase of the risk measure by one standard deviation, i.e., by roughly 2.8 units on the 11-point Likert scale, raises the probability to be informally employed by between 12 and 15 percentage points. This effect is somewhat smaller in 2012 but still large, since, given a raw probability of informal employment of 15 percent and holding all other factors constant, an increase of the risk measure by 2.6 units augments the probability of being informally employed by between 10 and 11 percentage points.

How important these effects are relative to other determinants of informal employment can be inferred from Tables A1 and A2 in the appendix where we present the full results of our estimated linear probability models. Columns 1-3 show three specifications employing OLS estimation, while columns 4-6 have the same specifications but are estimated with IV, in fact with two-stage least squares (TSLS). Columns 1 and 4 include besides the standardized risk measure demographic characteristics, educational attainment dummies, macro region dummies, industrial sector dummies and the log of household income as covariates. In columns 2 and 5 we add a dummy for a period of non-employment between 2004 and 2007 in table A1 (year 2007) and between 2007 and 2012 in Table A2 (year 2012). Finally, the third specification (columns 3 & 6) includes a further dummy for being in an informal employment relationship in the reference weeks of 2003 and/or 2004 in Table A1 (year 2007) and in the reference weeks of 2004 and/or 2007 in Table A2 (year 2012). [14]

Inspection of the IV results helps us to establish those determinants of the probability to be informally employed that are highly significant in both years. Females have a slightly higher probability to be in an informal employment state than men, while graduates of vocational and higher education have a far lower probability to be informally employed. Those employed in agriculture, construction, and services have a much higher incidence of informal employment than workers in other sectors. A previous non-employment spell raises the probability of being in an informal employment relationship substantially only in 2007. On the other hand, a previous informality spell predicts a higher probability

[14] We should note that a previous spell of non-employment can be established anytime between reference weeks whilst a previous spell of informal employment can only be determined during reference weeks.

of working in an informal job in both years, and thus confirms the strong persistence of informal employment in the Ukrainian labor market, which was shown by Akay and Khamis (2012).

When we compare the magnitudes of the coefficients on the general risk measure with the coefficients on the other main determinants of the probability to be informally employed, we can infer that attitudes towards risk taking are not quite as important in predicting informality as are educational attainment, industrial sector, and a previous informal employment spell, but nevertheless of crucial importance. Ignoring risk attitudes in a cross-sectional setting leads to substantial omitted variable bias.

Two test statistics in Tables A1 and A2 tell us how well the instruments perform in our IV (TSLS) regressions. The high probability values of Hansen's J test, which is the appropriate overidentification test in case of robust standard errors, confirm the null hypothesis of no correlation between the used instruments and the error term of the second stage regression. At the same time, we can very convincingly establish in the 2007 regression that the used instruments are strong. The first stage regressions for 2007 shown in Table OA3 in the online appendix demonstrate that all four instruments (mother's occupation, father's occupation, own height, average risk score at oblast level) are statistically significant in predicting individual risk attitudes in all specifications. The F-statistics of the Montiel-Pflueger robust weak instrument test are larger than the 5% worst case bias threshold in all specifications, pointing to very strong instruments in our non-homoscedastic setting.[15] The performance of the instruments is somewhat weaker in the 2012 regressions. Here only two instruments are statistically significant in the first stage regression (see Table OA4). However, the F-statistics of the Montiel-Pflueger test are only slightly lower than the 5% worst case bias threshold and substantially higher than the 10% threshold, thus still revealing strong instruments according to Montiel and Pflueger (2013) and Andrews et al. (2019).

We also estimate the probability of informal employment using the career risk measure as one of the predictors. Tables OA5 and OA6 in the online appendix show the full results of linear probability models for 2007 and 2012. We use mother's and father's occupation, own height, and average

[15] In a non-homoscedastic setting the correct F-statistic to detect weak instruments is the F-statistic developed by Montiel and Pflueger according to Andrews, Stock and Sun (2019).

willingness to take risks in career matters at the Oblast level as instruments for the IV (TSLS) regressions. While most of the coefficient estimates of control variables are very similar in terms of magnitude and significance levels as in the regressions with the general risk measure, as a comparison of tables OA5 and OA6 with tables A1 and A2 attests, the estimated effect of standardized willingness to take risks in career matters is only significant in 2007, but insignificant in 2012 independent of the estimation method. For 2007, Hansen's J test is satisfactory, but the values of the Montiel-Pflueger F-statistic point to not very strong instruments. We conclude that the standardized willingness to take risks in career matters is an inferior predictor of informal employment compared to the standardized willingness to take risks in general.[16]

The results discussed so far lead to the intermediate conclusion that willingness to take risks is an important predictor for being in formal vs. informal employment, where we subsume informal salaried employment and informal self-employment under the broad term informal employment. All regressions demonstrate that more risk loving individuals are more engaged in such broadly perceived informal employment. At the same time the IV regressions deal with measurement error and endogeneity issues and convincingly establish a large causal effect of risk attitudes on informality.

The ULMS data enable us to partition employment into five mutually exclusive states and investigate which impact risk attitudes have on these states using multinomial logit (MNL) regressions. Table 3 shows odds ratios in 2007 and 2012 for four states: involuntary informal dependent employment (IINV), voluntary informal dependent employment (IVOL), formal self-employment (FSE), and informal self-employment (ISE), with formal dependent employment serving as the default category. Before discussing the odds ratios on the standardized risk measure, we briefly comment on the odds ratios of the other covariates. Being Ukrainian and being female only has a strong negative impact on engaging in formal self-employment but does not affect the relative probabilities of the three informal employment states. In contrast, individuals with vocational and higher education are much less likely

[16] It is also not very clear how the average willingness to take risks in career matters at the regional level contributes to the formation of the willingness to take risks in career matters at the individual level. In contrast, the contribution of the average willingness to take risks in general at the regional level to the formation of this willingness at the individual level is well founded in the literature discussing the socialization process of children and adolescents.

to end up in voluntary dependent informal employment in 2007 and in both types of dependent informal employment and in informal self-employment in 2012. In addition, the log of household income affects positively the entrance into formal self-employment in both years. Finally, previous non-employment and informality spells raise the probability to be in any of the three types of informal employment in a particularly dramatic fashion. This last result and the highlighted odds ratios on the discussed covariates strike us as intuitively very reasonable.

The standardized general risk measure raises the relative probabilities of being in any of the three informal employment states or in formal self-employment in 2007. There are, however, substantial differences in the magnitudes regarding voluntary and involuntary dependent informal employment. While an increase of the general risk measure by one standard deviation raises the relative probability of voluntary salaried informal employment by approximately 51 percentage points, this rise in the relative probability is with roughly 27 percentage points much smaller in the case of involuntary salaried informal employment. In 2012 we have significant odds ratios above 1 only for voluntary salaried informal employment, and for formal and informal self-employment, but not for involuntary salaried informal employees. Since workers from this latter category have non-registered jobs against their will, their general risk attitudes should not necessarily enlarge the likelihood of being in an informal job relative to the likelihood of being a formal employee. The evidence regarding this supposition seems to be confirmed. In 2012, we find that higher willingness to take risk does not increase the probability of being involuntarily informally employed relative to being in formal salaried employment, while in 2007 we find a statistically significant positive effect of willingness to take risks on this relative probability, but this effect is much smaller than for the other two categories of informality and for formal self-employment.

V.3 Reverse causality, transitions between labor market states and exit from unemployment

To analyze potential reverse causality between risk attitudes and informal employment spells we take advantage of the panel nature of our data and of the fact that we can identify informal employment

spells in the reference week of four points in time (2003, 2004, 2007, and 2012) and that we solicit information on self-assessed risk attitudes in the reference weeks of 2007 and 2012.

One concern in the literature regarding risk attitudes and labor market outcomes relates to the fact that some respondents have experienced the analyzed labor market state long before the questions regarding risk attitudes were asked. In our case, we have some respondents who were informally employed in the reference weeks of 2003 and/or 2004 or who flew into informal employment between 2004 and the reference week of 2007; all these respondents were hence informally employed before the questions on risk attitudes were asked in 2007. It is conceivable that experiencing an informal employment spell might influence individuals' perception of their risk attitudes and bias their responses upward.

To test this potential artefact of reverse causality, we proceed in two ways. In the upper panel of Table 4 we regress the probability of moving into informal employment between 2007 and 2012 on risk attitudes measured in 2007. This regression has as its group of interest only those movers who were never informally employed before the reference week in 2007, hence we isolate the pure effect of risk attitudes on selection into informal employment. The results demonstrate that there is a statistically significant positive impact of risk attitudes on informal employment for movers without any prior informality experience.

In the bottom panel of Table 4 we look at the effect of moving into informal employment between 2007 and 2012 on the change in the risk index. Again, we restrict the sample of movers to those without any prior informality spell. This regression produces insignificant results, and hence tells us that moving into informality does not affect risk attitudes in a statistically significant way. So, on the face of our evidence we can infer that reverse causality is of little concern in the Ukrainian labor market.

We thus far have established that individuals who select themselves into voluntary informal dependent employment, and informal and formal self-employment have a higher propensity to take risks in general than individuals who are formal employees. This result, however, does not necessarily point to the desirability of these labor market states in the medium run.

To see which labor market states are preferred by workers in the medium term we calculate transition probabilities between 6 labor market states, and the state "out of the labor force" (OLF), taking 2007 as the origin period and 2012 as the destination period.[17] We consider two measures that allow us to pinpoint the desirable employment states in the medium run. First, we inspect the diagonal elements of the transition probabilities matrix to see whether a high fraction of individuals who were in the original employment state remains in this state after five years. Second, we identify the preferred destination state to which individuals move to from their original employment state should they not remain in their original states in large numbers.

The diagonal elements in Table 5 allow us to identify the "absorbing" employment states in the Ukrainian labor market, i.e., states that are rather persistent. Formal dependent employment as well as formal self-employment are such states since 66 percent of formal employees and 48 percent of the formally self-employed remain in this type of employment type over the five years period. Compared to informal salaried employment informal self-employment also seems a relative desirable state since 35 percent of the informally self-employed are still in this state after five years. This indicates that formal dependent employment, as well as formal and informal self-employment are also desirable states from the workers' perspective whilst voluntary transitions to the informal salaried sector are rare. The state of formal sector dependent employment appears to be particularly attractive. The largest outflows from any employment state are into formal dependent employment. At the same time, the majority of workers in formal dependent employment does not move out of this state (66 percent). Few workers leave formal dependent employment to transit to the informal sector while workers most frequently leave the labor force. The second largest exit state from formal dependent employment is unemployment. Once unemployed, the majority of workers either leaves the labor force (44 percent of unemployed workers) or is still unemployed at the end of the observation period. A substantial fraction of unemployed workers switches to formal dependent employment (29 percent), while the share of unemployed workers who go through a spell of informality is relatively small (10 percent of the

[17] We remove those respondents from the sample whom we can identify as "round-trippers", i.e., we only consider one-time moves between 2007 and 2012.

unemployed switch to either informal involuntary employment, informal voluntary employment or informal self-employment.)

Strikingly, zero percent of the workers who were voluntarily informal employees in 2007 still find themselves in this category in 2012, while for involuntary informal employees the percentage of those remaining in the same state is 7 percent. For informal employees the strongly preferred state in the medium run is formal dependent employment; roughly a third of workers who were originally voluntary or involuntary informal employees become formal employees by 2012. Transitions to any other state are clearly less important, as inspection of Table 5 demonstrates. In contrast, transitions from formal employment to informal are much less prevalent. So, on the face of this evidence we can moot that the Ukrainian labor market has a dichotomous nature. Ukrainian employees seem confronted with a segmented labor market as highlighted by Lehmann and Pignatti (2018), where informal employment is an alternative to unemployment or non-participation rather than to formal employment.

In light of the evidence that willingness to take risks affects selection into informality, we study next whether unemployed workers with a higher proclivity to take risks are more likely to exit into informal employment or self-employment than leaving the labor force or exiting to formal dependent employment. To this end, we estimate hazard rates for leaving unemployment for workers who become unemployed during the period from March 2007 until 2012, using a competing risks model with possible transitions to one of the following four alternative states to unemployment: formal dependent employment, informal salaried employment (both voluntary and involuntary), formal and informal self-employment, and non-participation.[18] In Table 6, we present sub-hazard ratios, focusing on the effect of willingness to take risks on exiting from unemployment to any of these four states. The estimates reveal that workers who are more willing to take risks have a significantly increased incidence of becoming self-employed, including of becoming informally self-employed. The impact of risk attitudes on transiting to self-employment is robust to controlling for age, nationality, gender, marital status, number of children in the household, education, as well as regional and year fixed effects. At the same

[18] Due to small sample size, we grouped formal and informal self-employment as well as voluntary and involuntary informal dependent employment into one category each.

time, higher willingness to take risks is associated with a reduced incidence of leaving the labor force or transiting to formal employment, and a higher incidence of entering informality, although these effects are not statistically significant. Hence, the sub-hazard ratios on the standardized risk variable reveal that higher willingness to take risks increases the hazard rate of becoming self-employed, when controlling for transitions to competing exit states. and suggest that higher willingness to take risks increases hazard rates of entering informal employment relative to transiting to formal employment.

VI. Conclusions

Using data from the four waves of the ULMS (2003, 2004, 2007 and 2012), we analyze the question whether workers with a higher willingness to take risks are more likely to select into informal salaried or informal self-employment. We have risk measures, which are derived from self-assessed risk attitudes in general and in career matters on a 11-point Likert scale, for the waves of 2007 and 2012. For most of the analysis the data permit us to not only make a dichotomous distinction of formal versus informal employment, but to distinguish between five employment states: formal and informal self-employment, formal salaried employment, voluntary informal salaried employment, and involuntary informal salaried employment. These five employment states can be identified in the reference weeks of the respondents in all four waves.

Since informal jobs are more risky than formal jobs along several dimensions, we test whether individuals with a greater proclivity to take risks in general or in career matters have a higher probability to select themselves into informal employment relationships. Linking risk attitudes with selection into an employment state along the informal-formal divide can also contribute to the discussion regarding segmentation versus integration of informal and formal segments of labor markets in developing and emerging economies. Since we can distinguish between informal employees who are voluntarily or involuntarily in informal dependent employment, we can see whether risk attitudes have a different impact on those who voluntarily choose informal dependent employment compared to those who find themselves in this type of employment against their will.

Testing for reverse causality we find no evidence that being in informal employment affects the risk attitudes of individuals. Instrumenting our risk measure with strong instruments we reduce attenuation bias due to measurement error and minimize endogeneity bias. Hence, we are convinced that we can establish a causal effect of risk attitudes on selection into informal employment.

Subsuming informal salaried employment and informal self-employment under the broad term informal employment we find that individuals with a higher propensity to take risks in general have a higher probability to be engaged in informal employment. When we split employment into five mutually exclusive states and estimate odds ratios relative to formal dependent employment using a multinomial logit model, we find that risk attitudes play only a small positive role in 2007 and no role in 2012 regarding the prediction of involuntary salaried informal employment. When it comes to voluntary salaried informal employment, informal self-employment, and formal self-employment, on the other hand, we find risk attitudes a strong positive factor for selection into these three states. We take these results as evidence that at least for a majority of salaried workers the labor market is segmented while for the self-employed we take the evidence pointing to an integrated labor market where individuals can freely choose their employment state along the informal-formal divide.

Medium-term transition probabilities between labor market states point us to those employment states that are particularly desired by workers. Inspection of the diagonal elements of the estimated transition matrix establishes that formal salaried employment, formal as well as informal self-employment are those "absorbing" states where a large percentage of workers remains even after five years. In contrast, voluntary and involuntary informal salaried employment seem in the medium run undesirable states for workers. It is also striking that formal salaried employment is for all other origin states by far the most desired destination employment state. This is particularly true for informal salaried employment (voluntary or involuntary) since more than a third of workers in these states move to formal employment. Other important destination states are unemployment and non-participation for informal employees. The countermoves from formal salaried employment to informal salaried employment are, on the other hand, miniscule. This evidence thus points for Ukrainian employees to labor market

segmentation along the formal-informal divide where informal salaried employment is a waiting stage alternative to unemployment or non-participation with the ultimate aim to enter formal employment.

Since many Ukrainian workers transit through unemployment, we finally explore, using a competing risks model, whether unemployed workers with a higher propensity to take risks are more likely to exit into informal salaried employment and self-employment than leaving the labor force or exiting to formal salaried employment. Our results reveal that higher willingness to take risks increases the hazard rate of becoming self-employed or an informal employee, when controlling for transitions to competing exit states.

Honing in on the two principal results of our study we can summarize these as follows. Risk attitudes affect selection into employment states in a causal fashion. Individuals with a higher propensity to take risks have a higher likelihood to select into voluntary informal dependent employment and informal self-employment than into formal dependent employment. Our second result characterizes the Ukrainian labor market as having a dichotomous nature along the formal-informal divide. Employees are predominantly confronted with a segmented labor market, whilst for the self-employed the Ukrainian labor market is integrated.

References

Akay, A. and Khamis, M. 2012. “The Persistence of Informality: Evidence from Panel Data.” Research in Labor Economics, 34, 229-256.

Andrews I., Stock J., Sun L., 2019. “Weak Instruments in IV Regression: Theory and Practice.” Annual Review of Economics,11, 727-753.

Bauernschuster, S., Falck, O., Heblich, S., Suedekum, J., Lameli, A., 2014. “Why are Educated and Risk-loving Persons more Mobile across Regions?” Journal of Economic Behavior & Organization, 98, 56-69.

Beauchamp, J. P., D. Cesarini, and M. Johannesson. 2017. “The Psychometric and Empirical Properties of Measures of Risk Preferences," Journal of Risk and Uncertainty, 54, 203-237.

Bonin, H., T. Dohmen, A. Falk, D. Huffman and U. Sunde. 2007. "Cross-sectional Earnings Risk and Occupational Sorting: The Role of Risk Attitudes." Labour Economics, 14(6), 926-937.

Boeri, T. and K. Terrell. 2002. "Institutional Determinants of Labor Reallocation in Transition." Journal of Economic Perspectives, 16(1), 51-76.

Bound, J., Brown, Ch., and N. Mathiowetz. 2001. “Measurement Error in Survey Data.” In J.J. Heckman and E. Leamer (Eds)., Handbook of Econometrics, Vol. 5, 3707-3843.

Bucciol, A. and R. Miniaci. 2018. “Financial Risk Propensity, Business Cycles and Perceived Risk Exposure.” Oxford Bulletin of Economics and Statistics 80(1): 160–83.

Caliendo, M., F. M. Fossen and A.S. Kritikos. 2010. "The Impact of Risk Attitudes on Entrepreneurial Survival." Journal of Economic Behavior & Organization, 76 (1), 45 -63.

Caliendo, M., F. M. Fossen and A.S. Kritikos. 2009. “Risk Attitudes of Nascent Entrepreneurs: New Evidence from an Experimentally-Validated Survey.” Small Business Economics, 32 (2), 153-167.

Chen, M.A. 2006. Rethinking the Informal Economy: Linkages with the Formal Economy and the Formal Regulatory Environment, in: Guha-Khasnobis, B., Kanbur, R. and Ostrom, E. (Eds.) 2006. Linking the Formal and Informal Economy: Concepts and Policies. Oxford University Press.

Cunningham, W. V. and W. F. Maloney. 2001. "Heterogeneity among Mexico's Microenterprises: An Application of Factor and Cluster Analysis." Economic Development and Cultural Change, 50, 131-156.

Dohmen, T., A. Falk, D. Huffman, U. Sunde, 2012. “The Intergenerational Transmission of Risk and Trust Attitudes”, The Review of Economic Studies, 79(2), 645–677, https://doi.org/10.1093/restud/rdr027

Dohmen, T., A. Falk, B. H. Golsteyn, D. Huffman, and Sunde, U. , 2017. “Risk Attitudes across the Life Course," The Economic Journal, 127, F95-F116.

Dohmen, T., A. Falk, D. Huffman, U. Sunde, J. Schupp and G.G. Wagner. 2011. "Individual Risk Attitudes: Measurement, Determinants and Behavioral Consequences.” J. Eur. Econ. Assoc. 9 (3), 522-550

Dohmen, T., H. Lehmann and N. Pignatti. 2016. “Time-varying Individual Risk Attitudes over the Great Recession: A Comparison of Germany and Ukraine. “ Journal of Comparative Economics, 44 (1), 182-200.

Dustmann, C, F Fasani, X Meng and L Minale, 2023. “Risk Attitudes and Household Migration Decisions”, Journal of Human Resources, 58, 112–145.

Falco P., 2014. “Does risk matter for occupational choices? Experimental evidence from an African labour market”. Labour Econ., 28, 96–109.

Fields, G. S..1990."Labour Market Modelling and the Urban Informal Sector: Theory and Evidence." in The Informal Sector Revisited. David Thurnham, Bernard Salomé and Antoine Schwarz ed: OECD. Paris.

Fouarge, D., Kriechel, B., Dohmen, D. 2014. “Occupational Sorting of School Graduates: The Role of Economic Preferences. Journal of Economic Behavior & Organization”, 106, 335-351.

Guasch, J. L... 1999. Labor Market Reforms and Job Creation: the Unfinished Agenda in Latin America and the Caribbean Countries. Washington D.C.: World Bank.

Guha-Khasnobis, B., Kanbur, R., and Elinor Ostrom (eds), 2006. ”Beyond Formality and Informality', in Basudeb Guha-Khasnobis, Ravi Kanbur, and Elinor Ostrom (eds), *Linking the Formal and Informal Economy: Concepts and Policies*, WIDER Studies in Development Economics (Oxford, 2006; online edn, Oxford Academic, 1 Sept. 2006), https://doi.org/10.1093/0199204764.003.0001, accessed 28 June 2023.

Harris, J.R. and M.P. Todaro. 1970. "Migration, Unemployment and Development: A two Sector Analysis." American Economic Review, 60, 126-142.

Heitmueller, A. (2005). “Unemployment Benefits, Risk Aversion, and Migration Incentives”. Journal of Population Economics, 18(1), 93–112.

Jaeger, D.A., H. Bonin, T. Dohmen, A. Falk, D. Huffman and U. Sunde. 2007. "Direct Evidence on Risk Attitudes and Migration." 2010. Review of Economics and Statistics, 92 (3), 684-689.

Kanbur, R.. 2009. "Conceptualizing Informality: Regulation and Enforcement." Unpublished Working Paper.

Kanbur, R., 2017. “Informality: Causes, consequences and policy responses”, Rev Dev Econ, 21, 939–961. https://doi.org/10.1111/rode.12321

Koudstaal, M., Randolph Sloof, R., van Praag, M., 2015. “Risk, Uncertainty, and Entrepreneurship: Evidence from a Lab-in-the-Field Experiment”. Management Science, 62(10), 2897-2915.

Krstic, G. and P. Sanfey. 2007. "Mobility, Poverty and Well-Being Among the Informally Employed in Bosnia and Herzegovina. " Economic Systems, . 31(3), 311-335.

Lehmann, H. and N. Pignatti. 2007. "Informal Employment and Labor Market Segmentation in Transition Economies: Evidence from Ukraine. " IZA Discussion Paper No.3269.

Lehmann, H. and Pignatti, N., 2018. “Informal Employment Relationships and the Labor Market: Is

there Segmentation in Ukraine?" Journal of Comparative Economics, 46(3), 838-857.

Lehmann, H., Muravyev, A. and K.F. Zimmermann, 2012. "The Ukrainian Longitudinal Monitoring Survey: Towards a Better Understanding of Labor Markets in Transition." IZA Journal of Labor and Development, 1:9.

Maloney, W. F..1999."Does Informality Imply Segmentation in Urban Labor Markets? Evidence from Sectoral Transitions in Mexico." World Bank Economic Review, 13, 275-302.

Maloney, W. F.. 2004. "Informality Revisited." World Development, 32, 1159-1178.

Mata, R., Frey, R., Richter, D., Schupp, J. and Hertwig, R., 2018. "Risk Preference: A View from Psychology." Journal of Economic Perspectives, 32(2), 155–172

Montiel, O., Pflueger C. and Pflueger, J.L., 2013. "A Robust Test for Weak Instruments." Journal of Business & Economic Statistics, 31(3), pp.358–369. doi:10.1080/ 00401706.2013.806694.

Pages, C. and M. Stampini. 2007. "No Education, No Good Jobs? Evidence on the Relationship between Education and Labor Market Segmentation. " IZA DP 3187.

Perry et al.. 2007. Informality: Exit and Exclusion. Washington D.C..

Roberts, B. W., 2009. "Back to the Future: Personality and Assessment and Personality Development." Journal of Research in Personality, 43(2): 137–45.

Reiersøl, O., 1941. "Confluence Analysis by Means of Lag Moments and Other Methods of Confluence Analysis." Econometrica, 9 (1), 1-24.

Roberts, B. W., DelVecchio, W. F., 2000. "The Rank-Order Consistency of Personality Traits from Childhood to Old Age: A Quantitative Review of Longitudinal Studies." Psychological Bulletin 126(1): 3–25.

Salamanca, N., Cardak, B.A., Ip, E., and Vecci, J., 2023. "Time-stability of Risk Preferences: A New Approach with Evidence from Developed and Developing Countries." Discussion Papers 2305, University of Exeter, Department of Economics.

Schildberg-Hörisch, H., 2018. "Are Risk Preferences Stable?" Journal of Economic Perspectives, 32, 135-54.

Skriabikova, O.J., Dohmen, T., and Kriechel, B., 2014. "New Evidence on the Relationship Between Risk attitudes and Self-employment". Labour Economics, 30, 176-184.

Tokman V., 1986. "The informal sector: fifteen later. " Paper presented at the Conference 'The Comparative Study of the Informal Sector', Harper's Ferry, October.

Van Huizen, T., Alessie, R., 2019. "Risk aversion and Job Mobility." Journal of Economic Behavior & Organization", 164, 91-106.

FIGURES AND TABLES

Figure 1- DETERMINATION OF INFORMAL EMPLOYMENT AND MEASURES OF RISK ATTITUDES

Panel A.1 Dependent employment: information used for determining informality vs. formality

Question: Tell me, please, are you officially registered at this job, which is on a work roster, work agreement or contract?

Answer: 1. Registered 2. Not Registered.

Panel A.2 Self-employment: information used for determining informality vs. formality

Question: Is your activity registered?

Answer1. Yes 2. No

Panel A.3 Dependent employment: information used for determining the voluntary vs. involuntary nature of informal employment

Question: Why are you not officially registered at this job?

Answers: 1. Employer does not want to register.

2. I do not want to register.

3. Both employer and I do not want to register.

****

Panel B.1 Question soliciting information on self-assessed general risk attitudes

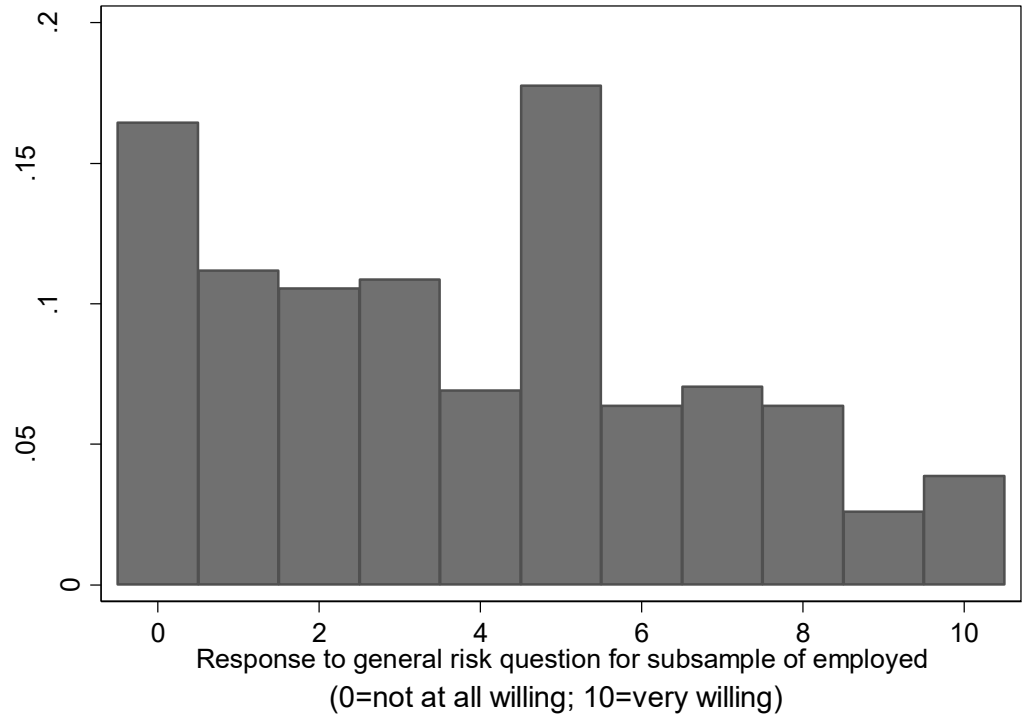
How do you see yourself? Are you generally a person who is fully willing to take risks or do you try to avoid taking risks? Please give a number from 0 to 10, where the value 0 means: "Completely unwilling to take risks" and the value 10 means "Completely willing to take risks". You can take the values in between to make your estimate.

Panel B.2 Question soliciting information on self-assessed domain-specific risk attitudes

People can behave differently in different situations. How would you rate your willingness to take risks in career matters, in health matters, in financial matters, during sports and leisure, while driving a car? (0 to 10 as before).

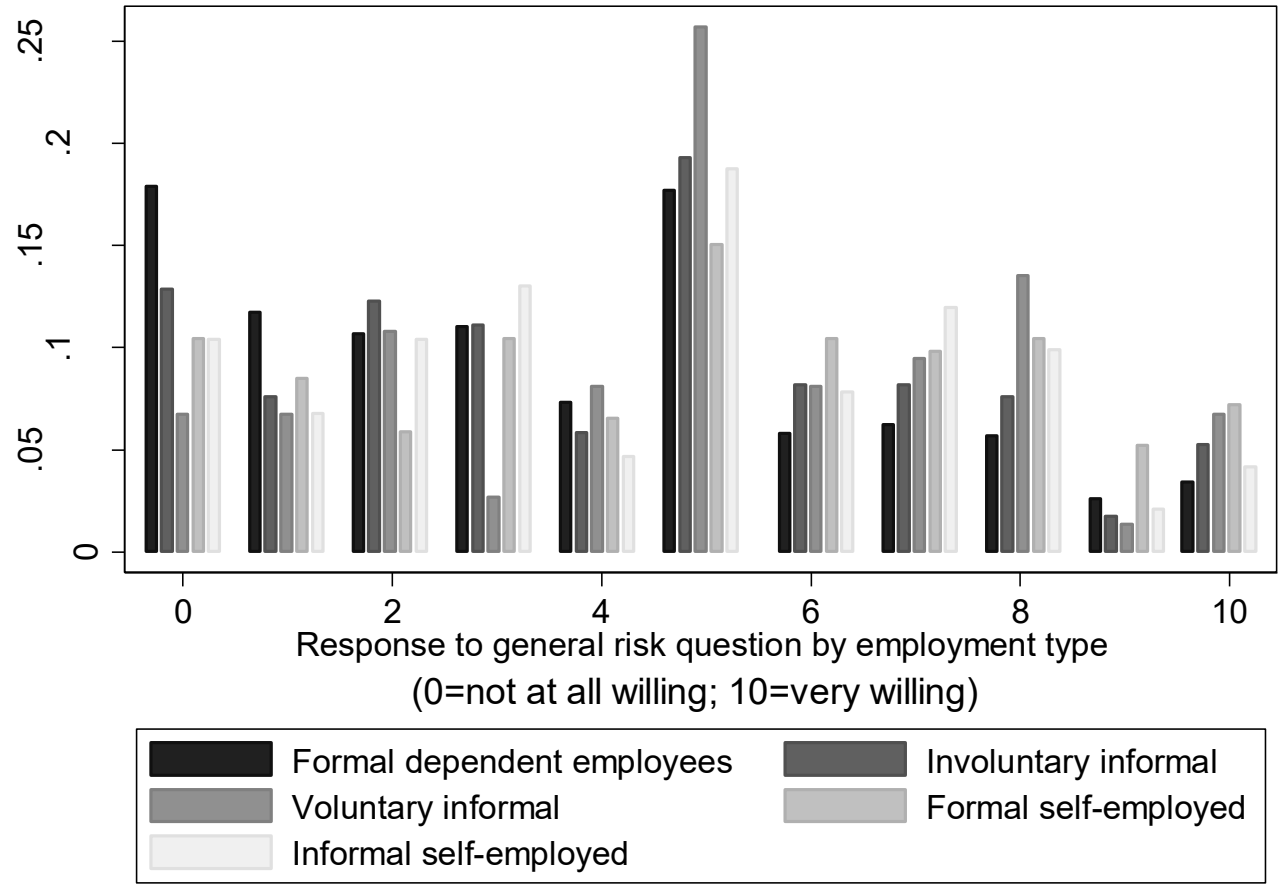
Source: Ukrainian Longitudinal Monitoring Survey (ULMS).

Figure 2. General Risk Attitudes – Ukraine 2007



Source: Ukrainian Longitudinal Monitoring Survey – year 2007

Figure 3. General Risk Attitudes by employment type – Ukraine 2007



Source: Ukrainian Longitudinal Monitoring Survey – year 2007.

Table 1. Average willingness to take risks by employment state in Ukraine – 2007

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Formal dependent employees		Involuntary informal		Voluntary informal		Formally self-employed		Informally self-employed	
	N	mean	N	mean	N	mean	N	mean	N	mean
All	2,438	3.666	169	4.231	71	4.958	153	4.869	183	4.557
Men	1,161	4.310	94	5.106	42	5.429	84	5.202	101	4.812
Women	1,277	3.080	75	3.133	29	4.276	69	4.464	82	4.244
Age										
15-25	316	4.535	50	4.480	22	5.909	6	4	21	5.238
26-35	515	4.111	43	4.977	20	5.800	34	4.735	30	4.767
36-45	637	3.570	39	3.846	12	3.250	60	5.350	53	4.264
46-55	694	3.062	30	3.433	13	3.538	44	4.614	57	4.070
56-65	276	3.580	7	3.429	4	5.250	9	4	22	5.591
Education										
Basic secondary or less	46	3.652	6	6.333	7	6.143	1	6	10	3.500
General secondary	281	3.427	27	3.481	13	4.231	14	4.929	35	4.143
Vocational	1,478	3.524	115	4.148	37	4.919	95	4.316	116	4.647
Higher education	622	4.108	18	5.556	14	5.143	42	6.048	22	5.227
Married										
No children	1,646	3.511	78	3.487	40	4	119	5.008	118	4.500
At least one child	790	3.990	91	4.868	31	6.194	34	4.382	65	4.662
Children										
Yes	1,531	3.632	92	4.152	41	5.561	79	5	112	4.420
No	907	3.723	77	4.325	30	4.133	74	4.730	71	4.775

Sector										
Agriculture	158	3.468	12	3.500	8	5.750	10	5	43	4.512
Industry	722	3.809	19	4.789	10	5.200	8	5	3	5
Construction	98	3.949	25	4.640	17	5.235	8	6	35	4.514
Sales, finance	329	3.778	70	4.043	19	4.579	92	4.598	16	4.813
Transportation	207	3.285	7	5.571	8	4.500	15	5	3	5.333
Public administration, education	738	3.505	4	4.500	1	1	1	5	5	6
Other services, other	178	3.972	28	4.321	8	5.125	16	5.500	22	4.500
Region										
Kiev	141	3.340	5	7.600	1	10	7	5.857	5	2.800
Center	620	3.679	37	3.378	18	4.278	42	4.357	47	5.128
West	381	3.874	18	4.444	10	3.500	30	6.267	33	5.061
East	687	3.584	42	4	24	5.750	43	4.744	31	5.032
South	609	3.690	67	4.537	18	5.111	31	4.161	67	3.821

NOTE: Authors' calculations.
Source: Ukrainian Longitudinal Monitoring Survey – year 2007.

Table 2. Risk Attitudes (standardized) and Informal Employment in Ukraine: 2007 and 2012 – Summary of Linear Probability Models

	Dependent variable: 1 if informally employed		
	(1)	(2)	(3)
	A		
2007 standardized general risk measure	0.025***	0.026***	0.024***
OLS on 2007 sample	(0.006)	(0.006)	(0.006)
Observations	2,529	2,529	2,529
Mean of dependent variable	0.1218	0.1218	0.1218
Standard deviation of risk measure (in levels)	2.848	2.848	2.848
	B		
2007 standardized general risk measure	0.155***	0.152***	0.122***
IV on 2007 sample	(0.042)	(0.041)	(0.038)
Observations	1,882	1,882	1,882
	C		
2012 standardized general risk measure	0.014**	0.014**	0.013*
OLS on 2012 sample	(0.007)	(0.007)	(0.007)
Observations	2,741	2,741	2,741
Mean of dependent variable	0.1507	0.1507	0.1507
Standard deviation of risk measure (in levels)	2.6269	2.6269	2.6269
	D		
2012 standardized general risk measure	0.113**	0.114**	0.099**
IV on 2012 sample	(0.045)	(0.044)	(0.045)
Observations	2,072	2,072	2,072

NOTES: OLS and IV estimates. The dependent variable is a dummy variable whose value is 1 if the individual is informally employed and zero if the individual is formally employed.
Control variables are given in the Table A1 in the annex for 2007, and in the Table A2 in the annex for 2012.
For 2007 OLS regressions, standard deviation of general risk measure (in levels): 2.848; for 2007 IV regressions, standard deviation of general risk measure (in levels): 2.828.
For 2012 OLS regressions, standard deviation of general risk measure (in levels): 2.627; for 2012 IV regressions, standard deviation of general risk measure (in levels): 2.610.
Instruments in the first stage of IV regressions are: mother's occupation, father's occupation, own height, average willingness to take risks at the Oblast level.
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: Ukrainian Longitudinal Monitoring Survey – years 2007 and 2012

Table 3 – Impact of standardized risk attitudes on likelihood to be in an employment state other than formal wage employment – 2007 and 2012

	2007				2012			
	(1) IINV	(2) IVOL	(3) FSE	(4) ISE	(5) IINV	(6) IVOL	(7) FSE	(8) ISE
Standardized risk measure	1.312***	1.673***	1.544***	1.564***	1.100	1.344*	1.534***	1.282***
	(0.135)	(0.243)	(0.168)	(0.183)	(0.112)	(0.238)	(0.188)	(0.122)
Age/10	1.428	0.706	44.856***	1.865	0.328*	0.059***	4.907*	0.771
	(0.960)	(0.646)	(41.860)	(1.443)	(0.198)	(0.055)	(4.256)	(0.487)
Age squared/100	0.932	1.021	0.642***	0.939	1.128*	1.418***	0.876	1.040
	(0.079)	(0.115)	(0.071)	(0.086)	(0.082)	(0.158)	(0.087)	(0.077)
Ukrainian	0.897	0.717	0.853	0.866	0.799	0.539	0.364***	0.877
	(0.228)	(0.248)	(0.232)	(0.256)	(0.195)	(0.231)	(0.094)	(0.217)
Female	0.939	1.220	0.666*	0.881	0.973	1.885	0.635**	0.745
	(0.208)	(0.365)	(0.152)	(0.233)	(0.196)	(0.757)	(0.145)	(0.156)
In a registered marriage	0.492***	1.214	1.476	0.678	0.646**	0.431*	0.918	0.583***
	(0.122)	(0.379)	(0.435)	(0.176)	(0.130)	(0.186)	(0.239)	(0.117)
Number of children in household	1.222	1.279	0.969	1.286	0.970	1.076	0.981	1.153
	(0.159)	(0.258)	(0.144)	(0.201)	(0.102)	(0.195)	(0.139)	(0.127)
General secondary education	1.556	0.513	0.799	1.378	0.396**	0.307*	2.421	0.798
	(0.925)	(0.311)	(0.906)	(1.025)	(0.161)	(0.219)	(2.788)	(0.389)
Vocational education	1.106	0.276**	0.794	1.114	0.420**	0.278*	3.325	0.514
	(0.614)	(0.150)	(0.861)	(0.775)	(0.156)	(0.188)	(3.766)	(0.240)
Higher education	0.392	0.276**	0.736	0.629	0.116***	0.110***	3.861	0.274***
	(0.243)	(0.156)	(0.817)	(0.477)	(0.049)	(0.080)	(4.398)	(0.137)
Log(adjusted household income)	0.994	0.949	1.745***	0.943	0.813**	0.600***	1.318*	0.943
	(0.117)	(0.166)	(0.297)	(0.147)	(0.083)	(0.103)	(0.217)	(0.115)
Had a period of non-	3.650***	3.211***	0.792	1.624	1.643**	2.009*	0.544**	0.844

employment between 2004 and 2007/2007 and 2012*								
	(0.889)	(1.119)	(0.278)	(0.518)	(0.368)	(0.818)	(0.169)	(0.209)
Had a period of informality between 2003 and 2004/ 2004 and 2007**	6.126***	4.692***	1.469	10.965***	2.478***	2.793**	1.219	4.137***
	(1.616)	(1.697)	(0.493)	(2.763)	(0.624)	(1.271)	(0.423)	(0.893)
Regional controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sectoral Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,517	2,517	2,517	2,517	2,710	2,710	2,710	2,710

NOTES: MNL estimates. Odds Ratios reported. Reference group: Individuals who are in formal dependent employment.
Regional and sectoral control variables are the same as in Tables A1 and A2.
*The period of non-employment is between 2004 and 2007 for the 2007 regressions, and between 2007 and 2012 for the 2012 regressions.
**The period of informality is between 2003 and 2004 for the 2007 regressions, and between 2004 and 2007 for the 2012 regressions.
Default categories are: Non-Ukrainian, Males, not in a registered marriage, Basic secondary education or less.
Legenda of employment states: IINV=involuntary informal dependent employment; IVOL= voluntary informal dependent employment;
FSE=formal self-employment; ISE=informal self-employment.
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: Ukrainian Longitudinal Monitoring Survey – year 2007.

Table 4: Risk and Informality over time – testing for reverse causality

			Linear probability model Standardized risk variable	
	N	Mean of Dependent Variable	without control variables	with set of control variables
			(1)	(2)
Impact of risk taking on subsequent informality				
a. Employed in 2012 who moved into informal employment between 2007 and 2012 and were never informal before	1215	0.063	0.019**	0.014*
			(0.008)	(0.008)
			(3)	(4)
b. Effect of moved into informal (2007-2012) for those who were never informal before on:				
change in risk index (2007-2012)	1187	-0.137	-0.137	-0.148
			(0.145)	(0.151)

Notes: Authors' calculations based on ULMS 2003, 2004, 2007, 2012. Number of movers: a. 96 (6.58%); b. 77 (6.34%); c. 94 (6.57%); d. 75 (6.32%)
Control variables are standardized risk measure in 2007, age divided by ten, age squared divided by 100, Ukrainian, female, married, number of kids, general secondary education, vocational education, higher education, sectoral dummies (job in 2007: agriculture, construction, sales and finance, transportation, public administration, and education, other), center, west, east, south.
Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.
Source: Ukrainian Longitudinal Monitoring Survey – years 2003,2004, 2007 and 2012.

Table 5. Medium-term transition probabilities between labor markets states without round-trippers: 2007-2012

2007-2012

	FDE	**IINV**	**IVOL**	**FSE**	**ISE**	**UN**	**OLF**	**Pi.**
FDE	**0.66**	0.03	0.01	0.01	0.02	0.05	0.22	**0.49**
	0.01	*0.00*	*0.00*	*0.00*	*0.00*	*0.01*	*0.01*	
IINV	0.36	**0.07**	0.05	0.01	0.14	0.22	0.14	**0.04**
	0.04	*0.02*	*0.02*	*0.01*	*0.03*	*0.04*	*0.03*	
IVOL	0.34	0.18	**0.00**	0.05	0.08	0.13	0.21	**0.01**
	0.08	*0.06*	*0.00*	*0.04*	*0.05*	*0.06*	*0.06*	
FSE	0.12	0.03	0.01	**0.48**	0.12	0.09	0.13	**0.03**
	0.04	*0.02*	*0.01*	*0.05*	*0.03*	*0.03*	*0.04*	
ISE	0.18	0.05	0.02	0.04	**0.35**	0.12	0.24	**0.04**
	0.03	*0.02*	*0.01*	*0.02*	*0.05*	*0.03*	*0.04*	
UN	0.29	0.02	0.01	0.02	0.07	**0.14**	0.44	**0.06**
	0.03	*0.01*	*0.01*	*0.01*	*0.02*	*0.03*	*0.04*	
OLF	0.22	0.02	0.01	0.01	0.02	0.07	**0.66**	**0.33**
	0.01	*0.00*	*0.00*	*0.00*	*0.00*	*0.01*	*0.02*	
P.j	**0.44**	**0.03**	**0.01**	**0.03**	**0.04**	**0.07**	**0.38**	

Notes: total sample size is 2,861. **Pi.** is the relative size of a sector at the beginning of the period; **P.j** is the relative size of a sector at the end of a period. Numbers in *italics* are bootstrapped standard errors.

Legenda: FDE=formal dependent employment; IINV=involuntary informal salaried employment; IVOL= voluntary Informal salaried employment; FSE=formal self-employment; ISE=informal self-employment; UN=unemployment; OLF=out of the labor force.

Source: Ukrainian Longitudinal Monitoring Survey – years 2007 and 2012.

Table 6. Competing risk regressions: exit from unemployment – all spells from March 2007

	(1) FDE	(2) IDE	(3) SE	(4) OLF
Average standardized risk variable - no covariates	0.904	1.101	1.605**	0.793
	(0.060)	(0.181)	(0.347)	(0.128)
Observations	774	774	774	774
Average standardized risk variable - with covariates	0.902	1.105	1.470*	1.105
	(0.061)	(0.191)	(0.316)	(0.205)
Observations	757	757	757	757
Average standardized risk variable - with covariates and reference week dummies	0.903	1.104	1.463*	1.112
	(0.061)	(0.190)	(0.310)	(0.209)
Observations	757	757	757	757

NOTE: Subhazard ratios. Covariates for panels 2 are: age divided 10 and age squared divided by 100 at the time in which the spell started, dummy for Ukrainian nationality, dummy for Female, dummy for married (vs. not in marriage), number of kids in household, education dummies (default, basic education and less), regional dummies (default, Kyiv). Covariates for panel 3 are the same as in panel 2 plus two time dummies for the spells starting in one of the two reference years (vs. spells starting between the two reference weeks).
FDE=formal dependent employment; IDE=informal dependent employment (voluntary or involuntary); SE=self-employment (formal or informal); OLF=out of the labor force.
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1.
Source: Ukrainian Longitudinal Monitoring Survey – years 2007, 2012

APPENDIX

Table A1. General Risk Attitude and Informal Employment in Ukraine: Linear probability model - 2007

	Dependent variable: 1 if informally employed					
	OLS			IV		
	(1)	(2)	(3)	(4)	(5)	(6)
Willingness to take risks (standardized) in 2007	0.025***	0.026***	0.024***	0.155***	0.152***	0.122***
	(0.006)	(0.006)	(0.006)	(0.042)	(0.041)	(0.038)
Age/10	-0.061	0.004	-0.023	-0.034	0.030	-0.014
	(0.039)	(0.041)	(0.039)	(0.052)	(0.055)	(0.053)
Age squared/100	0.005	-0.002	0.002	0.003	-0.004	0.002
	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)
Ukrainian	-0.014	-0.015	-0.014	-0.021	-0.024	-0.020
	(0.016)	(0.016)	(0.016)	(0.023)	(0.023)	(0.022)
Female	0.002	-0.001	-0.002	0.065***	0.061**	0.047**
	(0.013)	(0.013)	(0.013)	(0.025)	(0.024)	(0.022)
In a registered marriage	-0.056***	-0.054***	-0.047***	-0.026	-0.024	-0.020
	(0.015)	(0.014)	(0.014)	(0.021)	(0.021)	(0.020)
Number of children in household	0.018**	0.018**	0.020**	0.013	0.013	0.017*
	(0.009)	(0.009)	(0.009)	(0.011)	(0.011)	(0.010)
General secondary education	-0.048	-0.053	-0.047	-0.087	-0.096	-0.097
	(0.046)	(0.045)	(0.044)	(0.076)	(0.076)	(0.075)
Vocational education	-0.092**	-0.096**	-0.084**	-0.132*	-0.139*	-0.133*
	(0.043)	(0.043)	(0.041)	(0.071)	(0.072)	(0.071)
Higher education	-0.140***	-0.140***	-0.116***	-0.205***	-0.209***	-0.185***
	(0.044)	(0.044)	(0.042)	(0.071)	(0.071)	(0.071)
Center	0.054*	0.050*	0.047*	0.027	0.020	0.016
	(0.029)	(0.029)	(0.028)	(0.031)	(0.031)	(0.029)
West	0.045	0.047	0.048	0.022	0.023	0.023
	(0.031)	(0.031)	(0.030)	(0.034)	(0.034)	(0.031)
East	0.062**	0.064**	0.062**	0.056*	0.054*	0.047*
	(0.029)	(0.029)	(0.028)	(0.031)	(0.030)	(0.028)
South	0.087***	0.090***	0.077***	0.067**	0.068**	0.051*
	(0.029)	(0.029)	(0.028)	(0.031)	(0.031)	(0.028)
Agriculture	0.235***	0.232***	0.188***	0.218***	0.215***	0.175***
	(0.025)	(0.025)	(0.024)	(0.038)	(0.039)	(0.033)
Construction	0.343***	0.340***	0.316***	0.288***	0.288***	0.277***
	(0.027)	(0.027)	(0.026)	(0.050)	(0.050)	(0.049)
Sales, finance	0.159***	0.152***	0.118***	0.145***	0.138***	0.111***
	(0.019)	(0.019)	(0.019)	(0.026)	(0.026)	(0.025)
Transportation	0.050**	0.050**	0.054**	0.060**	0.059**	0.060**
	(0.024)	(0.024)	(0.023)	(0.026)	(0.025)	(0.025)
Public administration, education	-0.007	-0.010	-0.004	-0.019	-0.020	-0.007
	(0.018)	(0.018)	(0.017)	(0.015)	(0.015)	(0.014)
Other services, other	0.193***	0.186***	0.167***	0.149***	0.144***	0.134***
	(0.024)	(0.024)	(0.023)	(0.037)	(0.036)	(0.035)
Log(adjusted household	-0.002	-0.003	-0.004	-0.014	-0.015	-0.016*

income)						
	(0.007)	(0.007)	(0.007)	(0.010)	(0.010)	(0.009)
Had a period of non-employment between 2004 and 2007		0.082***	0.101***		0.081***	0.093***
		(0.017)	(0.016)		(0.026)	(0.025)
Had a period of informality between 2003 and 2004			0.279***			0.283***
			(0.021)			(0.037)
Constant	0.278***	0.138	0.151	0.307**	0.178	0.246*
	(0.105)	(0.109)	(0.105)	(0.154)	(0.158)	(0.149)
Observations	2,529	2,529	2,529	1,882	1,882	1,882
R-squared	0.168	0.175	0.232	0.024	0.038	0.152
P-value of Hansen's J test				0.2337	0.3232	0.2063
F-statistic of Montiel-Pflueger robust weak instrument test				19.238	19.259	19.438
% of Worst Case Bias						
tau=5%				17.850	17.841	17.813

NOTES: The dependent variable is a dummy variable whose value is 1 if the individual is informally employed and zero otherwise.
Columns 1-3 report OLS estimates. Raw probability of being informally employed in reference week in 2007: 0.1218; standard deviation of risk measure (in levels): 2.848.
Columns 4-6 report IV estimates. Raw probability of being informally employed in reference week in 2007: 0.116; standard deviation of risk measure (in levels): 2.828. Instruments are: mother's occupation, father's occupation, height, average willingness to take risks at the Oblast level.

Default categories are: Non-Ukrainian, Males, Not in a registered marriage, Basic secondary or less, Kyiv, Industry. Robust standard errors in parentheses*** p<0.01, ** p<0.05, * p<0.1

Source: Ukrainian Longitudinal Monitoring Survey – year 2007.

Table A2 – General Risk Attitude and Informal Employment in Ukraine: Linear probability model - 2012

	Dependent variable: 1 if informally employed					
	OLS			IV		
	(1)	(2)	(3)	(4)	(5)	(6)
Willingness to take risks (standardized) in 2012	0.014**	0.014**	0.013*	0.113**	0.114**	0.099**
	(0.007)	(0.007)	(0.007)	(0.045)	(0.044)	(0.045)
Age/10	-0.125***	-0.115***	-0.127***	-0.078	-0.062	-0.091*
	(0.042)	(0.043)	(0.043)	(0.051)	(0.054)	(0.053)
Age squared/100	0.014***	0.013**	0.014***	0.010	0.008	0.011*
	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)
Ukrainian	-0.012	-0.012	-0.010	-0.003	-0.003	-0.005
	(0.019)	(0.019)	(0.019)	(0.026)	(0.026)	(0.025)
Female	0.009	0.007	0.005	0.051**	0.050**	0.041*
	(0.014)	(0.014)	(0.014)	(0.022)	(0.022)	(0.022)
In a registered marriage	-0.048***	-0.048***	-0.047***	-0.051***	-0.051***	-0.047***
	(0.014)	(0.014)	(0.014)	(0.017)	(0.017)	(0.017)
Number of children in household	0.006	0.006	0.006	0.012	0.013	0.012
	(0.008)	(0.008)	(0.008)	(0.009)	(0.009)	(0.009)
General secondary education	-0.158***	-0.158***	-0.151***	-0.188***	-0.189***	-0.162**
	(0.054)	(0.054)	(0.054)	(0.066)	(0.066)	(0.066)
Vocational education	-0.193***	-0.194***	-0.186***	-0.209***	-0.209***	-0.183***
	(0.052)	(0.052)	(0.052)	(0.064)	(0.064)	(0.063)
Higher education	-0.275***	-0.275***	-0.264***	-0.284***	-0.283***	-0.247***
	(0.052)	(0.052)	(0.052)	(0.063)	(0.063)	(0.063)
Center	-0.059**	-0.059**	-0.060**	0.005	0.005	-0.012
	(0.030)	(0.030)	(0.030)	(0.037)	(0.037)	(0.037)
West	-0.043	-0.042	-0.039	-0.027	-0.028	-0.035
	(0.029)	(0.029)	(0.029)	(0.033)	(0.033)	(0.032)
East	0.021	0.022	0.022	0.057	0.057	0.039
	(0.030)	(0.030)	(0.031)	(0.039)	(0.039)	(0.039)
South	0.044	0.046	0.043	0.088**	0.087**	0.065*
	(0.030)	(0.030)	(0.030)	(0.035)	(0.035)	(0.035)
Agriculture	0.283***	0.281***	0.264***	0.247***	0.246***	0.211***
	(0.033)	(0.033)	(0.032)	(0.038)	(0.038)	(0.036)
Construction	0.400***	0.401***	0.389***	0.362***	0.362***	0.343***
	(0.041)	(0.041)	(0.041)	(0.052)	(0.052)	(0.050)
Sales, finance	0.125***	0.124***	0.117***	0.097***	0.097***	0.085***
	(0.022)	(0.022)	(0.022)	(0.026)	(0.026)	(0.026)
Transportation	-0.008	-0.008	-0.008	-0.032	-0.031	-0.032
	(0.020)	(0.020)	(0.020)	(0.023)	(0.023)	(0.023)
Public administration, education	-0.058***	-0.058***	-0.057***	-0.066***	-0.065***	-0.059***
	(0.013)	(0.013)	(0.013)	(0.016)	(0.016)	(0.016)
Other services, other	0.145***	0.143***	0.136***	0.171***	0.169***	0.152***
	(0.035)	(0.035)	(0.035)	(0.043)	(0.043)	(0.042)
Log(adjusted household income)	-0.017**	-0.017**	-0.017**	-0.020**	-0.020**	-0.021**
	(0.008)	(0.008)	(0.008)	(0.010)	(0.010)	(0.009)

Had a period of non-employment between 2007 and 2012		0.024	0.024		0.017	0.018
		(0.017)	(0.018)		(0.020)	(0.020)
Had a period of informality between 2004 and 2007			0.131***			0.199***
			(0.034)			(0.036)
Constant	0.725***	0.700***	0.711***	0.577***	0.535***	0.582***
	(0.124)	(0.126)	(0.126)	(0.155)	(0.159)	(0.157)
Observations	2,741	2,741	2,741	2,072	2,072	2,072
R-squared	0.220	0.221	0.228	0.126	0.126	0.174
P-value of Hansen's J test				0.7974	0.8048	0.7681
F-statistic of Montiel-Pflueger robust weak instrument test				16.230	16.291	16.015
% of Worst Case Bias						
tau=5%				17.700	17.770	17.677
tau=10%				10.790	10.790	10.777

NOTES: The dependent variable is a dummy variable whose value is 1 if the individual is informally employed and zero otherwise.
Columns 1-3 report OLS estimates. Raw probability of being informally employed in reference week in 2012: 0.1507; standard deviation of risk measure (in levels): 2.627.
Columns 4-6 report IV estimates. Raw probability of being informally employed in reference week in 2012: 0.1332; standard deviation of risk measure (in levels): 2.61. Instruments are mother's occupation, father's occupation, height, average willingness to take risks at the oblast level.

Default categories are: Non-Ukrainian, Males, not in a registered marriage, Basic secondary or less, Kyiv, Industry.
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

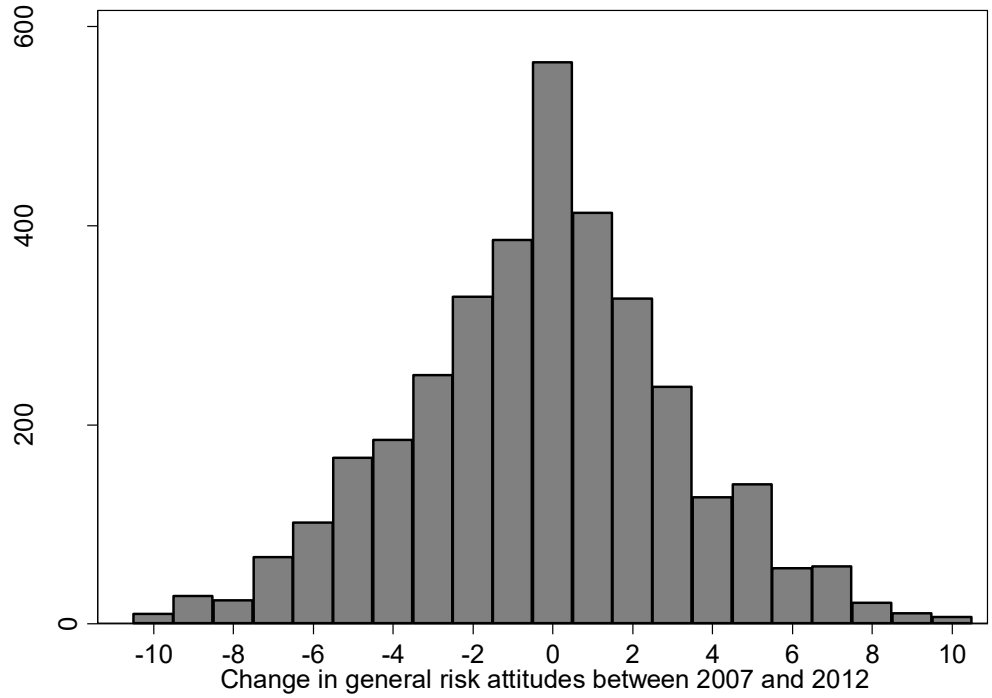
Source: Ukrainian Longitudinal Monitoring Survey – year 2012.

Online Appendix for

Risk Attitudes and Informal Employment in Ukraine

Figure OA1. General Risk Attitudes over time – Ukraine (2007, 2012)

Complete panel
Sample: 3510



Panel of Dependent Workers and Self-employed
Sample: 2040

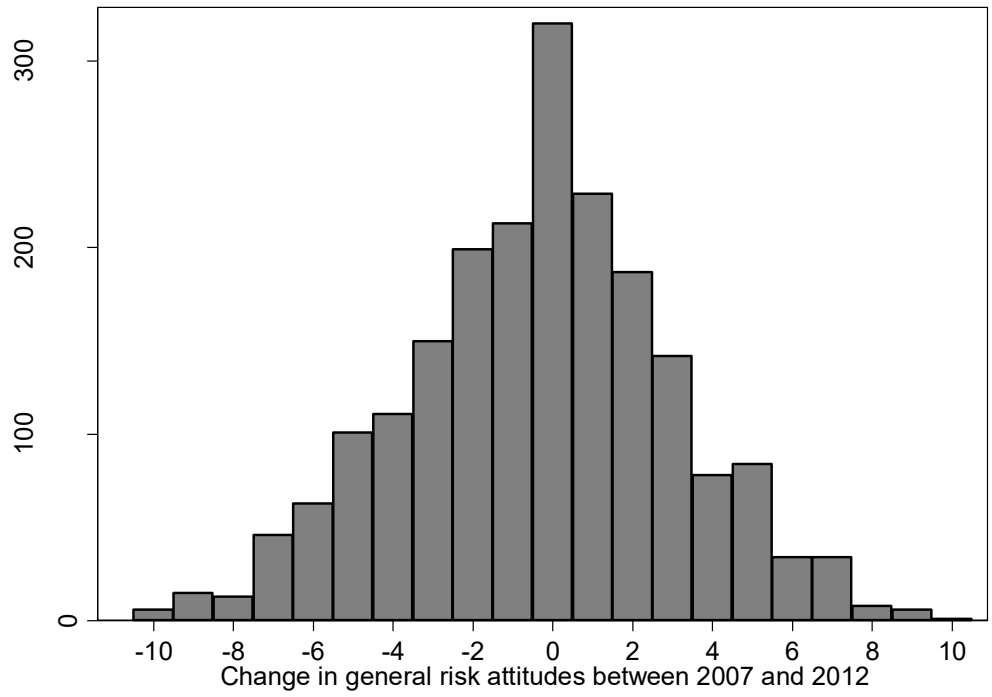
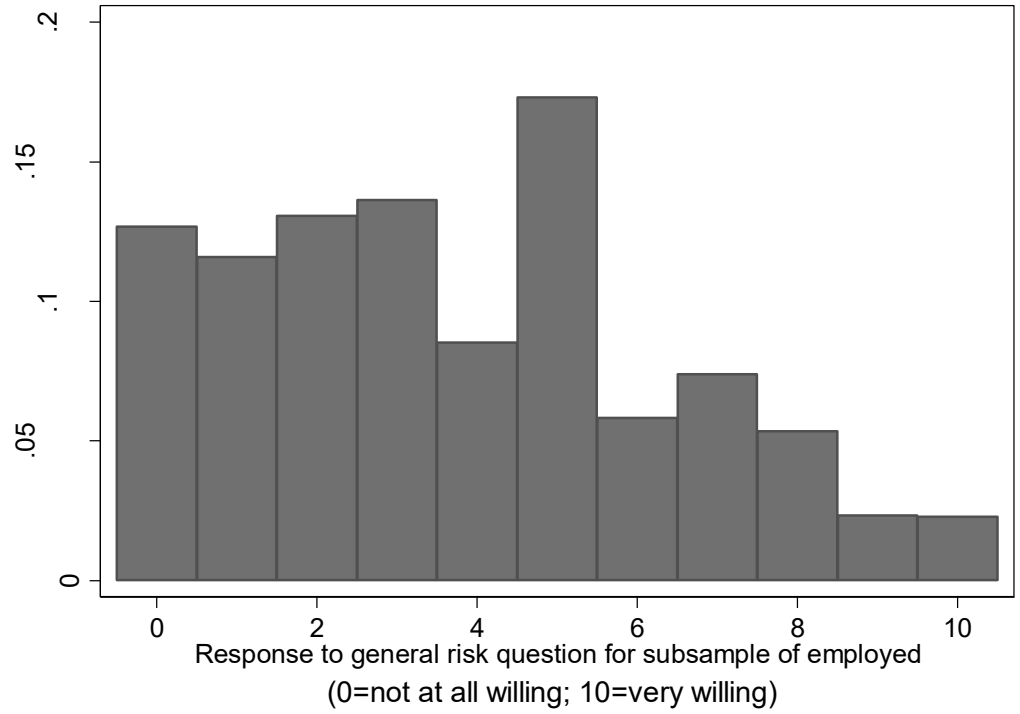
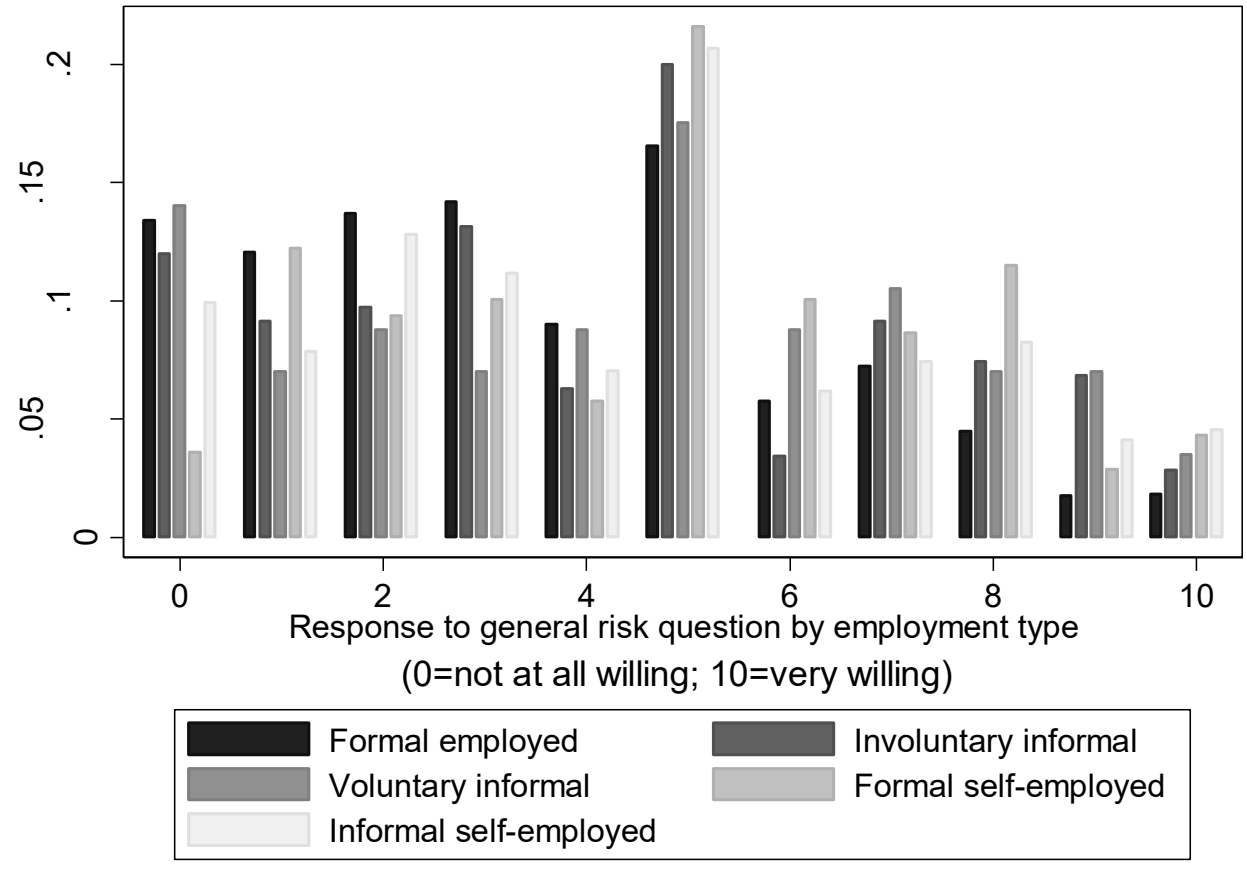


Figure OA2. General Risk Attitudes – Ukraine 2012



Source: Ukrainian Longitudinal Monitoring Survey – year 2012

Figure OA3. General Risk Attitudes by employment type – Ukraine 2012



Source: Ukrainian Longitudinal Monitoring Survey – year 2012.

Table OA1. Average willingness to take risks by employment state in Ukraine – 2012

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Formal dependent employees		Involuntary informal		Voluntary informal		Formally self-employed		Informally self-employed	
	N	mean	N	mean	N	mean	N	mean	N	mean
All	2,517	3.560	175	4.274	57	4.491	139	4.741	230	4.435
Men	1,165	4.045	98	4.694	28	4.893	83	4.880	155	4.871
Women	1,352	3.143	77	3.740	29	4.103	56	4.536	75	3.533
Age										
15-25	308	4.464	37	5.270	15	6.067	7	5.143	20	6.050
26-35	636	3.847	56	4.554	15	4.267	25	4.760	63	5.111
36-45	595	3.471	38	3.711	9	3.333	41	4.829	53	4.340
46-55	670	3.097	31	3.806	13	4.923	50	4.880	61	3.656
56-65	308	3.244	13	3	5	1.400	16	3.875	33	3.758
Education										
Basic secondary or less	47	3.979	17	3.706	6	5.833	1	8	17	3.235
General secondary	362	3.660	38	3.605	14	4.143	18	5.278	56	5.321
Vocational	1,151	3.431	91	4.341	27	4.333	68	4.706	126	4.127
Higher education	957	3.657	27	5.407	9	5.111	52	4.538	29	4.897
Married										
Yes	1,659	3.447	82	3.976	20	3.500	100	4.710	127	4.134
No	858	3.779	93	4.538	37	5.027	39	4.821	103	4.806
Children										
No children	1,407	3.456	94	4.404	33	4.212	81	4.679	136	4.603
At least one child	1,110	3.693	81	4.123	24	4.875	58	4.828	94	4.191
Sector										

Agriculture	161	3.652	18	4.333	2	9	4	6.750	83	3.590
Industry	706	3.425	38	5.079	18	4.500	5	4	9	5.111
Construction	73	4.384	25	4.280	7	5.571	12	5.667	67	4.925
Sales, finance	392	3.847	67	3.791	20	4	89	4.787	35	5.400
Transportation	230	3.783	7	3.571	3	4	13	4.615	12	5.833
Public administration, education	828	3.373					2	2.500	1	7
Other services, other	124	3.621	19	4.421	7	3.714	13	3.615	23	3.478
Region										
Kiev	134	4.022	11	5.636	5	3.600	10	5.100	7	5.143
Center	608	3.270	27	3.852	13	6.385	23	4.957	25	4.360
West	518	4.141	23	5.174	8	2.750	29	4.345	29	4.759
East	618	3.244	54	3.667	8	4.500	38	4.868	46	4.196
South	639	3.574	60	4.417	23	4.217	39	4.692	123	4.423

NOTE: Authors' calculations.
Source: Ukrainian Longitudinal Monitoring Survey – year 2012.

Table OA2 Occupation and informality- 2007

Occupation and Informality								
	Formal employees		Informal employees		involuntary informal		voluntary informal	
	N	percent	N	percent	N	percent	N	percent
managers	85	3.06	0	0	0	0	0	0
professionals	470	16.93	9	2.92	2	0.97	5	6.02
technicians and associate professionals	438	15.78	7	2.27	3	1.45	2	2.41
clerks	203	7.31	20	6.49	17	8.21	2	2.41
service workers and shop and market sal	183	6.59	79	25.65	57	27.54	18	21.69
skilled agricultural, forestry, and fis	30	1.08	2	0.65	1	0.48	1	1.2
skilled manual worker	582	20.97	66	21.43	41	19.81	23	27.71
plant and machine operators and assembl	246	8.86	19	6.17	11	5.31	8	9.64
unskilled occupations	493	17.76	105	34.09	74	35.75	24	28.92
armed forces (better to eliminate)	46	1.66	1	0.32	1	0.48	0	0
total	2,776		308		207		83	

Source: ULMS 2007

Table OA3. IV REGRESSIONS General Risk Attitude and Informal Employment in Ukraine: Linear probability model - FIRST STAGE - 2007

Dependent Variable: Standardized Risk Measure	(1)	(2)	(3)
Age/10	-0.198	-0.227	-0.217
	(0.146)	(0.156)	(0.156)
Age squared/100	0.015	0.018	0.017
	(0.018)	(0.019)	(0.019)
Ukrainian	-0.052	-0.050	-0.052
	(0.066)	(0.066)	(0.066)
Female	-0.356***	-0.356***	-0.355***
	(0.063)	(0.063)	(0.064)
In a registered marriage	-0.180***	-0.181***	-0.184***
	(0.052)	(0.052)	(0.053)
Number of children in household	0.037	0.037	0.036
	(0.032)	(0.032)	(0.032)
General secondary education	-0.305*	-0.301*	-0.303*
	(0.170)	(0.170)	(0.169)
Vocational education	-0.172	-0.169	-0.172
	(0.162)	(0.163)	(0.162)
Higher education	0.060	0.062	0.056
	(0.168)	(0.168)	(0.167)
Center	0.264**	0.268**	0.271**
	(0.119)	(0.119)	(0.119)
West	0.253**	0.252**	0.254**
	(0.124)	(0.124)	(0.124)
East	0.160	0.161	0.164
	(0.119)	(0.119)	(0.119)
South	0.209*	0.208*	0.214*
	(0.119)	(0.119)	(0.119)
Agriculture	0.103	0.105	0.116
	(0.088)	(0.088)	(0.089)
Construction	0.053	0.053	0.056
	(0.107)	(0.107)	(0.107)
Sales, finance	0.112*	0.115*	0.123*
	(0.066)	(0.067)	(0.068)
Transportation	-0.108	-0.107	-0.109
	(0.086)	(0.086)	(0.086)
Public administration, education	0.009	0.010	0.007
	(0.061)	(0.062)	(0.062)
Other services, other	0.181**	0.184**	0.188**
	(0.083)	(0.083)	(0.083)
Log(adjusted household income)	0.036	0.036	0.037
	(0.025)	(0.025)	(0.025)
Had a period of non-employment between 2004 and 2007		-0.037	-0.041
		(0.063)	(0.064)
Had a period of informality between 2003 and 2004			-0.077
			(0.074)

Mother's occupation	-0.046*	-0.046*	-0.046*
	(0.025)	(0.025)	(0.025)
Father's occupation	0.063*	0.063*	0.062*
	(0.033)	(0.033)	(0.033)
Average reported height	0.007*	0.007*	0.007*
	(0.004)	(0.004)	(0.004)
Average Risk score at Oblast level	0.270***	0.271***	0.273***
	(0.033)	(0.033)	(0.033)
Constant	-1.545**	-1.467**	-1.505**
	(0.722)	(0.739)	(0.741)
Observations	1,882	1,882	1,882
R-squared	0.1448	0.1450	0.1454

NOTES: First stage regression. The dependent variable is the reported willingness to take risks (0-10).
Default categories are: Non-Ukrainian, Males, Not in a registered marriage, Basic secondary or less, Kyiv, Industry.
Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Source: Ukrainian Longitudinal Monitoring Survey – year 2007

Table OA4. IV REGRESSIONS General Risk Attitude and Informal Employment in Ukraine: Linear probability model - FIRST STAGE – 2012

Dependent Variable: Standardized Risk Measure	(1)	(2)	(3)
Age/10	-0.352**	-0.287**	-0.303**
	(0.139)	(0.146)	(0.146)
Age squared/100	0.031*	0.024	0.026
	(0.017)	(0.017)	(0.017)
Ukrainian	-0.004	-0.005	-0.006
	(0.074)	(0.075)	(0.075)
Female	-0.364***	-0.364***	-0.365***
	(0.062)	(0.062)	(0.062)
In a registered marriage	-0.063	-0.061	-0.058
	(0.047)	(0.047)	(0.047)
Number of children in household	0.014	0.016	0.015
	(0.027)	(0.028)	(0.028)
General secondary education	0.221	0.217	0.231*
	(0.139)	(0.139)	(0.138)
Vocational education	0.223*	0.222*	0.235*
	(0.133)	(0.133)	(0.132)
Higher education	0.165	0.166	0.185
	(0.135)	(0.135)	(0.135)
Center	-0.171*	-0.172*	-0.181*
	(0.098)	(0.098)	(0.098)
West	-0.095	-0.101	-0.103
	(0.093)	(0.094)	(0.093)
East	-0.234**	-0.236**	-0.245**
	(0.097)	(0.097)	(0.097)
South	-0.184**	-0.186**	-0.197**
	(0.093)	(0.093)	(0.093)
Agriculture	0.033	0.030	0.009
	(0.085)	(0.085)	(0.087)
Construction	0.151	0.153	0.139
	(0.109)	(0.109)	(0.110)
Sales, finance	0.158**	0.158**	0.149**
	(0.063)	(0.063)	(0.064)
Transportation	0.070	0.074	0.073
	(0.084)	(0.084)	(0.084)
Public administration, education	0.080	0.082	0.085
	(0.060)	(0.060)	(0.059)
Other services, other	-0.050	-0.059	-0.069
	(0.091)	(0.091)	(0.091)
Log(adjusted household income)	-0.026	-0.026	-0.026
	(0.026)	(0.026)	(0.026)
Had a period of non-employment between 2007 and 2012		0.071	0.071
		(0.053)	(0.052)
Had a period of informality between 2004 and 2007			0.122
			(0.079)

Mother's occupation	-0.026	-0.026	-0.026
	(0.024)	(0.024)	(0.024)
Father's occupation	0.102***	0.103***	0.104***
	(0.033)	(0.033)	(0.033)
Average reported height	-0.002	-0.002	-0.002
	(0.003)	(0.003)	(0.003)
Average willingness to take risks at the Oblast level	0.308***	0.309***	0.304***
	(0.043)	(0.043)	(0.043)
Constant	0.355	0.155	0.175
	(0.722)	(0.742)	(0.741)
Observations	2,072	2,072	2,072
R-squared	0.1102	0.1110	0.1122

NOTES: IV estimates. The dependent variable is a dummy variable whose value is 1 if the individual is informally employed and zero if the individual is formally employed.
Instruments are: mother's occupation, father's occupation, height, average willingness to take risks at the Oblast level.
Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Source: Ukrainian Longitudinal Monitoring Survey – year 2012

Table OA5. Career Risk Attitude and Informal Employment in Ukraine: Linear probability model - 2007

	Dependent variable: 1 if informally employed					
	OLS			IV		
	(1)	(2)	(3)	(4)	(5)	(6)
Willingness to take risks in career matters (standardized) in 2007	0.014**	0.015**	0.017***	0.114**	0.109**	0.102**
	(0.007)	(0.007)	(0.006)	(0.050)	(0.049)	(0.047)
Age/10	-0.101**	-0.034	-0.060	-0.070	0.004	-0.040
	(0.043)	(0.045)	(0.045)	(0.051)	(0.054)	(0.053)
Age squared/100	0.010**	0.003	0.006	0.008	-0.000	0.005
	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)
Ukrainian	-0.017	-0.017	-0.014	-0.034	-0.033	-0.027
	(0.017)	(0.017)	(0.017)	(0.021)	(0.020)	(0.019)
Female	-0.008	-0.011	-0.011	0.027	0.022	0.021
	(0.013)	(0.013)	(0.013)	(0.021)	(0.021)	(0.020)
In a registered marriage	-0.042***	-0.040**	-0.032**	-0.015	-0.013	-0.005
	(0.016)	(0.015)	(0.015)	(0.021)	(0.021)	(0.020)
Number of children in household	0.016*	0.016*	0.016*	0.013	0.013	0.015
	(0.010)	(0.010)	(0.009)	(0.011)	(0.011)	(0.011)
General secondary education	0.010	0.002	0.017	-0.083	-0.100	-0.071
	(0.061)	(0.061)	(0.061)	(0.080)	(0.080)	(0.078)
Vocational education	-0.030	-0.035	-0.014	-0.112	-0.125	-0.092
	(0.058)	(0.058)	(0.058)	(0.078)	(0.077)	(0.076)
Higher education	-0.075	-0.076	-0.046	-0.186**	-0.193**	-0.149*
	(0.058)	(0.059)	(0.059)	(0.081)	(0.080)	(0.078)
Center	0.065**	0.059**	0.058**	0.078***	0.068**	0.062**
	(0.026)	(0.026)	(0.025)	(0.030)	(0.030)	(0.028)
West	0.042	0.043	0.045*	0.053*	0.052*	0.049*
	(0.026)	(0.027)	(0.026)	(0.030)	(0.031)	(0.029)
East	0.063**	0.063**	0.065***	0.073**	0.071**	0.068**
	(0.025)	(0.025)	(0.025)	(0.029)	(0.029)	(0.027)
South	0.082***	0.083***	0.074***	0.088***	0.087***	0.072***
	(0.025)	(0.026)	(0.025)	(0.029)	(0.029)	(0.027)
Agriculture	0.202***	0.197***	0.163***	0.194***	0.188***	0.156***
	(0.033)	(0.034)	(0.030)	(0.037)	(0.038)	(0.033)
Construction	0.330***	0.326***	0.302***	0.289***	0.284***	0.266***
	(0.042)	(0.041)	(0.041)	(0.050)	(0.049)	(0.049)
Sales, finance	0.159***	0.151***	0.120***	0.157***	0.148***	0.118***
	(0.022)	(0.022)	(0.021)	(0.027)	(0.027)	(0.026)
Transportation	0.050**	0.052**	0.055***	0.060**	0.059**	0.061***
	(0.021)	(0.020)	(0.020)	(0.024)	(0.024)	(0.024)
Public administration, education	-0.002	-0.004	0.001	-0.008	-0.009	0.000
	(0.011)	(0.011)	(0.011)	(0.014)	(0.014)	(0.014)
Other services, other	0.211***	0.205***	0.186***	0.170***	0.165***	0.152***
	(0.031)	(0.031)	(0.030)	(0.036)	(0.036)	(0.035)
Log(adjusted household	-0.005	-0.006	-0.007	-0.011	-0.012	-0.013

income)						
	(0.008)	(0.008)	(0.008)	(0.009)	(0.009)	(0.009)
Had a period of non-employment between 2004 and 2007		0.084***	0.103***		0.092***	0.105***
		(0.022)	(0.021)		(0.025)	(0.025)
Had a period of informality between 2003 and 2004			0.266***			0.289***
			(0.034)			(0.039)
Constant	0.312***	0.167	0.168	0.322**	0.174	0.207
	(0.121)	(0.125)	(0.122)	(0.151)	(0.154)	(0.149)
Observations	2,271	2,271	2,271	1,812	1,812	1,812
R-squared	0.154	0.163	0.216	0.059	0.080	0.152
P-value of Hansen's J test				0.3610	0.4515	0.5163
F-statistic of Montiel-Pflueger robust weak instrument test				9.868	9.918	10.11
% of Worst Case Bias						
tau=5%				17.603	17.603	17.566
tau=10%				10.756	10.757	10.736
tau=20%				7.019	7.020	7.008

NOTES: The dependent variable is a dummy variable whose value is 1 if the individual is informally employed and zero otherwise.
Columns 1-3 report OLS estimates. Raw probability of being informally employed in reference week in 2007: 0.1118;
standard deviation of risk measure (in levels): 2.849.
Columns 4-6 report IV estimates. Raw probability of being informally employed in reference week in 2007: 0.1078;
standard deviation of risk measure (in levels): 2.825.
Instruments are: mother's occupation, father's occupation, height, average willingness to take risks in career matters at the Oblast level.
Default categories are Non-Ukrainian, Males, not in a registered marriage, Basic secondary education or less, Kyiv, industry. Robust standard errors in parentheses*** p<0.01, ** p<0.05, * p<0.1

Source: Ukrainian Longitudinal Monitoring Survey – year 2007.

Table OA6. Career Risk Attitude and Informal Employment in Ukraine: Linear probability model - 2012

	Dependent variable: 1 if informally employed					
	OLS			IV		
	(1)	(2)	(3)	(4)	(5)	(6)
Willingness to take risks in career matters (standardized) in 2012	0.004	0.004	0.002	0.054	0.053	0.047
	(0.007)	(0.007)	(0.007)	(0.038)	(0.038)	(0.037)
Age/10	-0.117***	-0.096**	-0.122***	-0.080	-0.060	-0.088*
	(0.044)	(0.047)	(0.047)	(0.050)	(0.053)	(0.053)
Age squared/100	0.012**	0.010*	0.013**	0.009	0.007	0.010*
	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)
Ukrainian	-0.012	-0.012	-0.009	-0.014	-0.014	-0.011
	(0.019)	(0.019)	(0.019)	(0.022)	(0.022)	(0.022)
Female	0.000	-0.001	-0.005	0.020	0.019	0.012
	(0.014)	(0.014)	(0.013)	(0.017)	(0.017)	(0.017)
In a registered marriage	-0.046***	-0.046***	-0.044***	-0.040**	-0.040**	-0.036**
	(0.015)	(0.015)	(0.014)	(0.017)	(0.017)	(0.017)
Number of children in household	0.008	0.008	0.007	0.011	0.011	0.011
	(0.008)	(0.008)	(0.008)	(0.009)	(0.009)	(0.009)
General secondary education	-0.164***	-0.165***	-0.152***	-0.128**	-0.129**	-0.112*
	(0.057)	(0.057)	(0.057)	(0.064)	(0.064)	(0.064)
Vocational education	-0.190***	-0.191***	-0.178***	-0.149**	-0.148**	-0.129**
	(0.055)	(0.055)	(0.055)	(0.062)	(0.062)	(0.062)
Higher education	-0.273***	-0.273***	-0.251***	-0.235***	-0.234***	-0.204***
	(0.055)	(0.055)	(0.055)	(0.063)	(0.062)	(0.063)
Center	-0.057*	-0.058*	-0.067**	-0.017	-0.018	-0.033
	(0.030)	(0.030)	(0.030)	(0.035)	(0.035)	(0.035)
West	-0.049*	-0.050*	-0.052*	-0.035	-0.037	-0.044
	(0.029)	(0.029)	(0.029)	(0.031)	(0.031)	(0.031)
East	0.023	0.023	0.013	0.043	0.042	0.028
	(0.031)	(0.031)	(0.031)	(0.039)	(0.039)	(0.039)
South	0.046	0.045	0.034	0.084**	0.083**	0.064*
	(0.030)	(0.030)	(0.031)	(0.037)	(0.037)	(0.037)
Agriculture	0.206***	0.205***	0.177***	0.203***	0.202***	0.170***
	(0.033)	(0.033)	(0.032)	(0.037)	(0.037)	(0.035)
Construction	0.386***	0.386***	0.358***	0.352***	0.353***	0.326***
	(0.042)	(0.042)	(0.041)	(0.050)	(0.050)	(0.048)
Sales, finance	0.122***	0.122***	0.109***	0.102***	0.102***	0.089***
	(0.022)	(0.022)	(0.022)	(0.025)	(0.025)	(0.025)
Transportation	-0.009	-0.007	-0.008	-0.021	-0.020	-0.024
	(0.020)	(0.020)	(0.020)	(0.021)	(0.021)	(0.021)
Public administration, education	-0.052***	-0.052***	-0.046***	-0.056***	-0.056***	-0.051***
	(0.013)	(0.013)	(0.013)	(0.015)	(0.014)	(0.014)
Other services, other	0.113***	0.112***	0.094***	0.109***	0.107***	0.093**
	(0.035)	(0.034)	(0.034)	(0.040)	(0.040)	(0.040)

Log(adjusted household income)	-0.009	-0.008	-0.009	-0.015*	-0.015*	-0.016*
	(0.008)	(0.008)	(0.008)	(0.009)	(0.009)	(0.009)
Had a period of non-employment between 2007 and 2012		0.022	0.022		0.021	0.021
		(0.017)	(0.017)		(0.019)	(0.019)
Had a period of informality between 2004 and 2007			0.194***			0.200***
			(0.031)			(0.035)
Constant	0.656***	0.602***	0.641***	0.532***	0.481***	0.530***
	(0.128)	(0.134)	(0.133)	(0.151)	(0.155)	(0.154)
Observations	2,596	2,596	2,596	2,072	2,072	2,072
R-squared	0.197	0.197	0.221	0.163	0.165	0.197
P-value of Hansen's J test				0.3956	0.4079	0.4322
F-statistic of Montiel-Pflueger robust weak instrument test				18.107	17.970	17.837
% of Worst Case Bias						
tau=5%				18.560	18.582	18.552
tau=10%				11.286	11.298	11.281
tau=20%				7.319	7.326	7.316

NOTES: The dependent variable is a dummy variable whose value is 1 if the individual is informally employed and zero otherwise.
Columns 1-3 report OLS estimates. Raw probability of being informally employed in reference week in 2012: 0.1360;
standard deviation of risk measure (in levels): 2.629.
Columns 4-6 report IV estimates. Raw probability of being informally employed in reference week in 2012: 0.1198;
standard deviation of risk measure (in levels): 2.620.
Instruments are mother's occupation, father's occupation, height, average willingness to take risks in career matters at the Oblast level.
Default categories are Non-Ukrainian, Males, Not in a registered marriage, Basic secondary education or less, Kyiv, industry.
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: Ukrainian Longitudinal Monitoring Survey – year 2012.