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ABSTRACT

Having unique data we investigate the link between job separations (displacement and quits) and informal employment, which we define in several ways posing the general question whether the burden of informality falls disproportionately on job separators in the Russian labor market. After we have established positive causal effects of displacement and quits on informal employment we analyze whether displaced workers experience more involuntary informal employment than their non-displaced counterparts. Our main results confirm our contention that displacement entraps some of the workers in involuntary informal employment. Those who quit, in turn, experience voluntary informality for the most part, but there seems a minority of quitting workers who end up in involuntary informal jobs. This scenario does not fall on all the workers who separate but predominantly on workers with low human capital. We also pursue the issue of informality persistence and find that informal employment is indeed persistent as some workers churn from one informal job to the next. Our study contributes to the debate in the informality literature regarding segmented versus integrated labor markets. It also contributes to the literature on displacement by establishing informal employment as an important cost of displacement. We also look at the share of undeclared wages in formal jobs and find that these shares are larger for separators than for incumbents, with displaced workers bearing the brunt of this manifestation of informality.

Keywords: job separations, worker displacement, informality, Russia.

JEL classification: J64, J65, P50.

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1. Introduction

Russia experienced a period of strong economic growth between 1999 and 2008. This growth, manifesting itself in an average GDP growth rate of roughly 7 percent, was accompanied by substantial worker turnover in the Russian labor market, with job separations amounting to up to 20 percent (see figure 1). Parallel to these large separations rates we see a continuous rise in informal employment and informal activities: the number of informally employed workers rose from roughly 8 million in 1999 to about 12 million in 2008, i.e. from 13 to 18 percent of total employment (Gimpelson and Zudina 2011). Schneider et al. (2010) provide evidence that the shadow economy of Russia is large compared to other transition and emerging economies, amounting to roughly 41 percent of official GDP in 2007.

Even if the shadow economy and informal employment are substantial, it could well be that they afflict predominantly marginal groups of the workforce. The descriptive statistics of dependent employees in 2009 in Table 1 show that the informally employed indeed have a worse labor market history and, in the case of educational attainment, worse characteristics than their formal counterparts. Preceding the job in 2009, informally employed have substantially longer non-employment spells and a far lower share of university graduates. Still, nearly 12 percent of the informally employed have finished university education. What is in addition particularly striking in Table 1 is the lack of divergence regarding the other demographics. Thus rising informal employment is an

important phenomenon in the Russian labor market, which is clearly not restricted to marginal groups of the workforce.

The main aim of this paper is to see whether there is a link between job separations and the incidence of informal employment. The first six rows of Table 1 seem to imply such a link since informal employees have roughly twice the displacement and quit rates of formal employees. In a transition economy like the Russian one where informal employment has been growing and where the vast majority of incumbents has a formal employment relationship it might well be that the burden of rising informal employment falls disproportionately on job separators.[1]

We are particularly interested in establishing whether the type of job separation produces a differential impact on informality. In other words, are workers who voluntarily separate from their jobs (quitters) differently affected than their displaced counterparts who lost their jobs involuntarily? We can moot that quitters are less likely to end up in informal employment against their will than displaced workers. Using unique data from a displacement supplement to the Russian Longitudinal Monitoring Survey (RLMS) in 2008 and from an informality supplement to the RLMS in 2009 we are able to test this proposition. We thus can establish important findings about the factors driving the formal-informal divide in the labor market, which have not yet sufficiently been discussed in the literature, by linking mode of job separations and subsequent informal or formal employment. Our data are detailed enough to investigate the impact of job separations on type of employment across heterogeneous groups of the workforce. We

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[1] In principle rising informal employment could also obtain by changing formal jobs of incumbents into informal ones and by having a high incidence of informal employment for new labor market entrants.

can also analyze whether informality breeds informality, i.e. whether having separated from an informal job raises the likelihood to find oneself subsequently in another informal job.

The scarce empirical literature on informality in transition countries finds that most informal employment relationships are not wanted by the affected workers, especially if they are dependent wage earners.[2] Given this predominantly involuntary nature of informal employment its incidence might be perceived as a labor market outcome that imposes a cost on displaced workers. This paper thus contributes to the large literature on the costs of job loss.[3] The conventional costs that this literature focuses on are foregone earnings due to less employment and less hours worked but also wage penalties upon reemployment. In a companion paper, we find that the monetary costs of job loss in Russia consist in large foregone earnings due to less employment and less hours worked and not in wage penalties upon re-employment (Lehmann et al. 2011).

In addition to these traditional labor market outcomes caused by job loss, researchers have started to look at other outcomes that are related to workers' welfare as well as the welfare of their families. For example, Sullivan and von Wachter (2009) analyze life expectancy as an outcome and establish that displacement at age 40 will shorten the life expectancy of an average worker in the United States by 1 to 1.5 years. Leombruni, Razzolini and Serti (2010) measure the causal effect of displacement on workplace injury rates in Italy, confirming a substantially higher injury rate at subsequent jobs of displaced

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[2] See, e.g., Krstic and Sanfey (2007) on Bosnia and Hercegovina, Lehmann and Pignatti (2007) on Ukraine, Bernabè and Stampini (2008) on Georgia and Pagés and Stampini (2007) on several transition countries.

[3] For a survey of older studies on the costs of job loss see Kuhn (2002); the most recent studies are summarized, for example, in Hijzen et al. (2010).

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workers relative to their non-displaced counterparts. Lindo (2011) investigates parental job loss and infant health in the United States. His analysis reveals that husbands' job losses have significant negative effects on infant health. Liu and Zhao (2011) study a similar issue in China, looking at the effects of mass layoffs of parents in the mid-1990s on their children's health. They find that paternal job loss affects children's health negatively while maternal job loss does not show any significant effect.[4]

Adding to this literature we focus on two non-conventional labor market outcomes for the individual displaced worker: apart from informal employment relationships in subsequent jobs we also look at unofficial wage payments in formal sector jobs, which are wide-spread in the Russian economy (Gimpelson and Zudina 2011). Lehmann et al. (2011) provide some preliminary evidence that displaced workers have a higher probability of having their subsequent jobs in the informal sector than their non-displaced counterparts. The study here exclusively focuses on the link between job separations and informality using various measures of informal employment from different data sources as well as a measure of unofficial wage payments (so called "envelope payments").

Being able to distinguish between involuntary and voluntary informal employment our study contributes to the debate in the informality literature on the issue of segmented versus integrated labor markets. We thus contribute not only to the literature on displacement but also to the literature on informality.

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[4] There are many more studies on the health costs of displacement; this growing literature is discussed in Lindo (2011).

The remainder of the paper has the following structure. The next section addresses the research questions that we investigate when linking job separations and informal employment relationships, embedding this discussion in the literature on informality, while section 3 discusses the data and definitional issues and provides some descriptive analysis of job separations and informality.   This is followed by a section, which presents the empirical models and our research approach of testing the link between displacement, quits and informality. These tests are done first for dependent employees only using probit, pooled logit and fixed effect logit models as well as OLS estimation. In a second part they are extended to formal and informal self-employment and non-employment within a multinomial logit framework. Section 5 presents our empirical findings. We find a significant impact of previous displacement and quits on informality, which is robust to different measures of informality. The central results of our analysis show that displacement entraps some of the workers in involuntary informal employment. Those who quit, in turn, experience voluntary informality for the most part, but there seems a minority of quitting workers who read the labor market incorrectly and thus end up in involuntary informal jobs. This scenario of entrapment for the displaced and wrong expectations of some of those who quit does not fall on all the workers who separate but predominantly on workers with low human capital and on those who separate from informal jobs. In a final section we offer some conclusions and policy implications.

2. Linking displacement, quits and subsequent informal employment

The general literature on informality does not discuss a possible link of the mode of separation from jobs on the one hand and the formality or informality of subsequent jobs on the other. The theoretical search and matching macro models, which explicitly include an informal sector, treat separations from jobs as exogeneous, modeling them as exogeneously given attrition rates of jobs.[5] Micro studies on informal employment, on the other hand, make no distinction between involuntary displacement and voluntary quits (see, e.g., Boeri and Garibaldi, 2006, Bosch and Maloney, 2010).

The scarce literature on informality in transition countries analyzes the generally contentious issue of whether labor markets are segmented and workers are prevented from entering the formal sector, as put forth in an early seminal paper by Harris and Todaro (1970), or whether labor markets are integrated and most workers choose voluntarily the informal sector (see, e.g., De Soto 1990 and Maloney 2004). For Bosnia and Herzegovina Krstic and Sanfey (2007) find segmentation as do Bernabè and Stampini (2008) for Georgia. Lehmann and Pignatti (2007), on the other hand get mixed results: while they establish segmentation for dependent employees, they find a two-tier informal self-employment sector, where the lower tier reflects an integrated labor market, i.e. anyone can enter informal activities, while the more remunerative upper tier is segmented, with workers blocked from freely entering this part of informal self-employment.[6]

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[5] See, e.g., Kolm and Larsen (2003); Albrecht, Navarro and Vroman (2009); Zenou (2008).
[6] This characterization of informal self-employment goes back to Fields (1990)

None of these studies explicitly take into account previous employment, past informality experience or the type of separation from the previous job, which might have an important impact on whether a worker is formally or informally employed in the current job. It is certainly feasible to moot that displaced workers have a higher probability to end up in informal employment against their will. In turn, those who quit may choose an informal employment relationship voluntarily. However, a fraction of those who quit might read the labor market wrong and consequently also they might end up in informal employment involuntarily. With the data at our disposal we are, therefore, interested to pose the following five research questions:

1. Do job history and past separations matter for subsequent informal employment and are there any differences between voluntary and involuntary separations?

2. Do job history and past separations matter for the amount of "envelope payments" in subsequent jobs and are there any differences between voluntary and involuntary separations?

3. Are displaced workers more likely to be "trapped" in informality while those who quit choose it voluntarily?

4. Is the experience of displaced workers and quitters with little human capital different from those with abundant human capital?

5. Is informality persistent, i.e. are workers who separate from informal jobs more likely to be informally employed in their subsequent jobs and are there different likelihoods for those displaced and those who quit from informal jobs?

Answers to these questions allow us to better understand the nature of informal employment and what drives it in the Russian labor market. Thus, the value added of this paper does not only consist in establishing whether informality is an additional important cost of displacement but also sheds light on unresolved questions in the literature regarding the factors driving the formal-informal divide in the labor market. In this regard, our analysis especially contributes to the debate on the nature of labor markets in emerging and transition countries, i.e. whether these labor markets are segmented or integrated.

3. Data, measurement issues and descriptive analysis

The analysis uses a database that consists of the panel data of the Russian Longitudinal Monitoring Survey (RLMS) for the years 2003 to 2009 and two special supplements. The first supplement is on displacement that was developed by our team in collaboration with Russian scholars and administered to the 17th round of the RLMS between October and December 2008, while the second one on informality, developed by the same group of researchers, was fielded between October and December 2009.[7] The

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[7] Throughout its history, the data of the main RLMS data set have been collected in the months of September to December.

main RLMS data form a well known rich panel data set, which has provided the empirical basis of many important papers on the Russian labor market. We use the main panel data of the years 2003 to 2009 and combine them with the new data from the two supplements. The displacement supplement also contains a panel element, which allows us to trace informal employment over time.

This study and the two supplements focus on the main job of workers, which in the case of multiple job holding is either the job providing the largest income or the job where the worker deposits his or her labor book.[8] We also distinguish in our analysis between dependent employees and the self-employed and entrepreneurs. Following Slonimczyk (this volume), we consider respondents as self-employed/entrepreneurs if they undertake entrepreneurial activities and are either owners of firms or self-employed individuals who work on their own account with or without employees. They are considered informal if their activity is not registered with the authorities.

The supplement on displacement provides retrospective information on respondents' job and non-employment spells over the years 2003 to 2008. We have information on the beginning and the end of each job spell and of each non-employment spell and are thus able to construct a complete labor market history for all respondents in the indicated period.[9]

In order to identify a separation as a quit or a displacement the supplement provides information on the reason for separating from a job. The possible answers given in the

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[8] Respondents in the main RLMS and in the displacement supplement are asked to discuss the job that they themselves consider their main job. This can be understood by the respondents in the two ways mentioned in the text.

[9] We also have information on the actual weekly hours worked, on occupation and the sector of employment as well as on the wage at the beginning and the end of each job.

supplement are reproduced in table A1 and are very much standard in labor force surveys administered in OECD countries. As respondents are told to only give one answer it is relatively straightforward to classify job separations into quits and displacements.[10] The classification provided in table A1 leads to a conservative estimate of separations caused by displacement.

The upper panel of figure 1 shows the estimates of annual quit and displacement rates for the years 2003 to 2008. Quit rates are generally thought to be pro-cyclical and displacement rates countercyclical (Pissarides 1994) This supposition is borne out by the presented quit and displacement rates. Since the years 2003-2008 are a boom period we see very large quit rates that are between four to five times larger than the displacement rates. The latter rates hover between two and three percent and are thus not negligible but on the lower end of the spectrum that we observe in OECD countries (Kuhn 2002). Only a small portion of displacements are caused by plant or firm closure, the vast majority are due to redundancies as the bottom panel of figure 1 attests. The small number of displacements caused by firm or plant closure determines our research strategy insofar as we cannot use this measure as our conditioning variable, even though it is thought to be "more exogenoeus" than displacement due to redundancies. Instead, we have to employ displacement in general as our conditioning regressor, independent of whether it is due to firm/plant closure or redundancies. The supplement on displacement is comprised for the most part of retrospective data covering the years 2003 to 2008. Preliminary analysis of these retrospective data by Lehmann et al. (2011) shows that recall bias does not drive the

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[10] For a discussion of the pros and cons of using survey data to define displacement see the introductory chapter in Kuhn (2002).

results regarding wage developments. Considering that recall bias should be minimal when recalling such a dramatic event as a job separation we are confident that displacement and quits are measured essentially without error, or, if there should exist some measurement error, it certainly will not have a discernible impact on our results.

Defining informal employment is a complex issue (see, e.g., World Bank 2007). In this paper, we use the "legalistic" perspective to determine informal employment, i.e. we consider an employment relationship informal if the employer does not register the job to avoid the payment of taxes and social security contributions.[11] The Russian labor code stipulates that all employees must sign a written contract and provide their "labor book" to the employer. Oral agreements are explicitly prohibited. Also interesting, and thus far little pursued in the literature is informality that arises from "envelope payments", where workers who are formally employed get part of their income as undeclared wages. The main RLMS data survey instrument and the 2009 supplement on informality contain several questions that allow us to shed light on the two different manifestations of informality that we pursue in this paper: the informal employment relationship and "envelope payments" to formal workers. Thus our data enable us to test the robustness of the results to different definitions of informality.

The main RLMS data survey instrument contains questions that allow the identification of workers who have informal employment relationships. Dependent employees are asked whether they are officially registered at their job, i.e. whether they

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[11] The "productive" concept of informal employment, which for example links small firm size or self-employment to informal status can lead in transition economies to large measurement error (Lehmann and Pignatti 2007). This is not to say that the "legalistic" definition cannot be also plagued by some measurement error, which in a middle income transition country like Russia strikes us, however, as smaller of an order of magnitude than the measurement error associated with the "productive" definition.

are on a "work roster, work agreement or contract?" A positive response to this question is interpreted as a formal employment relationship. Those workers who say no to this question are considered to be in an informal employment relationship. For those who are determined to be in such a relationship we can also establish whether they entered it involuntarily or voluntarily.[12] The supplement on informality allows us to establish dependent workers who have an oral contract in 2009, which we take as a second measure of an informal employment relationship. In addition, the displacement supplement contains retrospective questions about the type of contract, which a person has in the period 2003-2008. Again, taking the existence of an oral contract as an indication of an informal employment relationship the data allow us to estimate pooled logit and fixed effects logit models with informal employment as the dependent variable. The informality supplement also allows us to get at the issue of informal employment from an additional angle, by asking dependent employees whether the employer pays social security contributions on the entire wage or only on part of it. In the latter case the percentage of non-compliance is asked for. We use the answers to these questions to establish the incidence of informal employment. From the main data set we can also recover the percentage of a worker's salary that is paid officially, that is on which taxes and contributions are paid, thus indirectly establishing the incidence and extent of unofficial wage payments or so-called "envelope payments."

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[12] Respondents are asked whether (1) the employer did not want a registration of the job, (2) the respondent did not want to register, or (3) both employer and respondent did not want to register. Respondents giving answers (2) or (3) are deemed to be voluntarily in informal jobs.

All information that we use to construct the dependent variables for our regressions are summarized in Table 2, where we also give the source and the way we use the data in the estimation. The first two measures, informal employment and informality in contributions, are taken from the informality supplement. These dependent variables are employed in probit cross section models for the year 2009. The percentage of official wage payments, the complement of "envelope payments", is taken from the 2009 reference week section of the main RLMS data. The information that allows us to construct formal dependent employment as well as involuntary informal dependent employment and voluntary informal dependent employment (item 4) is also taken from the 2009 reference week section of the main RLMS data. To establish informal and formal self-employment we employ data from both the 2009 informality supplement and from the 2009 reference week section of the main RLMS data. This information and responses that imply non-employment in the 2009 reference week are the basis for the construction of six mutually exclusive labor market states, in which workers can find themselves in 2009.[13] We use a multinomial logit model to determine the probability to be in any of these states.

Information from the displacement supplement is used to construct panel data on informal employment for the years 2003 to 2008, equating an oral contract with an informal employment relationship. In principle we could have used item 4 to derive panel data on informal employment. However, only the displacement supplement provides a

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[13] These states are: involuntary informal dependent employment, voluntary informal dependent employment, formal dependent employment, formal self-employment, informal self-employment and non-employment

complete labor market history of each worker. That is why we use the retrospective panel data from the displacement supplement since these data allow us to follow more accurately the relation between the informality status and separation events in any period, whereas a panel constructed from the main survey would detect this status only for the reference week. These panel data are employed in the estimation of pooled and fixed effects logit models.

The regressors that we use in our various empirical models are shown in Table 1. The demographic and regional variables and household income are taken from the main RLMS survey. The informality supplement data also contain a general risk indicator, running from 0 (complete unwillingness to take risks in general matters) to 10 (complete willingness to take risks in general matters). Inspection of Table 1 shows that on this measure all employees are risk averse, but that informal employees have a substantially higher propensity to take risks than formal employees. We have also constructed dummies for small regions, based on primary sampling units, which we use in some of the estimated models.

Table 3 shows the link between type of job separation and the six labor market states, in which a worker can be found in 2009. Looking at displacement events, the bold numbers give the absolute number and the percentages of events associated with each destination state. For example, 35 displacement events in the years 2003-2008 (8.4% of all displacement events in this period) are associated with non-employment in 2009. The vast majority of displacement events is unsurprisingly linked to dependent formal employment, while at a low level slightly more are associated with involuntary than

voluntary informal dependent employment. Self-employment is the least likely outcome for workers experiencing displacement, with formal self-employment particularly rare, since of the total 416 displacement events only 2 are associated with formal self-employment in 2009. We see a similar distribution of quit events by destination state, with the vast majority of quits ending up in formal dependent employment and self-employment, in particular formal self-employment, being the least likely destination.

When we slice separation events along the formal-informal dimension, the distribution of labor market states changes markedly. For example, comparing the distributions for quit events from formal and informal jobs we can see that the number of individuals ending up in dependent formal employment drops by more than 20 percentage points when we go from quitting formal jobs to quitting informal jobs. In addition, quits from formal jobs produce a slightly higher percentage of workers ending up as a voluntary informal employee while quitting from informal jobs is associated with a large majority of involuntary informal jobs within dependent informal employment. Similar changes in the distributions of destination states occur when going from formal to informal job displacement, with the caveat that the absolute numbers are small for the latter type of displacement. Our descriptive analysis clearly points to the persistence of informality and to the fact that some workers previously employed in an informal job seem to subsequently get entrapped in informal jobs against their will.

The third entry in each cell of table 3 gives the ratio of separation events relative to the number of individuals in a destination state in 2009.[14] For example, the total displacement events associated with non-employment are 35 and the number of individuals in this state in 2009 are 104 leading to a ratio of 0.337. The ratio of total quits to individuals in non-employment is 0.885. Going down the columns one can see the contribution of separation events of each type to the number of individuals in each state in 2009. Inspection of these ratios conditional on type of separation ratios shows the obvious fact that the contribution of quit events is much larger than the contribution of displacement events. Also note that the ratio of the total displacement and quit events are larger than the sum of their respective disaggregated events because of missing information regarding the distinction between formal and informal jobs.

Finally, the sum of the total displacement and quit ratios can tell us something about how much the stocks in the respective states are driven by job turnover brought on by displacement and quits. When this sum is less than 1, like, e.g. in the case of the destination state of dependent formal employment (0.656) separations do not contribute to a rising stock of the state. When, as is the case for the states of dependent involuntary and voluntary informal employment, the sum of the ratios is far above 1, this points to displacement and quit events contributing to rising stocks of the two states in question. For informal and formal self-employment, the sums of the ratios are below 1. The upshot of these calculations is the fact that displacement and quit events contribute

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[14] The standard deviations of these ratios are in parentheses.

disproportionately to the stocks of dependent informal employment, but not to informal self-employment.

4. The empirical models and our research approach

The decision to be an informal worker can be modeled in the framework of random utility models, where choices are determined by individual characteristics x_i and an error term ε which includes unobserved attributes. An individual i opts for informality if the utility from this choice, U^{inf} is higher than the utility from a formal job, U^{form}. Thus, the probability of observing individual i in an informal job is:

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\begin{aligned}
Pr(Inf = 1) &= \Pr\left(U^{inf} > U^{form}\right) \\
&= \Pr\left(x_i'\beta_{inf} - x_i'\beta_{form} + \varepsilon_i^{inf} - \varepsilon_i^{form} > 0 \big| x\right) \qquad (1) \\
&= \Pr(x_i'\beta + \varepsilon > 0 | x) = \Phi(x_i'\beta)
\end{aligned}
$$

Assuming that the unobserved factors ε are normally distributed, the binary choice between informality and formality can be estimated using a standard probit model.

We start by estimating the set of binary choice equations for different dependent variables in 2009 that define the informal employment relationship employing the probit model (1) as well as standard OLS regressions to estimate the complement of "envelope payments", that is, the percentage of official wage payments. We begin with the most parsimonious model that includes exogenous covariates only (age and gender), and then extend it by including sequentially other covariates. To at least reduce the omitted variables bias we also control for risk attitudes which are usually unobserved and found to be an important predictor of informality status (Dohmen et al. 2011). The main regressors of interest are, of course, the measures related to job separations. We employ

displacement and quit dummies as well as the number of displacement and quit events and link them to informality in 2009. These measures of job separations are defined for three different time intervals: job separations occurring in 2008, in 2007 and 2008, and in the period 2003-2008. We thus model shorter-term and longer-term effects of job separations on informality, but also ensure that the coefficients on the separation variables in our cross section regressions do not just pick up the rising trend of informal employment and informality that we have mentioned in the introduction.

The sketched cross sections regressions that use probit and OLS models can establish correlations between informality and separations, they cannot establish a causal effect of the latter on the former. Assuming that the unobservable factors are fixed over time, the causal effect can be estimated when these unobservables are differenced away. We, therefore, take advantage of the panel dimension of our data, and, in a second step, estimate pooled logit and fixed effects logit models with the separation events occurring at time t-1 and t-1 plus t-2. The pooled logit model uses the variation between and within individuals, whilst the fixed effects logit model exploits the variation within individuals.

The derivation of the pooled logit model is the same as the derivation leading to model (1), with the unobserved factors now having a logistic distribution, i.e., $\varepsilon \sim \Lambda(0, \pi^2/3)$.

The derivation of the fixed effects logit specification is more complex. We estimate a conditional maximum likelihood on the sample of individuals who change status at least once over the T periods and experience a sum of events $n_i = \sum_{t=1}^{T} y_{it}$ different from 0 and T. For these individuals the conditional distribution of the sequence

of outcomes $y_{i1} = y_1, ..., y_{iT} = y_T$ does not depend on the individual specific and time-invariant unobserved effect c_i (Wooldridge, 2002). The probabilities of observing a given sequence of outcomes can be formulated using Bayes' rule as follows:

$$P(y_{i1} = y_1, ..., y_{iT} = y_T | \mathbf{x}_i, c_i, n_i = n)$$
$$= P(y_{i1} = y_1, ..., y_{iT} = y_T | \mathbf{x}_i, c_i) / P(n_i = n | \mathbf{x}_i, c_i)$$
(2)

where $P(n_i = n | \mathbf{x}_i, c_i)$ is the probabilities of all sequences of $\mathbf{y}_i$ that will produce a sum of outcomes n_i equal to n. The vector $\mathbf{x_i}$ contains the above mentioned covariates and yearly dummies. The log likelihood in this case can be expressed as follows:

$$l_i(\boldsymbol{\beta}) = \log \left\{ \exp\left(\sum_{t=1}^{T} y_{it} \mathbf{x}_{it} \boldsymbol{\beta} \right) \left[\sum_{a \in R_i} \exp\left(\sum_{t=1}^{T} a_t \mathbf{x}_{it} \boldsymbol{\beta} \right) \right]^{-1} \right\}$$
(3)

where R_i represents the subset of $\mathfrak{R}^T$ which includes all the possible combinations of a_t which is an indicator function taking the value one for periods t in which transitions are possible. This yields a sum over the T periods equal to n_i, i.e. $\left\{ \mathbf{a} \in \mathfrak{R}^T : a_t \in \{0,1\} \text{ and } \sum_{t=1}^{T} a_t = n_i \right\}$.[15]

Since we find that separation events significantly raise informality when using the fixed effects framework we are confident that the probit and OLS regressions undertaken in the first step show at least correlations with the direction going predominantly from the

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15 The probit, OLS, pooled logit and fixed effects logit models that we estimate provide an empirical answer to research questions 1 and 2. These models are estimated with the sample of dependent employees of working age (16-59).

separation event to informality status. Since we also include year dummies in the fixed effects logit regressions the significant results on the separation variables cannot purely reflect the upward time trend of informality that we observe in the data. The supposition that separation events have a causal impact on informality is further strengthened by robustness checks, which provide fixed effects logit estimations with interactions of year with regions, gender and education as well as interactions of separation events with gender and education.

To obtain a better understanding of the voluntary versus involuntary nature of informality, in a last step, we differentiate between six different labor market states – formal employment, involuntary informal employment, voluntary informal employment, formal self-employment, informal self-employment and non-employment. Again, random utility models can be used to estimate such multiple choice models. In this framework, the probability of observing outcome j is:

$$\Pr\left(U^j > U^k\right) \text{ for any } k \neq j \qquad (4)$$

If the k error terms have an extreme value distribution, this choice can be estimated using a multinomial logit model, and the probability of choice *j* becomes as follows:

$$\Pr(j = 1) = \frac{e^{x_i'\beta_j}}{1+\sum_{k=1}^{K} e^{x_i'\beta_k}} \quad j=1,....,K \qquad (5)$$

This model is estimated for the cross-section of the 2009 data, where the set of regressors includes displacement and quit measures for separation events occurring anytime in the period 2003 – 2008.[16] Estimation of multinomial logit models using the whole sample of

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[16] We have also experimented with estimating pooled multinomial logit models for the 2003-2008 period in order to incorporate more labor market transitions and to check the robustness of our results. We were,

the working age population allows us to give an answer to research question 3. Slicing the data by level of education and by source of separation (separation from formal or informal employment) we can provide an empirical analysis of research questions 4 and 5.[17]

5. Results

5.1 Relation between separation events and informality status

Using various measures of informal employment from different sources as well as the percentage of official wage payments as the dependent variables representing informality status in 2009, we perform probit and OLS regressions, having a set of control variables and separation (displacement and quit) events as the explanatory variables of interest. The set of separation events that we employ in our regressions is characterized according to the three different time intervals mentioned in the previous section and repeated here for convenience: {separation occurring in 2008; separation occurring in 2007 and 2008; separation occurring anytime in the period 2003-2008}. Instead of separation events, we finally include non-employment spells as an explanatory variable of interest, with the

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however, not able to distinguish between voluntary and involuntary self-employment and had to use self-reported self-employment status in these regressions. The main results were qualitatively similar to the ones reported in the text and are available from the authors upon request.

[17] A major drawback of the multinomial logit model is the assumption that the error terms are mutually independent leading to the independence of irrelevant alternatives (IIA) property. We have conducted several tests excluding each of the outcomes (or a combination of more outcomes) and tested the IIA property between this restricted model and the full model with all the alternatives. The IIA test was implemented with a generalized Hausman test. The null hypothesis of equality of coefficients between the restricted and full model was always rejected. For this reason, we have opted for the full efficient model which includes all outcomes. An alternative route would have been to estimate multinomial probit models, which alas is not possible with the data at hand since we do not have exclusion restrictions, i.e. attributes that vary across choices (see Keane, 1992, for identification requirements of multinomial probit models). The second theoretical alternative to the multinomial logit model could be the nested logit model. This model, while solving the IIA problem, in practice converges only in the context of a conditional logit model, i.e. a model where there exist characteristics which vary across choices.

same time intervals as the separation events. The results of the multitude of regressions that we perform, combining different measures of informality with differently timed separation events and non-employment spells, will be summarized in a concise fashion. However, to better understand how we proceed we reproduce the results of probit regressions that link informal employment in 2009, using an oral agreement without documents as the basis for its definition, to displacement or quit events occurring in 2008.

Table 4 shows the four specifications of this probit model. The first specification (Models 1 and 5) only includes truly exogenous covariates. It has a quadratic in age and gender, with older workers having a lower, males a higher probability to be in informal employment. Both results are confirmed in the above cited scarce literature on informality in transition countries. Models 2 and 6 add variables of educational attainment, of marital status, for the number of children, for living in a village or in a big city. It also controls for local labor market conditions by including small region dummies. Workers living in a village or in a big city have a lower probability of being informally employed by roughly five percentage points. Confirming our priors, workers with higher education have a propensity to be informally employed that is substantially lower than workers with primary education or less. For workers with secondary education this negative difference in the propensity to be informally employed also exists but is attenuated. In the case of married workers this propensity is 2 percentage points lower. Models 3 and 7 add a measure of willingness to take risks in general going from 0 ("unwilling to take any risk") to 10 ("always willing to take risk"). An increase by one unit of this general risk measure will increase the likelihood of being in an informal

employment relationship by roughly half a percentage point. This positive relationship between willingness to take risks and informal employment confirms the finding of Dohmen, Khamis and Lehmann (2011) who study the link between risk attitudes and informality in Ukraine. Controlling for risk attitudes strikes us as an important step towards attenuating omitted variables bias. The final specification (models 4 and 8) adds household income which is negatively related to informal employment, but is not statistically significant.

This negative effect of household income while present when we use separation events occurring during 2008 is also insignificant with separation events going further back in time. On the other hand, models 3 and 7 produce the same magnitudes of marginal effects and the same significant levels of the included covariates no matter what the dependent variable and no matter which time interval we use for the separation events. We thus report the marginal effects of displacement and quit events and of non-employment spells for models 3 and 7 when summarizing our regression results.

Panel 1 of our summary table 5 reports the marginal effects of separation events used in separate regressions. Inspecting these marginal effects when oral contract defines informal employment we can see that these effects are large but attenuated over time. A displacement event taking place in 2008 raises the probability of being informally employed by nearly 6 percentage points. This effect falls to 2 percentage points if displacement occurs anytime in the period 2003-2008. The effects are smaller for quits but show the same attenuation pattern. If in the opinion of the employee the employer

does not pay social security contributions or pays them only partially the worker is defined to be informally employed. Defining informal employment in this way produces very large marginal effects since displacement occurring in 2008 is associated with a rise of the probability of being informally employed of roughly 15 percentage points falling to about 7 percentage points when the displacement event falls into the 2003-2008 interval. For quits these effects are substantially smaller. The third block of results deals with the complement of informal employment using the respondent's assertion that in the reference week of 2009 s/he is officially registered at the job. While having the same attenuation patterns with respect to the time intervals as the other two measures, the effects are much smaller (in absolute value) and quits seem to produce a slightly larger reduction in formal employment than displacement events.   The final block in panel 1 reports the coefficients on the separation events when the dependent variable is the percentage of officially paid wages. We have the striking result that the large negative effect on the percentage of official wage payments is not attenuated when we use the larger 2007-2008 interval. Attenuation only sets in when separation occurs anytime between 2003 and 2008. Equally striking are the much larger declines associated with displacement events.

Panel 2 presents results with the separation variables used jointly in the regression. It is noteworthy that the results are very similar to those in panel 1. Since we estimate the effects of both displacement and quit events jointly we are able to test for the equality of the coefficients employing a chi-square test in the case of the probit regressions and an F-test when using OLS estimation. In the case of informal employment captured by a lack

of paid contributions and in the case of official wage payments the null hypotheses of equal marginal effects or equal coefficients are rejected pointing to larger effects associated with displacement events. This assertion is particularly true for displacement events that have occurred in 2007 and 2008 and in the period 2003-2008. Even though the marginal effect of the displacement variable is substantially larger than the marginal effect of the quit variable when informal employment is defined as having an oral contract, the test fails to reject the null hypothesis of equal marginal effects. In the case of formal employment the marginal effects are quite close or even equal, consequently unsurprisingly the null hypothesis is not rejected in this case.[18]

In the final panel we investigate whether there is an association between non-employment spells and informality status. The marginal effects of informal employment and formal employment are mirror images, while for informality in contributions the effects are slightly higher but have the same time pattern. Official wage payments are also negatively affected by the length of non-employment. The further back in time the non-employment spell occurred the smaller the rise in the probability of informal employment or the smaller the reduction in the propensity to be formally employed or the reduction of the percentage of official wage payments.

The evidence presented in table 5 provides some tentative answers to our first two research questions. Job separations are strongly associated with a higher incidence of informal employment no matter which of its measures we use. Job separations also lead

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[18] The results of the chi-square tests (in the case of the probit regressions) and F-test (when using OLS regression) are not shown here but available upon request from the authors.

to a substantial reduction in official wage payments in subsequent jobs. In two of the four cases, informal employment captured by lack of paid contributions and the percentage of official wage payments, we can formally establish a larger effect for displacement events than for quits. So, displaced workers are more strongly affected by informal employment relationships and "envelope" payments in subsequent jobs than their quitting counterparts.

5.2 Establishing a causal effect of separation events on informal employment

The cross-section regressions that we performed thus far establish strong correlations between separation events and informality status, no matter which definition is used. We now take the analysis a step further using the retrospective panel data of the 2008 displacement supplement. This is a monthly data set with a complete labor market history of all respondents employed at time of interview, which allows us to identify displacement and quit events up to 12 months (t-1) and 24 months (t-2) prior to holding an employment relationship. This employment relationship, the dependent variable, is traced back through time, taking the value one if the respondent has an oral contract. We start off with the estimation of pooled logit models and then turn to fixed effects logit models to establish a causal effect of separation events on informal employment.[19]

The first four columns of table 6 present coefficients on the separation variables and other covariates including year dummies of the pooled logit model. A comparison with

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[19] In addition to fixed effects logit estimation we also experimented with a pooled logit model using all workers who changed jobs in any way as our observations (including moves from formal to other formal jobs or from informal to informal etc.). The results of the coefficients on the separation variables lie between those of the general pooled logit model and the fixed effects logit model. They are not represented here but available on request.

the marginal effects of the probit regressions in table 4 shows the same demographic characteristics driving informal employment since the signs and the significance levels are similar. Displacement and quit events have a large and very similar impact on informal employment independent of whether we use t-1 or t-2 as the time interval.

While the pooled logit model takes advantage of variation between and within individuals the fixed effects logit model only uses variation within individuals, i.e. only uses respondents who move from formality to informality and vice versa. The number of regressors is thus reduced with fixed effects logit estimation, but we eliminate unobservable factors that partially determine informal employment as long as these unobservable factors are time-invariant.[20] Given the validity of the time invariance assumption we can identify a causal effect of separation events on informal employment. The coefficients on the separation variables shown in columns 5 – 8 of table 6 are smaller than the coefficients of the pooled logit indicating that unobserved factors play an important role in the determination of informal employment. Nevertheless, the coefficients remain large and highly significant. It is of particular interest that the causal impact of displacement events shows no attenuation when we go from 2008 to the period 2007 and 2008 and is more than three times as large as the impact of quit events in the case of this time period.

The statistically significant causal impact of separation events on informal employment is confirmed when we perform several robustness checks of the fixed effects

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[20] Whether these unobserved factors are indeed time-invariant is, of course, an open question. However, many of these factors like, e.g., ability, motivation, risk attitudes and social identity should not really change from year to year.

model. In these robustness checks we first interact year with region to account for variation in the macroeconomic environment over time and space.[21] A second set of interactions consists in the interaction of separation events with gender and educational attainment. The latter two variables are also interacted with year. Results of the robustness checks with the first set of interactions are shown in columns (1) – (4) of table A2 in the appendix. It is striking that the coefficients on the separation variables are very similar to the ones in the basic fixed effects model shown in table 6. When we interact displacement events with gender and education, and these latter two variables with year, the sum of the principal coefficient on the displacement event and the coefficient on the interaction term is always positive and significant. For t-1 this also holds for quit events, while with t-2 quit events only impact on informal employment when interacted with secondary education. In summary, 7 out of 8 robustness regressions point to significant positive impacts of separation events on informal employment.

The larger estimated effects of displacement events in the fixed effects logit model and the fact that these effects are not attenuated over time in conjunction with the smaller and attenuated effects of quit events might be interpreted as evidence of a segmented labor market. Essentially those separated from their jobs involuntarily seem to be rationed out of formal employment more than their quitting counterparts. Since we have information on the voluntary nature of informal dependent employment in our data we analyze this issue of labor market segmentation in what follows together with the

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[21] In applied work the interaction of time with region is often used to control somewhat roughly for the business cycle. Since the years 2003-2008 reflect a boom period in the Russian labor market, it makes little sense to speak of having these interactions as controls for the business cycle. Nevertheless, we do control for a changing macroeconomic environment within this boom period.

question whether displacement imposes a cost on workers in the form of involuntary informal employment.

5.3 Job separations and the involuntary and voluntary nature of informal employment

Taking formal dependent employment as our base category, we perform multinomial logit (MNL) regressions varying measures of displacement and quits and allowing for five labor market states in addition to the state of formal employment of dependent workers: involuntary informal employment of dependent workers, voluntary informal employment of dependent workers, informal self-employment, formal self-employment and non-employment. We treat informal self-employment as voluntary. Also, in line with our priors the main survey instrument implicitly assumes that all formal dependent employment is voluntary.

The six states shown in table 7 are given for the year 2009.[22] The MNL regressions are cross section regressions where we estimate the probability of being in a certain state in 2009 using covariates from the same year, including the general risk indicator. The main regressors of interest are measures of job separations, which are defined as separations occurring anytime between 2003 and 2008. We use this time interval to maximize the number of occurring job separations. The evidence in table 5 implies that it is not really problematic to map separation events in the period 2003-2008 to labor market status in 2009 since the effects of displacement and quits are never reduced to 0

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[22] We are confronted here with rather small sample sizes, especially for the formal and informal self-employed.

when we choose this longest time interval at our disposal. In addition the evidence in table 6 points to a non-decreasing causal effect of displacement on informal employment as the time interval is widened to 24 months, while for quits the effect is reduced but remains large.

On the basis of MNL regressions[23] we calculate the marginal effects of displacement and quits for the six potential states. In panels 1-5 of table 7, we use variants of the sum of displacement and quit events as the regressors of interest. Panel 6 is based on one MNL regression with four mutually exclusive dummies included: the dummies take the value one if the last separation is a displacement from an informal job, a displacement from a formal job, a quit from an informal job or a quit from a formal job. The last panel in table 6 tries to see whether informality breeds informality by including the number of months in an informal job in the period 2003-2008. The control variables are the same as those used in the probit regressions shown in table 4.

Panels 1 and 2 of table 7 essentially tell the same story. Whether the sum of displacement and quit events are individually or jointly included in the regression the marginal effects are very close to each other. Both the sum of displacement events and the sum of quit events raise the probability of being involuntarily in informal employment by roughly half a percentage point. In contrast, only quits influence the probability of being in a voluntary informal job. We take these two results as evidence that displaced workers get trapped in informal jobs while among quitters there are some workers who select themselves into an informal job while others read the labor market wrong and end

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[23] These regressions are not shown here but available upon request.

up involuntarily in such a job. Panels 1 and 2 also show that those who separate voluntarily from their job lower their chances of finding formal dependent employment, while the displaced have a lower probability of being self-employed formally. It is also striking that displaced workers have a far higher probability to end up in non-employment than those who quit.

Panels 3 and 4 provide some of the central evidence of our analysis in this section. In panel 3 the variable of interest is the sum of displacement events interacted with low and high education[24], in panel 4 the same human capital variables are interacted with the sum of quit events. Displaced workers with low human capital find themselves with a higher probability in involuntary informal employment than their non-displaced counterparts, while displaced workers with high educational attainment are much less likely to find themselves in this state. In contrast, the latter group has a higher propensity to find itself in voluntary informal employment and formal employment, but displacement does not affect the probability to be in this state as far as the low educated workers are concerned. Unsurprisingly, displacement raises the likelihood to be in non-employment independent of educational attainment. The sum of quit events of workers with low and high education have a somewhat different pattern (panel 4). Those with low education have an increased likelihood to be in both the involuntary and voluntary sector of dependent informal employment; at the same time these workers are less likely to find themselves in formal dependent and self-employment. Workers with high education who quit their previous jobs have a higher propensity of finding a voluntary informal job, and a substantially

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[24] High education means university education; low education is secondary education or less.

lower probability to be involved in informal self-employment, while the states involuntary informal and formal dependent employment are not affected by their quitting actions.

The evidence collected in panels 3 and 4 can be interpreted in the following way. Some of the workers with low human capital who are displaced get trapped in informal jobs, as they end up in a state they do not want to select. On the other hand, workers with a large amount of human capital upon displacement find themselves in informal employment relationships only voluntarily, in actual fact interacting displacement with high education depresses the probability to be in an involuntary informal job substantially. Workers with low education who quit end up in both involuntary and voluntary informal jobs, so some of them get trapped against their will in informal employment. In turn, workers well endowed with human capital who quit subsequently can avoid informal jobs if they do not want them. Consequently, the results presented in panels 3 and 4 also imply that informal employment is an important cost of displacement and that it falls predominantly on workers with low education.

In panel 5 displacement and quit events are sliced differently as we investigate whether there are differences in the probability of occupying states by formal or informal sector of origin. Concentrating on dependent employment as an outcome, we see that being displaced from a formal job does not affect any dependent employment state. Quits from formal employment, on the other hand, raise the probability to be in involuntary and voluntary informal jobs. The probability to be in involuntary informal employment is

raised by about two percentage for those workers who are displaced from an informal job. For those who quit from such a job the likelihood is raised for both involuntary and voluntary informal employment. In panel 5 it is also striking that those who quit from an informal job are not entering non-employment at an increased rate but informal and formal self-employment, while the three remaining separations in this panel cause a higher probability to end up in non-employment. Panel 6, where the last separation is decomposed in four mutually exclusive events (displacement from a formal job, displacement from an informal job, quits form a formal job and quits from an informal job), conveys similar information as the previous panel. In particular, displacement from an informal job makes it a lot less likely that the new job is of the voluntary informal nature. Furthermore, quits from informal employment translate into higher probabilities of both types of informal jobs.

The results reported thus far in table 7 help us to give some tentative answers to our research questions three and four. They confirm our contention that displacement entraps some of the workers in involuntary informal employment. Those who quit, in turn, experience voluntary informality for the most part, but there seems a minority of quitting workers who end up in involuntary informal jobs because they read the labor market wrong when separating from their previous job. This scenario of entrapment for the displaced and wrong expectations of some of those who quit does not fall on all the workers who separate but predominantly on workers with low human capital and on those who separate from informal jobs.

Does informality breed informality? The answer given by panel 7 is pretty clear: having spent some months in informality will increase the probability to increase all types of informal employment in the subsequent job. The likelihood of finding formal employment as a dependent worker is, on the other hand, lowered. These results point unequivocally to the persistence of informal employment relationships over time and give at least a partial answer to our research question five.

6. Conclusions

The general research question that we investigate focuses on the link between job separations (displacement and quits) and informality. Our empirical analysis wants to see whether displaced workers and quitters experience more informal employment and "envelope payments" in subsequent jobs than new labor market entrants or incumbents whose jobs might have become informal. In a transition economy like the Russian one where informal employment has been growing and where the vast majority of incumbents has a formal employment relationship it might well be that the burden of rising informal employment falls disproportionately on job separators. We refine this general research question by investigating the question whether workers who are involuntarily separated from their jobs are more likely to become trapped in involuntary informal employment than workers who quit their jobs. We also want to see whether this experience of potentially being trapped in involuntary informal employment differs by the level of human capital. In addition, we wish to find out whether informality breeds informality, that is, whether past spells in informal employment raises the likelihood to be currently in

an informal job. Finally, we also investigate whether displacement and quits impose a cost even on workers who work in a formal job insofar as the part of the officially paid wage is lower for them than for their incumbent counterparts. Answers to these questions contributes to the literature on informal employment in transition economies as well to the literature on displacement. As far as the latter is considered, informality can be considered an additional important cost of job loss if the data show a higher probability of being in involuntary informal employment for displaced workers than for workers who quit their jobs. With respect to the former literature, a higher incidence of involuntary informal employment for the displaced points to the existence of a segmented rather than integrated labor market for this group while for quitters the labor market is mostly integrated.

To get at these issues we use a unique data base that combines the main RLMS panel data set of the years 2003 to 2009 with a supplement on displacement that was administered with the main 17th wave of the RLMS in the months of October to December 2008, and a supplement on informality that was fielded with the main 18th wave of the RLMS between October and December 2009. The data from the two supplements are of high quality and contain information on modes of separation and types of informality that allow us to analyze the above raised questions.

We use probit, OLS, pooled logit, fixed effects logit and multinomial logit models in our empirical analysis. In our cross section probit and OLS estimations we use three different informal employment definitions as well as the percentage of official wage

payments, all measured in 2009, and link them to displacement and quit events constructed for the periods 2008, 2007 and 2008 and 2003-2008. The correlations between all dependent variables and the separations events are strong and highly significant. The fixed effects logit model, which uses retrospective panel data from the displacement supplement, establishes large causal effects of displacement and quits on informal employment, with displacement effects being substantially larger than quit effects. This result is robust to several specifications with interactions. We infer from this that the direction of the correlations that we establish with our cross section probit, OLS and multinomial logit regressions should go predominantly from separation events to informality.

Our multinomial logit results confirm our contention that displacement entraps some of the workers in involuntary informal employment. Those who quit, in turn, experience voluntary informality for the most part, but there seems to be a minority of quitting workers who end up in involuntary informal jobs because they read the labor market wrong when separating from their previous job. However, this scenario of entrapment for the displaced and wrong expectations of some of those who quit does not fall on all the workers who separate but predominantly on workers with low human capital and on those who separate from informal jobs. This latter result also implies that informal employment is persistent as some workers churn from one informal job to the next. We also find strong evidence that displacement translates into larger "envelope payments" in formal jobs than quits.

Our results provide a subtle message regarding the question of labor market segmentation versus labor market integration: as in Lehmann and Pignatti (2007) we find evidence for the coexistence of the segmented and integrated labor market paradigm. Segmented insofar as displaced workers are predominantly pushed into involuntary informal employment relationships without many opportunities to enter preferred formal employment. In contrast, the labor market seems mainly integrated for workers who quit since they move freely between formal and informal employment at their own will.

The results of the fixed effects logit estimation also points to informal employment as an important cost of job loss in the Russian labor market. In our companion paper on the monetary and non-monetary costs of displacement in the Russian labor market we put forth the policy recommendation to promote policies that help displaced workers to increase their search effectiveness. This recommendation was based on the fact that the main monetary costs of job loss were found to be foregone earnings due to long spells of non-employment and not wage penalties upon re-employment. Given the results in this study, the policies that we wish to advocate need to be amended. If it is true that above all displaced workers with low human capital end up in informal jobs involuntarily, training and further training policies should also be on the agenda of policy makers who wish to help displaced workers.

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Figure 1: Separations and Layoffs

Separations (sample: working age 15-59 years)

Layoffs (sample: working age 15-59 years)
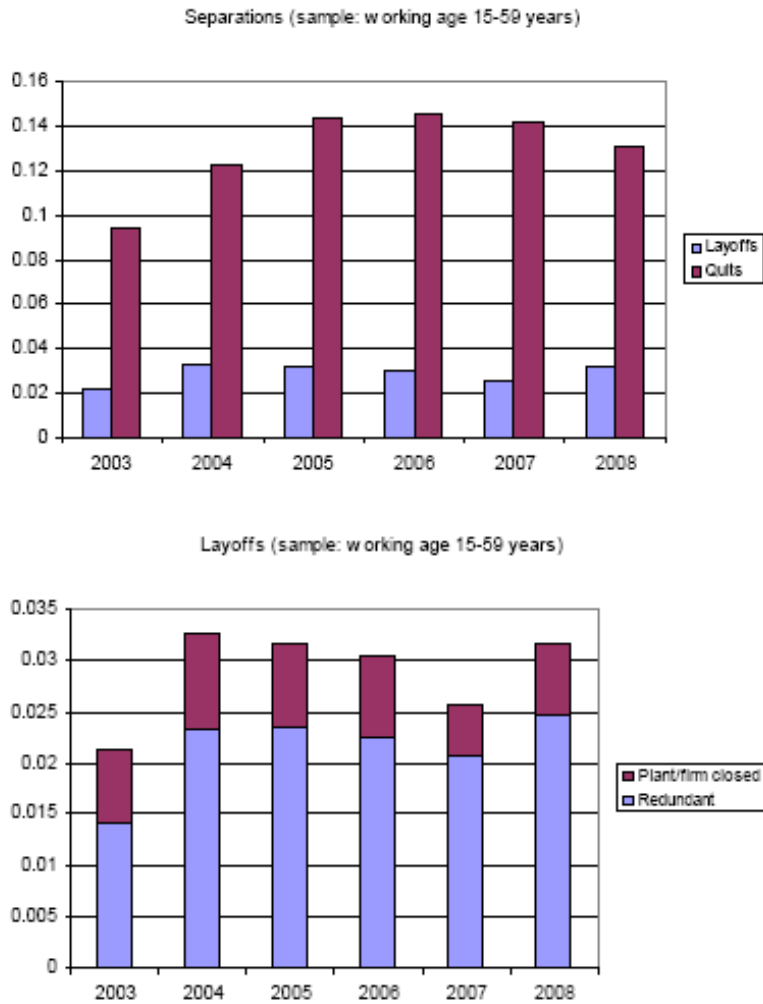
Source: Authors' calculations based on RLMS supplement on displacement.
Note: Our definition of working age deviates from the official definition, which is 16-59 for men and 16-54 for women.

TABLES

Table 1: Descriptive statistics of dependent employees

Variables	All sample	Employed officially	Informal Employees
Displ., 2008	0.025 (0.155)	0.022 (0.146)	0.041 (0.199)
Displ., 2007-2008	0.042 (0.211)	0.039 (0.205)	0.066 (0.249)
Displ., 2003-2008	0.134 (0.394)	0.122 (0.376)	0.231 (0.511)
Quits, 2008	0.095 (0.306)	0.086 (0.291)	0.248 (0.469)
Quits, 2007-2008	0.198 (0.473)	0.184 (0.457)	0.413 (0.626)
Quits, 2003-2008	0.585 (0.917)	0.551 (0.881)	1.116 (1.180)
Months non-empl., 2008	0.438 (1.844)	0.352 (1.637)	1.471 (3.310)
Months non-empl., 2007-2008	1.020 (3.771)	0.841 (3.367)	3.008 (6.736)
Months non-empl., 2003-2008	2.626 (8.253)	2.225 (7.459)	7.058 (13.625)
Age	42.714 (9.130)	42.897 (9.091)	41.554 (9.324)
Male	0.431 (0.495)	0.423 (0.494)	0.537 (0.499)
City	0.344 (0.475)	0.346 (0.476)	0.256 (0.437)
Village	0.190 (0.393)	0.185 (0.389)	0.165 (0.372)
Regional center	0.466 (0.499)	0.469 (0.499)	0.579 (0.494)
Higher education	0.291 (0.454)	0.309 (0.462)	0.116 (0.320)
Secondary education	0.622 (0.485)	0.609 (0.488)	0.736 (0.441)
Primary education	0.087 (0.282)	0.081 (0.273)	0.149 (0.356)
Children	0.735 (0.787)	0.731 (0.788)	0.719 (0.742)
Marital status	0.806 (0.395)	0.810 (0.392)	0.760 (0.427)
Moscow/St. Petersburg	0.182 (0.385)	0.186 (0.389)	0.264 (0.441)
North-West	0.069 (0.253)	0.072 (0.259)	0.017 (0.128)
Central-Volga	0.432 (0.495)	0.431 (0.495)	0.339 (0.474)
South	0.106 (0.308)	0.102 (0.303)	0.099 (0.299)
East	0.212 (0.409)	0.209 (0.406)	0.281 (0.450)
Risk indicator	3.744 (2.816)	3.657 (2.789)	4.372 (2.733)
Household income	33402.91 (22074.41)	33656.14 (22044.56)	33449.59 (23522.41)
N. obs	16854	15342	726

Notes: Sample used in the analysis with the 2009 data. "Official Employment" variable is from the main survey. "Displ." and "Quits" stand for sum of separation events. Household income includes total income of the family in the last 30 days and is trimmed (the first and the last percentage is dropped); the sample for the household income is 15702.

Table 2: Informality measures

Measure of informality	Source	Way data are used in estimations
1) Informal employment Equals 1 if employee has an oral agreement without documents.	Informality supplement 2009	Cross-section
2) Informality in contributions: Equals 1 if the employer does not or is suspected not to pay, at least in part, the social security contributions commensurate with an employee's wage.	Informality supplement 2009	Cross-section
3) Percentage of official wage: Denotes the percentage of the wage the respondent thinks was paid officially, i.e. from which the employer paid taxes (set equal to missing if answer is "don't know").	Main survey 2009 Reference week section	Cross-section
4) Formal dependent employment plus voluntary nature thereof: 4a) Equals 1 if an employee is registered at the job officially, that is with labour book/agreement or contract. 4b) if informal dependent employment: Voluntary vs. involuntary: Involuntary informal equals 1 if the employer didn't want to register, while voluntary informal – if either employee or both employer and employee didn't want to register.	Main survey 2009 Reference week section	Cross section
5) Informal and formal self-employment: if the respondent works in an enterprise or organization, is the owner of the firm and considers himself as an entrepreneur and is not officially registered at the job (it is formal if the respondent is registered at the job)	Informality supplement 2009 and Main survey 2009 Reference week section	Cross section
6) informal employment: Equals 1 if employee has an oral agreement without documents.	Displacement supplement 2008	Retrospective panel 2003-2008

Table 3: Descriptive statistics on types of separations and potential destination states

Type of job separation 2003-2008	Destination state in 2009						
	0 *Non-employed.*	*1* *Formal employee*	*2* *Informal Involuntary employee*	*3* *Informal Voluntary employee*	*4* *Self-employed informal*	*5* *Self-employed formal*	
Displacement events total	**35** **8.4%** 0.337 (0.601)	**342** **82.2%** 0.119 (0.370)	**15** **3.6%** 0.234 (0.496)	**13** **3.1%** 0.220 (0.527)	**9** **2.2%** 0.076 (0.297)	**2** **0.5%** 0.039 (0.196)	**416** **100%**
Displacement events from formal job	**32** **8.7%** 0.308 (0.576)	**304** **82.8%** 0.106 (0.349)	**12** **3.3%** 0.187 (0.467)	**12** **3.3%** 0.203 (0.518)	**6** **1.6%** 0.051 (0.221)	**1** **0.2%** 0.019 (0.140)	**367** **100%**
Displacement events from informal job	**3** **12.5%** 0.029 (0.168)	**17** **70.8%** 0.006 (0.085)	**2** **8.3%** 0.0312 (0.175)	**1** **4.2%** 0.017 (0.130)	**0**	**1** **4.2%** 0.020 (0.140)	**24** **100%**
Quit events total	**92** **5%** 0.885 (0.884)	**1546** **83.2%** 0.537 (0.869)	**71** **3.8%** 1.109 (1.311)	**65** **3.5%** 1.102 (1.029)	**62** **3.2%** 0.525 (1.115)	**22** **1.2%** 0.431 (0.806)	**1858** **100%**
Quit events from formal job	**79** **5%** 0.760 (0.876)	**1353** **85.6%** 0.470 (0.791)	**43** **2.7%** 0.672 (0.855)	**51** **3.2%** 0.864 (0.798)	**39** **2.5%** 0.331 (0.693)	**16** **1%** 0.314 (0.678)	**1581** **100%**
Quit events from informal job	**9** **5.5%** 0.087 (0.315)	**105** **63.6%** 0.037 (0.229)	**22** **13.3%** 0.344 (0.930)	**11** **6.6%** 0.184 (0.473)	**13** **7.9%** 0.110 (0.429)	**5** **3%** 0.098 (0.361)	**165** **100%**
Number of individuals in respective state (2009)							
	104	2879	64	59	118	51	3275

Notes*:* In the top of each cell we find in bold the total number of type of separation event by potential destination state and its percentage relative to the total number of that event in the entire sample. The second row gives the distribution of individuals in the labor market states in 2009 for the main job. The third row displays the ratio of type of separation event by potential destination state relative to the number of individuals in this destination state in 2009 (N.B.: These are events not individuals. i.e. an individual might be displaced more than once, and all these events enter the ratio.) Standard deviations are in parentheses. N.B. The sum of displacement events from formal jobs and from informal jobs does not equal the total number of displacements because of missing information on formality/informality in some cases. The same problem exists with quits.

Table 4: The impact of displacement and quit events occurring in 2008 on informal employment in 2009 – marginal effects

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Displ.	0.047***	0.073***	0.058***	0.054***				
	(0.013)	(0.016)	(0.015)	(0.015)				
Quits					0.054***	0.040***	0.041***	0.046***
					(0.004)	(0.004)	(0.004)	(0.004)
Age	-0.009***	-0.007***	-0.006***	-0.007***	-0.008***	-0.006***	-0.005***	-0.006***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)
Age squared	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Male	0.027***	0.024***	0.021***	0.018***	0.025***	0.022***	0.019***	0.016***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
City		-0.056***	-0.053**	-0.053**		-0.059***	-0.057***	-0.059***
		(0.020)	(0.021)	(0.022)		(0.020)	(0.020)	(0.021)
Village		-0.049***	-0.046***	-0.044***		-0.051***	-0.049***	-0.048***
		(0.012)	(0.013)	(0.014)		(0.011)	(0.011)	(0.012)
Higher edu.		-0.053***	-0.052***	-0.051***		-0.052***	-0.050***	-0.048***
		(0.003)	(0.004)	(0.004)		(0.003)	(0.003)	(0.004)
Sec. edu.		-0.024***	-0.021***	-0.016***		-0.023***	-0.019***	-0.014***
		(0.005)	(0.005)	(0.005)		(0.005)	(0.005)	(0.005)
Children		-0.002	-0.002	0.000		-0.001	-0.002	0.001
		(0.002)	(0.002)	(0.002)		(0.002)	(0.002)	(0.002)
Married		-0.020***	-0.021***	-0.015***		-0.020***	-0.022***	-0.014***
		(0.005)	(0.005)	(0.005)		(0.005)	(0.005)	(0.005)
Risk indicator			0.004***	0.005***			0.004***	0.005***
			(0.001)	(0.001)			(0.000)	(0.001)
Hh. income				-0.000				-0.000
				(0.000)				(0.000)
Small regions	yes	yes	yes	yes	yes	yes	yes	yes
Observations	22116	17442	16854	15432	22116	17442	16854	15432

Source of dependent variable: Informality supplement in 2009. Robust standard errors in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 5: Relation between different informality measures and separation events

Dependent Variables	Informal employment: informality supplement 2009 Marginal effects: probit			Informality in contributions: informality supplement 2009 Marginal effects: probit			Formal employment: reference week 2009 of main survey Marginal effects: probit			Percentage of official wage: reference week 2009 of main survey OLS coefficients		
Regressors												
Panel 1: separation variables used in separate regressions												
	2008	2007-08	2003-08	2008	2007-08	2003-08	2008	2007-08	2003-08	2008	2007-08	2003-08
	t-1	t-2		t-1	t-2		t-1	t-2		t-1	t-2	
Displ.	0.058***	0.032***	0.020***	0.149***	0.089***	0.068***	-0.035***	-0.018***	-0.018***	-8.241***	-9.505***	-5.047***
	(0.015)	(0.006)	(0.003)	(0.024)	(0.010)	(0.006)	(0.014)	(0.006)	(0.003)	(1.806)	(1.392)	(0.702)
Quits	0.041***	0.023***	0.016***	0.087***	0.050***	0.039***	-0.039***	-0.022***	-0.016***	-5.740***	-4.813***	-3.070***
	(0.004)	(0.003)	(0.001)	(0.007)	(0.005)	(0.003)	(0.004)	(0.002)	(0.001)	(0.936)	(0.593)	(0.319)
Panel 2: separation variables used jointly in the same regression												
	2008	2007-08	2003-08	2008	2007-08	2003-08	2008	2007-08	2003-08	2008	2007-08	2003-08
Displ.	0.057***	0.030***	0.018***	0.151***	0.085***	0.066***	-0.034***	-0.015***	-0.015***	-8.341***	-9.114***	-4.708***
	(0.015)	(0.006)	0.003	(0.024)	(0.010)	(0.006)	(0.013)	(.006)	(0.003)	(1.814)	(1.414)	(0.704)
Quits	0.041***	0.023***	0.016***	0.087***	0.049***	0.038***	-0.039***	-0.021***	-0.015***	-5.780***	-4.656***	-2.965***
	(0.004)	(0.003)	(0.001)	(0.007)	(0.005)	(0.003)	(0.004)	(0.002)	(0.001)	(0.937)	(0.598)	(0.320)
Panel 3: number of months of non-employment (separate regressions)												
Non-empl.	0.008***	0.004***	0.002***	0.011***	0.005***	0.003***	-0.008***	-0.004***	-0.002***	-0.741***	-0.312***	-0.102***
	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.160)	(0.074)	(0.032)

Notes: Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. Sample includes employees only. "Displ." and "Quits" stand for sum of separation events. All regressions include age, age squared, gender, city/village dummies, education, children, marital status, risk indicator and small regions (primary sample units). The tests of the equality of marginal effects or coefficients in Panel 2 suggest that they are statistically different for informality in contributions and percentage of official wage, but not in the case of having an oral contract or being registered at the job oficially. The means of the dependent variables are as follows: informal employment - 0.060, informality in contributions - 0.143, formal employment - 0.948, Percentage of official wage - 89.469.

Table 6: Pooled and Fixed Effects logit regressions

	(1) Pooled logit, displacement t-1	(2) Pooled logit, displacement t-2	(3) Pooled logit, quits t-1	(4) Pooled logit, quits t-2	(5) FE logit, displacement t-1	(6) FE logit, displacement t-2	(7) FE logit, quits t-1	(8) FE logit, quits t-2
Displ.	0.875*** (0.035)				0.690*** (0.073)			
Displ.		0.893*** (0.030)				0.692*** (0.070)		
Quits			0.850*** (0.025)				0.372*** (0.047)	
Quits				0.921*** (0.024)				0.205*** (0.053)
Age	-0.140*** (0.007)	-0.130*** (0.007)	-0.140*** (0.007)	-0.134*** (0.007)				
Age squared	0.002*** (0.000)	0.001*** (0.000)	0.002*** (0.000)	0.001*** (0.000)				
Male	0.295*** (0.020)	0.305*** (0.020)	0.267*** (0.020)	0.267*** (0.020)				
Higher edu.	-1.837*** (0.038)	-1.832*** (0.039)	-1.829*** (0.038)	-1.820*** (0.039)	-2.867*** (0.298)	-2.891*** (0.298)	-2.839*** (0.297)	-2.872*** (0.297)
Sec. edu.	-0.548*** (0.025)	-0.549*** (0.025)	-0.535*** (0.025)	-0.527*** (0.025)	0.059 (0.141)	0.030 (0.142)	0.090 (0.141)	0.080 (0.141)
Children	-0.044*** (0.016)	-0.043*** (0.016)	-0.042*** (0.016)	-0.043*** (0.016)	-0.474*** (0.078)	-0.497*** (0.078)	-0.469*** (0.078)	-0.482*** (0.078)
Married	-0.335*** (0.023)	-0.341*** (0.023)	-0.326*** (0.023)	-0.334*** (0.023)	-0.087 (0.101)	-0.074 (0.101)	-0.083 (0.101)	-0.081 (0.100)
Moscow/St. Petersburg	-0.624*** (0.031)	-0.627*** (0.031)	-0.618*** (0.031)	-0.612*** (0.032)				
North/West	-0.607*** (0.043)	-0.600*** (0.043)	-0.622*** (0.042)	-0.604*** (0.042)				
Central/Volga	-0.326*** (0.023)	-0.320*** (0.023)	-0.319*** (0.023)	-0.310*** (0.023)				
South	-0.247*** (0.033)	-0.251*** (0.033)	-0.246*** (0.033)	-0.247*** (0.033)				
City	-0.519*** (0.023)	-0.519*** (0.023)	-0.510*** (0.023)	-0.507*** (0.023)				
Village	-0.810*** (0.026)	-0.816*** (0.026)	-0.793*** (0.026)	-0.788*** (0.026)				
Constant	0.378*** (0.140)	0.161 (0.141)	0.353*** (0.132)	0.138 (0.133)				
Year dummies	yes	Yes	yes	Yes	yes	Yes	yes	yes
Observations	295070	295070	295070	295070	18336	18336	18336	18336
N. of indiv.					349	349	349	349

Notes: Robust standard errors in parentheses. *significant at 10%; **significant at 5%; *** significant at 1%. The dependent variable is informality (oral contract) from displacement supplement 2008. "Displ." and "Quits" stand for sum of separation events. This is a monthly dataset based on the retrospective panel from the displacement supplement. t-1 indicates displacement or quits in the previous 12 months. t-2 indicates displacement or quits in the previous 24 months. Fixed effects (Conditional) Logit estimation uses only job changers (i.e. movers from formality to informality and vice versa). Omitted categories: female, primary education, not married, regional center, East.

Table 7: Multinomial logit regressions – marginal effects of regressors measuring displacement, quits and months in informal job.

	Involuntary informal employment	Voluntary informal employment	Formal employment	Informal self-employment	Formal self-employment	Non-employment
Panel 1: Displacements and quits used in separate regressions						
Displ.	0.0055*	0.0042	-0.0104	-0.0127	-0.0098*	0.0233***
Quits	0.0051***	0.0044***	-0.0145***	-0.0019	-0.0021	0.009***
Panel 2: Displacements and quits used jointly						
Displ.	0.0044*	0.0035	-0.0085	-0.0125	-0.0094*	0.0219***
Quits	0.005***	0.0043***	-0.0139***	-0.0016	-0.0018	0.0081***
Panel 3: Displacements by education						
Displ_low	0.0051**	0.0034	-0.0057	-0.0152	-0.012	0.0245***
Displ_high	-0.131***	0.0125*	0.101***	0.0242	-0.0057	0.0204***
Panel 4: Quits by education						
Quits_low	0.0054***	0.0039***	-0.0118**	0.0008	-0.006**	0.0077***
Quits_high	0.0004	0.0078***	0.0008	-0.0256**	0.0014	0.0151***
Panel 5: Displacements and quits by informality status used in separate regressions						
Displ_formal	0.0048	0.005	-0.0001	-0.0194*	-0.0148*	0.0245***
Quits_formal	0.0027*	0.0043***	-0.004	-0.0098**	-0.0036	0.0104***
Displ_informal	0.0185*	0.0091	0.2473***	-0.3327***	0.0159	0.0418**
Quits_informal	0.0147***	0.0098***	-0.0657***	0.0215***	0.008**	0.0115
Panel 6: last separation by informality status used jointly						
last_displ_formal	0.0024	0.0192	-0.07***	-0.017***	-0.0093***	0.0748***
last_quit_formal	0.0054	0.0152***	-0.0359***	-0.0172***	-0.0025**	0.035***
last_displ_informal	0.0679	-0.101***	-0.1768	-0.0269***	-0.0038***	0.1497
last_quit_informal	0.0449*	0.0571*	-0.166***	0.0033	0.007	0.0535
Panel 7: months of being in an informal job						
Months_informal	0.0006***	0.0005***	-0.0028***	0.0005**	0.0002	0.0008***

Notes: Robust standard errors in parentheses. *significant at 10%; **significant at 5%; ***significant at 1%. Marginal effects are reported. "Displ." and "Quits" stand for sum of separation events over 2003-2008. "Displ_low" ("Quits_low") and "Displ_high" ("Quits_high") stands for the sum of displacement (quits) events for individuals with low (high) education, respectively. "Displ_formal" ("Quits_formal") and "Displ_informal" ("Quits_informal") stand for the sum of displacement (quit) events from formal and informal job, respectively. "last_displ_formal" ("last_quit_formal") and "last_displ_informal" ("last_quit_informal") are equal to one if last separation is displacement (quit) from formal or informal job, respectively; and these four dummies represent mutually exclusive events. Other covariates include age, age squared, gender, city, village, education, children, marital status, macro region and risk indicator.

Table A1. Reasons for leaving job and classification as quit or displacement

REASON	CLASSIFICATION
1 Closing down of enterprise/organization	Displacement
2 Moving of enterprise/organization	Displacement
3 Reorganization of enterprise/organization	Displacement
4 Bankruptcy of enterprise/organization	Displacement
5 Privatization of enterprise/organization	Displacement
6 Dismissal initiated by employer	Displacement
7 Personnel reduction	Displacement
8 Expiring of employment contract	Quit
9 Expiring of probation time	Quit
10 Military service	Quit
11 Imprisonment	Quit
12 Own illness or injury	Quit
13 Studies	Quit
14 Retirement	Quit
15 Early retirement	Quit
16 Marriage	Quit
17 Parental leave	Quit
18 Need to take care of other members of family	Quit
19 Change of residence	Quit
20 Wanted/was proposed higher salary	Quit
21 Wanted/was proposed better working conditions	Quit
22 Wanted/was proposed more interesting work	Quit
23 Wanted to start own business	Quit
24 Main job became second job	Quit
25 End of farming/sole proprietorship	Quit
26 Other	Variable

Table A2: Fixed Effects logit with interactions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Displ. t-1	0.675***				-0.041			
	0(.082)				(0.195)			
Displ. t-1×male					0.462*** †			
					(0.150)			
Displ .t-1×high ed					1.380***†			
					(0.315)			
Displ. t-1×sec ed.					0.494***†			
					(0.190)			
Displ. t-2			0.776***			0.005		
			(0.078)			(0.191)		
Displ. t-2 ×male						0.373*** †		
						(0.143)		
Displ .t-2 ×high ed						2.120*** †		
						(0.323)		
Displ. t-2 ×sec ed						0.418** †		
						(0.187)		
Quits t-1		0.365***					0.142	
		(0.051)					(0.122)	
Quits t-1×male							0.092 †	
							(0.096)	
Quits t-1×high ed							0.516** †	
							(0.211)	
Quits t-1×sec ed.							0.168 †	
							(0.118)	
Quits t-2				0.217***				-0.187
				(0.058)				(0.141)
Quits t-2×male								-0.044
								(0.109)
Quits t-2×high ed								-0.188
								(0.228)
Quits t-2×sec ed.								0.557*** †
								(0.137)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Interactions:								
Year×region	Yes	Yes	Yes	Yes				
Year×male					Yes	Yes	Yes	Yes
Year×high ed.					Yes	Yes	Yes	Yes
Year×sec ed.					Yes	Yes	Yes	Yes
Observations	16067	16067	16067	16067	18336	18336	18336	18336
N. indiv.	301	301	301	301	349	349	349	349
Log likelihood	-7441.27	-7450.31	-7425.44	-7468.53	-8590.46	-8573.82	-8614.45	-8626.53

Notes: Robust standard errors in parentheses. *significant at 10%; **significant at 5%; ***significant at 1%. †indicates when the interaction plus the coefficient on the respective separation variable (e.g. $\beta_{displ}+\beta_{displ\times male}$) is significant at the 5% level. The standard errors of these linear combinations are computed using the delta method. Coefficients are reported. The dependent variable is informality (oral contract) from displacement supplement 2009. "Displ." and "Quits" stand for sum of separation events. This is a monthly dataset based on the retrospective panel from displacement supplement. t-1 indicates displacement or quits in the previous 12 months. t-2 indicates displacement or quits in the previous 24 months. Fixed Effects (Conditional) Logit estimation uses only job changers (i.e. movers from formality to informality and vice versa). The rest of covariates is as in Table 6.

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