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Market Segmentation in Transition Economies:  
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## ABSTRACT

### **Informal Employment Relationships and Labor Market Segmentation in Transition Economies: Evidence from Ukraine\***

Research on informal employment in transition countries has been very limited because of a lack of appropriate data. A new rich panel data set from Ukraine, the Ukrainian Longitudinal Monitoring Survey (ULMS), enables us to provide some empirical evidence on informal employment in Ukraine and the validity of the three schools of thought in the literature on the role of informality in the development process. Apart from providing additional evidence with richer data than usually available in developing countries, the paper investigates to what extent the informal sector plays a role in labor market adjustment in a transition economy. The evidence points to some labor market segmentation since the majority of informal salaried employees are involuntarily employed and workers seem to queue for formal salaried jobs. We also show that the dependent informal sector is segmented into a voluntary “upper tier” and an involuntary lower part where the majority of informal jobs are located. Our contention that informal self-employment is voluntary is confirmed by the substantial earnings premia associated with movements into this state.

JEL Classification: J31, J40, P23

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## 1. Introduction

There has been a revival of research on informal employment and labor market segmentation in developing countries over the last two decades. This research has been accompanied by heated discussions about the nature of informal employment, taking recourse to three schools of thought.

The traditional school sees informal employment as a predominantly involuntary engagement of workers in a segmented labor market: there is a primary, formal labor market with “good” jobs, i.e. well paid jobs with substantial fringe benefits, and a secondary, informal labor market with “bad” jobs, i.e. having the opposite characteristics of the good jobs. All workers would like to work in the primary labor market, but access to it is restricted, while there is free entry to the secondary labor market. Given the non-existence of income support for the unemployed in developing countries, workers who are not hired in the primary sector essentially queue for it while working in the secondary, informal sector.<sup>1</sup>

The second, “revisionist” school of thought goes at least as far back as Rosenzweig (1988) and is recently associated with the work of Maloney (1999, 2004). In his understanding, many workers choose informal employment voluntarily and, *given their characteristics*, have higher utility in an informal job than in a formal one. This school of thought also raises doubts about the preferability of formal sector jobs along the various dimensions mentioned in the traditional literature on labor market segmentation. For example, if formal employment is linked with the provision of pension benefits, in less developed countries such benefits might not be unequivocally good in the eyes of the employed as the government might be perceived as a potential “raider” of pension funds in a future budgetary crisis. Health care benefits provide a second example for the possibly

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<sup>1</sup> Classical statements of this view are Lewis (1954) and Harris and Todaro (1970). More recent studies affiliated with this school of thought are, for example, Chandra and Khan (1993) and Loayza (1993, 1997).

dubious nature of fringe benefits connected to formal employment. Having health care insurance might be undesirable because of the low quality of health services or unnecessary because of family coverage of the health insurance through another member of the household. Also, given that fringe benefits generate costs to the employer – who might or might not be able to shift these costs on to the worker – it is not a priori clear that wages are lower in the informal sector, and empirical evidence is required to establish the relative wage levels.

Another interesting insight put forth by the revisionist school of thought is about the general nature of the labor market. Rather than comprehending the labor market as segmented, the various employment relations are seen as a continuum of options that workers have at a point in time as well as over their working life. For example, young workers enter informal salaried employment to gain some training, which in turns enables them to enter at a later stage formal salaried employment. Having acquired physical and additional human capital as formal salaried employees, as they get older they might leave for informal self-employment or informal entrepreneurship. If their activities or businesses are successful they will finally enter formal self-employment or entrepreneurship. This vision of labor market options over the working life cycle is in stark contrast with the traditional view, where young workers work in the informal sector but essentially queue for a formal sector job. Once they have achieved a formal employment relationship they try to remain formally employed until retirement.

The third strand in the literature starts out with the labor market segmented into a formal and informal sector. It paints, however, a more complex picture of labor market segmentation than the traditional school of thought as it sees “upper tier jobs” and “free entry jobs” in the secondary, informal sector (see, e.g., Fields, 1990, 2006). Access to “upper

tier jobs” – good jobs that people like to take up in the informal sector – is restricted. Most of the jobs in the secondary, informal sector are “free entry jobs”, which can be had by anyone and which people only involuntarily take up.

Of course, the reality of labor markets in developing countries is complex and the available evidence does not lead to the acceptance of one school of thought and the unequivocal rejection of the other competing paradigms. The evidence suggests, instead, that labor markets in developing countries exhibit characteristics that point to the partial validity of all three schools of thought. From a recent in-depth study of informality in Latin America (World Bank, 2007), one might infer that in that area of the world the traditional paradigm has partial validity for *salaried employees*, while the situation and the behavior of the *self-employed* and *small entrepreneurs* might be better explained by the competing paradigms.

Research on informal employment in transition countries has been very limited, even though informality is mooted a wide-spread phenomenon in these countries. The main reason for the paucity of studies on this topic has been the lack of appropriate data. A new rich panel data set from Ukraine, the Ukrainian Longitudinal Monitoring Survey (ULMS), enables us to fill the data gap for one transition economy. The paper contributes to the literature on informal employment and labor market segmentation at least twofold. First, as we have information about the voluntary/involuntary nature of an informal employment relationship and longitudinal data in a period of growth at our disposal, we can more directly test segmentation than researchers usually have been able to do. Second, the paper attempts to investigate to what extent the informal sector plays a role in labor market adjustment in a transition economy and to which degree idiosyncratic factors related to the transitional context lead to different choices by workers regarding employment states than the ones we observe in developing countries.

To better understand the role of informal employment relationships in a transition country like Ukraine, we sketch the evolution of the employment structure in the Ukrainian labor market since independence in the next section. This is followed by a description of the ULMS data set and a discussion of data issues and of conceptual issues related to informality. The fourth section looks at the components of employment, namely formal salaried employment, informal involuntary salaried employment, informal voluntary salaried employment, formal self-employment and informal self-employment<sup>2</sup> and presents estimates of transitions from formal and informal employment based on multinomial logit models. Subsequently we discuss the use of various types of transition matrices for testing labor market segmentation and present our results and compare some of them to results found for Mexico (Maloney, 1999). Section six looks at the determination of log hourly earnings using various models, among them fixed effects and difference-in-differences specifications. A final section offers some tentative conclusions based on the evidence in sections five and six.

## **2. The transition context and the evolving employment structure in Ukraine: 1991-2004**

Ukraine has found itself in a prolonged transition recession for most of the nineties of the last century. Reform efforts have been inconsistent and incoherent, making Ukraine one of the “laggards” among the transition countries. “State capture” by various oligarchic groups has been mentioned as one of the causes that made it difficult for entrepreneurs to develop their creative potential and thus hampered growth for nearly a decade (Aslund 2002). Only towards the end of the nineties led reform efforts by the government to positive growth of GDP between 1999 and 2004. Especially between 2003 and 2004 Ukrainian GDP expanded rapidly.

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<sup>2</sup> All informal self-employment is considered voluntary. Because of too few cases we cannot look at entrepreneurs and exclude them from the analysis.

Using the Ukrainian Longitudinal Monitoring Survey (ULMS), a nationally representative survey of the Ukrainian working age population that numbers roughly 4000 households and 8500 individuals<sup>3</sup>, we can sketch the dynamics of employment in Ukraine between 1991 and 2004. In spite of the poor reform record of Ukraine in the nineties, the employment structure of the Ukrainian economy has significantly changed between 1991 and 2004 as Table 1 makes clear. The sectoral distribution of employment changed substantially and in line with the changes observed in many transition countries (Boeri and Terrell, 2002). The agricultural and industrial sectors lost employment shares while the sector services grew.<sup>4</sup> In our presentation of the net changes that occur, we divide the years since independence into two sub-periods, 1991-1997, and 1998 – 2004. The first sub-period relates to the years that saw a hyperinflation and prolonged stagnation with virtually complete paralysis in the management of reform efforts. The beginning of the period 1998 to 2004 saw the start of a concerted reform effort resulting in robust economic growth towards the end of the period. In the first sub-period the employment share of agriculture was nearly stable while the share of services increased roughly by the amount that the employment share of industry declined. Between 1998-2004 agricultural employment contracted slightly while employment contraction in industry was more moderate than in the early years. At the same time, the share of services grew vigorously, leading to an overall share of about 60 percent in 2004. Hence, as far as the employment shares of the three sectors are concerned, the Ukrainian economy has made progress towards a more modern sectoral distribution, even if agricultural employment had a relatively large share in 2004.

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<sup>3</sup> The ULMS is briefly presented in the data section of this paper. For a more detailed of the ULMS, see Lehmann (2007).

<sup>4</sup> In some transition economies, e.g. Bulgaria and Romania, we see a large increase in the share of agricultural employment. In these countries, agriculture provides a “buffer” for labor released from industry, as much of this new agricultural employment consists in subsistence agriculture. In Ukraine where until very recently land could not be privately owned, agriculture clearly could not fulfill such a buffer function.



However, the “laggard status” of the Ukrainian economy is clearly reflected in the employment structure of 2004, if we look at employment shares by ownership. Employment in privatized and new private firms amounted to about 40 percent in 2004, a share far lower than in most other transition countries. For example, by 1997, the average employment share in the private sector in Central European countries was 65 percent (Boeri and Terrell, 2002), while by 2004 still about half of all employment was in the state sector in Ukraine. What is noteworthy, on the other hand, is the rapid growth of the new private sector between 1997 and 2004.

Very striking is also the share of the self-employed, which is very low in international perspective. Boeri and Terrell (2002), for the year 1998, cite shares of self-employment of 13 percent for both the Czech Republic and Hungary, and shares of 16 percent and 6 percent for Poland and Russia respectively. Given these levels, it seems that the 4 percent of self-employed are an indication of worse start-up conditions for the self-employed and/or of the relatively low demand for services provided by the self-employed in Ukraine.

On the other hand, we see steady progress in the size distributions of Ukrainian firms. In centrally planned economies, much of production took place in large conglomerates and enterprises were vertically and often also horizontally integrated. An important measure of reform progress is, therefore, the employment share of workers in relatively small firms, i.e. in firms with less than 100 or less than 50 employees. In 1997, Ukraine has a fraction of employment in firms with less than 100 employees that is roughly equal to the average fraction in Central European transition countries (41.7 percent). We also see an accelerating share of workers in small firms between 1997 and 2004 with the result that by 2004 nearly half the workforce is employed in firms, which have less than 50 employees.

The presented data of the evolving employment structure in the Ukrainian labor market make clear that informal employment in a country of the former Soviet Union has to be seen embedded in a different context than informal employment in a developing country even if the degree of development as measured by per capita income is similar. In the case of Ukraine, in 2004 a large part of the workforce still worked in industry and in relatively large firms. More importantly, most members of the work force sold their labor to firms and only a small fraction to themselves. This is in sharp contrast to most developing countries. In Mexico, for example, 25.5 percent of the employed were self-employed in 1991 and 1992 (Maloney, 1999 and Bosch and Maloney, 2005). This important difference between Mexico and Ukraine - the two countries might stand for developing and transition countries here – might be explained by mainly three factors. First, the overemphasis on large industrial conglomerates under central planning and the only rudimentary nature of the industrial sector in developing countries imply a very different employment structure at a similar level of per capita income. This different employment structure leaves much more room for self-employment in developing countries than in transition economies. The second factor, which we wish to highlight, is of a psychological nature. Many if not most workers in developing countries have lived in precarious conditions for decades, while a large majority of workers in a transition economy like Ukraine's have experienced secure, life-long employment within large firms. One would, therefore, expect a much lower average propensity to take up self-employment with risky prospects in the formal or informal sector in a transition economy than we would observe in a developing economy. This lower average propensity for risky activities by workers in a transition is probably not limited to self-employment but can be possibly generalized to the informal sector at large.<sup>5</sup> Finally, many displaced workers

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<sup>5</sup> While this statement is mainly conjecture at the moment, the 2007 wave of the ULMS collects information also on risk attitudes of workers in Ukraine. Data derived from focus group sessions and a pilot study, both

receive income support in Ukraine in the form of unemployment benefits or unemployment assistance. As of 2001 (see Lehmann, Kupets and Pignatti, 2005), unemployment benefits are paid for a maximum of 12 months for a period of two years of unemployment duration. Depending on the length of unemployment insurance contributions, the replacement rate varies between 70 and 50 percent for the first ninety days of eligibility, then between 40 and 56 percent for the next ninety days, and then falls to between 35 and 49 percent for the last six months. After exhausting benefits, the unemployed are potentially paid unemployment assistance, amounting to 75 percent of the national subsistence minimum established by the government.<sup>6</sup> Given this income support, which is relatively generous for some of the Ukrainian displaced workers, we would expect larger flows from employment states into unemployment in Ukraine than in a developing country like Mexico where income support for the unemployed is essentially non-existent.

### **3. Data issues**

Our principal source of information is the ULMS, a nationally representative survey, 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 and 7,200 respectively.<sup>7</sup> 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

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undertaken in preparation of the 2007 wave of the ULMS, show that apart from the very young and the highly skilled most workers in Ukraine seem to be extremely risk averse.

<sup>6</sup> While unemployment benefits seem to be paid to those eligible, unemployment assistance exists more on paper than in reality.

<sup>7</sup> Attrition is not entirely random as far as employment status is concerned. While the overall attrition is 18.6 percent, once we control for demographic factors, informal salaried workers and the formal self-employed have attrition rates that are roughly 6 percentage points higher than the average attrition rate, while the informal self-employed attrite by 5 percentage points less (see Table A.1 in the appendix).

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 central data used in this paper are those from the two reference week sections in 2003 and 2004. The questionnaire allows us to distinguish between salaried workers and the self-employed. Informality for salaried workers in the primary job in the reference week<sup>8</sup> is identified by the answer to the question: "Tell me, please, are you officially registered at this job, that is, on a work roster, work agreement, or contract"? To identify the voluntary nature of informal employment for salaried workers, we ask the question: "Why aren't you officially registered at this job"? If the answer to this question is "Employer did not want to register me", we categorize the employee as involuntarily informally employed. If, on the other hand, the answer is "I did not want to register" or "Both", we consider the employee's informal employment as voluntary. With registration, salaried workers acquire several fringe benefits, pension rights as well as substantial job security, the latter at least on paper. We should note 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. For the self-employed

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<sup>8</sup> Respondents are advised by interviewers to identify their primary job as that job where they have their main earnings, and not necessarily the job where they have deposited their labor book. In most cases these two characteristics will, however, coincide.

there is a question on whether the activity is registered or not, which again allows us to identify informality. Informal activities of the self-employed are considered voluntary.

There are many criteria used to identify informal employment or informal economic activity of the self-employed. Registration, which, for salaried employees, brings with it the payment of social security contributions by employer and employee as well as rather strict employment protection legislation, is the criterion preferred in the literature. When information on registration is not available, other criteria are used, which can be burdened with substantial measurement error. Treating all self-employed or all workers employed in firms that have less than 5 employees as informal as is often done in a development context would most certainly introduce large measurement biases in the Ukrainian case. As far as self-employment is concerned, there exist countervailing reasons for registration or non-registration of activities by the self-employed in Ukraine. On the one hand, registering one's activity as self-employed one has to pay only a monthly flat tax, which amounts to approximately the equivalent of 60 US dollars; so on purely economic grounds registration is clearly not expensive and is beneficial. On the other hand, many might shy away from registration in order to avoid becoming the victim of corruption by state officials or worse. The ULMS data show, at any rate, that a large fraction of the self-employed must be considered formal (see Table 2). In the Ukrainian data, we also find that on our measure in both years informal salaried workers are employed to more than 60 percent in firms that have five employees or more. So, clearly the measurement error would be huge if we employed either of the alternative definitions of informality.

However, we also 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. Extending the definition of informality to semi-informality and extended

informality, as is done in Table 3, nearly triples the share of informal workers in 2003 from 10 to 29 percent and more than doubles it in 2004 from 15 to 34 percent. These latter numbers are more in line with the estimates presented by Schneider (2004), who surmises that, in 2002-2003, production in the shadow economy amounted to more than 50 percent of official Ukrainian GDP. However, while his estimates might capture overall informal activity, i.e. all undeclared activity, they cannot give a clear picture of informal employment relationships in the country.

In Ukraine, like in many 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 (see below). 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.<sup>9</sup> For our study, which looks at informal employment relationships and labor market segmentation, our definition of informality strikes us as the most appropriate, since it distinguishes between employment relationships that are embedded in the state-sponsored social safety net and those that are not.

The measurement of wages is another important data issue. Salaried employees are asked in the two reference weeks to give their last monthly net salary in Hryvnia. If workers are

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<sup>9</sup> The phenomenon of "envelope payments" is particularly wide-spread among small new private firms. For large firms, i.e. firms with several thousand employees, it might be logistically difficult to pay in addition to "official" salaries. We have evidence from one large firm located in Central Ukraine, whose director of human resources stated that it would be a logistic nightmare to pay additional "unofficial" wages and that his firm only made "official" wage payments.

paid in another currency (e.g. dollars or rubles), they are asked to convert this currency into Hryvnia. The self-employed are asked to give an estimate of net income for the last month, which preceded the reference week. Since we do not have a measure of the capital used by the self-employed, we cannot include returns to capital in net monthly income. However, we do not think that in 2003 and 2004 this component was substantial in the Ukrainian context.

Like in all CIS countries, salaried workers in Ukraine have been confronted with wage arrears. While this phenomenon was less rampant in 2003 and 2004 than in the 1990s, even in our reported period a substantial fraction of workers received less than the contractual wage in the last month preceding the reference week. Some persons, on the other hand, received more than the contractual wage in this month, since they were paid some of the previously withheld wages. A second problem connected to wages in the Ukrainian case is the already mentioned practice of “envelope payments” that were a frequent occurrence in many firms during the reported period. In order to take account of the wage arrears problem, two questions are asked about wages. The first question asks respondents to give the actual monthly net wage paid out to them, while the second question asks about the contractual monthly net wage. In our wage regressions, we attenuate the measurement problem due to wage arrears by including a dummy variable for those whose last wage exceeds the contractual wage and a dummy variable for those whose last wage is less than the contractual wage. The “envelope payment” problem is mitigated by advising interviewers to solicit information on the “true” actual and contractual wages, i.e. on the sum of “official” and “unofficial” wage payments.<sup>10</sup>

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<sup>10</sup> While it would be interesting to get information about the shares of “official” and “unofficial” payments, questions that would try to solicit such information would be too sensitive and would meet very likely with a general refusal to answer such questions. Questions that try to get at total wage payments are definitely less sensitive and generate wage information for the majority of respondents.

A third issue is the potential non-normality of log hourly earnings (Heckman and Honoré, 1990). The actual log hourly earnings do not seem to be normal according to figure 1. This impression is confirmed by a Jarque-Bera (1980) test of normality, which rejects the null hypothesis in both years. To attenuate the problem connected to non-normality we also estimate earnings functions using robust and quantile (median) regression. However, these alternative estimation methods do not produce really different results from simple OLS and Heckit models. Our wage analysis, therefore, only presents estimates based on these latter models.

For a job held in the reference week we know its precise beginning, and are thus able to determine tenure in an accurate fashion. We can calculate actual work experience from 1986 onward, but for those in work in 1986 we only know the date at which that job began and nothing of their previous labor market history. We, therefore, prefer to use age as a proxy for actual work experience.

#### **4. Informal employment relationships in Ukraine – a descriptive analysis**

Table 2 shows the composition of employment in 2003 and 2004. In both years, the vast majority of workers are formal salaried employees. We do see, however, a substantial increase in informal employment over the period, rising from 9.7 percent to 13.9 percent of the total employed workforce.<sup>11</sup> What is particularly noteworthy is the much higher incidence of involuntarily informal employees than workers who voluntarily have entered an informal employment relationship in both years. So, on our measure of informality, about two thirds of the informally employed have been denied a formal employment relationship that they presumably would have preferred. On the other hand, more than half of the self-

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<sup>11</sup> The increase in informal employment relationships is not related to attrition (see footnote 7).



employed seem to find it advantageous in 2004 not to register their activity. The cross tabulations purvey a message that was also stressed in the above cited World Bank (2007) study on informality in Latin America: dependent employees in their majority prefer formal jobs while a majority of the self-employed consciously chooses informality.

Table 4 presents descriptive statistics for the five employment categories that we can distinguish in the data. With shares of 52 and 53 percent in total employment in the years 2003 and 2004, women in both years had similar shares in formal and involuntary informal dependent work, while they were strongly underrepresented in formal self-employment. Ethnicity is relevant insofar as Ukrainian workers had a lower incidence of involuntary informal salaried employment than their overall shares in total employment, which were 44 and 43 percent in the two years. It is also striking that formal self-employment was more a domain of non-Ukrainians (predominantly Russians) while Ukrainians were somewhat overrepresented among the informally self-employed. The young and the single were disproportionately employed as informal dependent workers, while we find university graduates predominantly in formal salaried jobs as well as in formal self-employment, results that are not unexpected. The relative shares of the other demographic factors, which are shown across employment types in table 4, seem to confirm our priors.

The second row from the bottom presents mean real net hourly earnings<sup>12</sup> in Hryvnia. These means are calculated after the respective distribution has been truncated from below at half the hourly minimum wage.<sup>13</sup> By far the highest real mean wages were paid in formal

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<sup>12</sup> Strictly speaking, dependent employees earn wages while the self-employed have earnings. Since we discuss both types of workers jointly, wages and earnings are used interchangeably in what follows.

<sup>13</sup> From previous work (see Lehmann, Kupets and Pignatti, 2005) we know that minimum wages are often not enforced; so, hourly wages below the hourly minimum wage are certainly possible in the Ukrainian economy. On the other hand, since the monthly minimum wage is below the monthly subsistence level, we find an hourly wage less than half the hourly minimum wage not credible. This truncation eliminates only a few observations, though.

self-employment if we take account of all workers. However, if we exclude agricultural workers from the pool of informal self-employment, this category had the highest mean hourly earnings in 2003. Given the relatively small number of self-employed in international perspective the relative favorable position of the formal self-employed is not surprising as most of them were probably engaged in scarce professional services during the reported period. The informal self-employed and the voluntarily informal salaried workers had the next highest wages. It is noteworthy that mean real wages of formal salaried employees were ranked fourth and were only superior to the earnings of those salaried workers who involuntarily had informal employment relationships with their firms.

With the exception of the informal self-employed, the growth of mean real earnings<sup>14</sup> was impressive between 2003 and 2004, varying between 27 and 42 percent. Attrition cannot explain this result since in a probit regression<sup>15</sup> wages in 2003 are positively correlated with the probability of leaving the sample of those employed in 2003. The last row of the table reproduces the median earnings in the two years for the employment categories. The annual growth of median real earnings was substantially less, so we moot that the whopping increases in mean real wages came about because of large gains of those in the upper part of the distribution. Inspection of the wage data shows that this was indeed the case.

While the rankings of the mean real earnings are informative, we can also gain some valuable insights by looking at the entire earnings distributions for the five employment types. Figures 2 and 3 show log hourly earnings for 2003 with all employed and with workers in agriculture excluded from the sample. A large fraction of the informal self-employed were engaged in agriculture (see table 2), most of whom earned low wages, since we observe a fat tail at the lower end of the wage distribution of the informally self-

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<sup>14</sup> Earnings of 2004 are calculated in 2003 consumer prices.

<sup>15</sup> This regression is not shown here but available upon request.

employed in figure 2. This fat lower tail disappears when agriculture is excluded from informal self-employment. Also, informal self-employment gains mass in the upper tail of the distribution relative to formal self-employment when agricultural workers are excluded. These patterns prevailed also in 2004 as inspection of figures 4 and 5 make clear and are consistent with the higher mean hourly wages for the informal self-employed once agricultural workers are excluded. At any rate, the hourly earnings of both the formal and informal self-employed in 2003 and 2004 were by far the most widely dispersed, pointing to the tremendous heterogeneity within these two groups.

There are other interesting patterns that can be made out in the earnings distributions. The distributions of the formal salaried and the salaried workers, who involuntarily have an informal job, were the most compressed with little mass in the tails. Also the distributions of the latter category were furthest to the left in both years. In addition, there seem to have been a lot of awfully low paid jobs among formally salaried employees, although the lowest wages were paid to workers in other employment categories. Finally, while in 2003 there were many jobs for voluntary informal salaried workers in the upper part of the distribution that paid more than for jobs of the formal salaried, this difference disappeared in 2004.

In a final descriptive exercise, we estimate multinomial logit transitions within formal employment as well as between formal and informal employment from reference week 2003 to reference week 2004 (columns (2) and (3) of table 5). We repeat this exercise with informal employment as the origin state (columns (4) and (5)).<sup>16</sup> Following Maloney

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<sup>16</sup> Estimating transitions between two reference weeks is problematic if round-tripping is a major issue. The data are structured in such a way that we can reconstruct any change in labor market status lasting one month or more in the period between the two reference weeks. This reconstruction shows virtually no round-tripping at all.

(1999), we include initial earnings as a regressor to ensure that the schooling and age covariates are not just picking up the effect of earnings.<sup>17</sup>

Job transitions within formal employment are only explained by a gender dummy and a dummy for residing in the West of Ukraine. Women had a 5 percentage points lower likelihood to exchange one formal job for another than men, while Western residents also had a somewhat lower probability to change such jobs than residents in the rest of the country. Movements between formal and informal employment, on the other hand, are influenced by gender, years of schooling and age. Women remain by one percentage point more in a formal job, while workers with 5 more years of education were one and a half percentage point less likely to move into an informal job. The results derived from the cubic in age are the most interesting here. Workers between 15 and 27 years of age had a lower propensity to move from a formal to an informal job as had workers 53 years and older, while the core group of workers, i.e. middle-aged workers, had a higher propensity. These propensities connected to age, however, are very small since they never exceed half of one percentage point in absolute value.

We do not find much predictive power in our set of regressors when we estimate movements from one informal job to another. The situation is dramatically different if we consider transitions from informal to formal employment. Female and Ukrainian workers had a much lower propensity to move into formal employment as had singles as well as workers with children. Relative to workers in Kiev, workers residing in the rest of the country were much less inclined or had less opportunity to move to formal jobs.

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<sup>17</sup> When we do not include initial earnings we get virtually identical results. The regressions without initial earnings are not shown here, but they are available on request.

While these results are interesting, of particular relevance in column (5) are the coefficients on the age cubic and on the number of workers in formal employment relationships in the household. The coefficient on the latter covariate implies that each additional formally employed member of household raises the likelihood of those members, who were informally employed in 2003, to move into formal employment in 2004 by roughly 10 percentage points. We can interpret this result as a network effect; those being employed in firms where formal jobs prevail might provide information to other members of household about vacancies for such types of jobs. Our data, at any rate, seem to refute the idea that a worker is more willing to stay in an informal relationship because another member of household is formally employed and thus covered by health insurance that extends to the entire household. The result is not that surprising in the Ukrainian context since health coverage is universal for residents and not tied to employment.

The coefficients on the age polynomial generate age-propensity-to-move-out-of-informality profiles, which are roughly mirror images of those produced by the age coefficients in column (3). Workers between the age of 15 and 21 years show monotonically decreasing but positive propensities to move into formal employment relationships as do workers between 60 and 50 years of age. A worker in the core group, on the other hand, is less likely to move as s/he gets older. The predicted propensities to move from informal to formal employment are in absolute value nearly ten times larger than the predicted propensities to move in the opposite direction. How these age profiles relate to movements between employment states over the life cycle can only be ascertained if formal and informal employment relationships can be disaggregated into dependent relations and self-employment. We cannot perform this disaggregation within our multinomial framework, but

will analyze transition matrices based on disaggregated employment states in the next section.

## **5. Transition between labor market states and segmentation**

The panel nature of our data allows us to estimate transition matrices between labor market states from the reference week in 2003 to the reference week in 2004. The transitions are estimated for 4 and 6 labor market states in tables 6 and 7 respectively. The first type of transition matrix, the P-matrix, shows the conventional transition probabilities that assume an underlying Markov process (top panels in tables 6 and 7); the transition probability is estimated by the ratio of the flow out of the origin state into the destination state over the total stock of the origin state. In the absence of round-tripping – as stated before, virtually no one who changes labor market state does this more than once over a year – these estimates are close to the true transition probabilities. We then estimate two types of transition matrices for the Ukrainian labor market that were produced in Maloney (1999) for Mexico, the “Q” and the “V” matrices. The rationale for these matrices is not universally accepted in the literature, and we provide estimates of them for the Ukrainian labor market only for the purpose of comparing our results with those for the Mexican labor market, although the comparisons that we can undertake are far from perfect. A simpler and maybe more straightforward way to look at transitions between labor market states is to show the raw flows between these states and to present the distribution of these flows across the destination states, i.e. the ratios of the flows to the respective destination states relative to the *total of flows* emanating from the origin state. This is done in table 8.

The “Q”- matrix is meant to facilitate the comparability of transition probabilities of two states that have large differences in their stocks. Standardizing the transition probabilities of the top panels of tables 6 and 7 by dividing by the size of the destination states in 2004, we arrive at the “Q”-matrices in the middle panels of the tables. It can occur, however, that persons would like to move from an origin to a destination state, but might find it difficult to move out of a state and/or into a state because of little churning. Under Markovian assumptions, duration of state occupancy is exponentially distributed and given by the reciprocal of the outflow rate, i.e. for the origin state  $i$  by  $(1/(1-\mathbf{P}_{ii}))$ , while for the destination state  $j$  by  $(1/(1-\mathbf{P}_{jj}))$ . Clearly, the larger the durations of occupancy of origin and destination states, the harder it is for a worker to move from the origin to the destination state. In the bottom panels of tables 6 and 7 “V”-matrices are shown that are generated by multiplying the “Q”-matrices by the product of the durations of state occupancy. The values of the derived “Q”- and “V”-matrices are, of course, no longer transition probabilities, as they can exceed 1. In the case of the V-matrices these values give the propensity of a person to move from one state to another. A high value essentially means that a person has spent a lot of effort to move even though it was very difficult to do so.<sup>18</sup>

What transitions are implied if the economy is growing but the labor market is relatively segmented? As pointed out by Maloney (1999), we would expect little turnover in the formal sector, since workers are intent on gaining and retaining formal employment. As workers are queuing in informal jobs to gain access to a formal employment relationship, we should also observe mainly unidirectional flows from the informal to the formal sector and only a trickle of flows in the other direction. The implicit assumption made here is that growth translates into the expansion of above all formal employment relationships. With the

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<sup>18</sup> For a detailed discussion of the “Q” and “V” matrices and the rather restrictive assumptions underlying them, see Bosch and Maloney (2005).

economy better performing, firms can open more formal jobs than in recessionary times. However, the strong growth of the Ukrainian economy between 2003 and 2004, which brought with it a substantial fall in the unemployment rate, did not result in an expansion of formal employment as can be seen by comparing the shares of formal jobs and of the formal self-employed in columns  $P_i$  and rows  $P_j$  of tables 6 and 7. Instead, the fall in unemployment was entirely driven by growing informal employment relationships (compare e.g. the  $P_i$  and  $P_j$  entries for informal employment in table 6). With such a scenario one needs to modify the predictions put forth by Maloney and others, as we would expect relatively large flows into informal employment relationships even if there is segmentation. However, as long as we observe large flows into formal employment even though there are no new formal job slots created, we might infer that workers will take any opportunity they get to enter a formal employment relationship.

We saw previously that propensities to move between employment states are different for various age groups. We present the various transition matrices for the core group of workers between 25 and 49 years of age in the main text and relegate the transition estimates of the more disaggregated matrices for young and older workers to the appendix.<sup>19</sup>

The upper panel of table 6 shows an outflow rate from the state of formal employment that is large in international perspective. So, on this measure workers seem to willingly leave formal employment. That the story is, however, not that simple can be seen by the fact that most of the outflow is into non-employment. Particularly striking is, on the other hand, the high churning rate of informal employment, with most of the outflow going to formal employment. When we standardize by the size of the destination state, we see a slightly larger outflow rate from informal to formal employment than vice versa. We also

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<sup>19</sup> The matrix estimates of transitions between four states for the young and older workers are not shown in the paper but available upon request.



note that the transitions from unemployment to employment are disproportionately large into informal jobs.

Turning to the values in the bottom panel of table 6, two interesting observations can be made about the relationship between the Q- and the V-matrix. First, the adjacent entries below and above the diagonal entries in the V-matrix do not provide any additional information as far as the *relative* disposition to move is concerned. For example, since the transitions from informal to formal employment and the reverse transitions are both multiplied by the product of the durations of state occupancy in these two employment states in order to arrive at the corresponding values of the V-matrix, we get the same relative result as in the Q-matrix: workers show a slightly higher disposition to move from informal to formal employment than vice versa. So, despite the fact that job growth is nearly entirely linked to informal employment relationships, persons try particularly hard to get into a formal employment relationship. Second, when entries in the Q-matrix are multiplied by different durations of state occupancy the numbers in the V-matrix reveal additional information when they are compared with the corresponding entries in the Q-matrix. For example, the disposition to move from unemployment to informal employment is only slightly higher than the disposition to move from unemployment into formal employment. On the other hand, in the Q-matrix, the transition from unemployment to informal employment is thrice as large as the transition to formal employment. We can infer from these relative magnitudes that, if at all possible, unemployed persons will try to find formal employment but are restricted of doing so, and hence enter into an informal employment relationship. Similar relative magnitudes can be seen when inspecting the transitions from not-in-the-labor-force into informal and formal employment and the respective “dispositions

to move” in the V-matrix. So, our numbers seem to provide evidence for the hypothesis that informal employment is a waiting stage and that people queue in this state for formal jobs.

The churning rates for the young are higher than for the core group as far as the first 3 states are concerned. Like with the core group, there is a slightly higher disposition to move from informal to formal employment than vice versa. One important difference consists in the far higher disposition to move from unemployment to formal than to informal employment even though the transition to informal employment is about 50 percent higher in the Q-matrix. So, the young preferably take up formal employment if it is available. Unsurprisingly, the churning rates of all states are lowest for older workers. Noteworthy, however, is the fact that the disposition to move from informal to formal employment is more than double the disposition to move in the opposite direction. In addition, the disposition to move from unemployment to informal employment is twice as large as the disposition to move to formal employment, while the standardized transition from unemployment to informal employment is six times larger in the Q-matrix than the corresponding transition into formal employment. The transition estimates and the estimated “dispositions to move” for all three age groups seem to highlight the existence of rationing of formal jobs, i.e. some segmentation seems to be present during this period of growth in the Ukrainian labor market.

The estimation of transitions for a finer disaggregation might shed more light on the issue of segmentation in the Ukrainian labor market. In table 7, formal employment is divided into formal salaried employment and formal self-employment, while informal employment is divided into informal salaried employment<sup>20</sup> and informal self-employment. The non-employment states are retained from table 6. Table 7 shows the P-, Q- and V-

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<sup>20</sup> For reasons of comparability we do not subdivide informal salaried employment into its voluntary and involuntary segment. This is done below in our direct flow estimates (table 8) and in the wage analysis.

matrices for the middle aged core group, while tables A.2 and A.3 in the appendix show the estimates for young and older workers. Our discussion first focuses on the Ukrainian labor market and then, where possible, compares our results for Ukraine with the estimates obtained by Maloney (1999) for Mexico.

The two formal employment states are far more stable than the informal states. Salaried workers who have informal jobs, on the other hand, have the most volatile turnover. It is also striking in the top and middle panels of table 7 that we see large flows from formal and informal salaried employment into the two non-employment states. So, even when we normalize by the size of the destination states, transitions from both types of salaried employment to unemployment and not-in-the-labor-force are relatively large. The transitions and the propensities from formal salaried employment to other states (the first rows in matrices Q and V) show some insightful patterns. Even though the transition to informal salaried work is nearly twice as large as the transition to formal self-employment, the propensities in the V-matrix are reversed in order. So workers separated from a formal job try much harder to get into formal self-employment than into informal salaried work, which might not be surprising given that two thirds of this work is involuntary. In addition, it is slightly easier to get from formal salaried employment to informal self-employment than its formal counterpart, but the propensity to move into the latter state is more than double than the propensity to move into the former.

Turning to the moves from informal salaried employment, we see a similar picture insofar as moves into a formal relationship, either as dependent employment or as self-employment are preferred. While in the middle panel of table 7 the transition to informal self-employment is higher than into formal self-employed, the propensities are again reversed. It is also noteworthy that the propensity to move to formal salaried work is only

slightly smaller than the corresponding propensity to informal self-employment even though the transition into the latter state in the Q-matrix is nearly four times as large. Finally, even though the expansion of jobs was all in the informal sector, the propensity to move from informal salaried employment to formal dependent jobs is slightly higher than the reverse propensity. If we put credence into the estimates of the Q- and V-matrices, we interpret these results in the following fashion: it is relatively easy to move into an informal relationship, but workers try to enter a formal relationship whenever possible.

Concerning the two states of self-employment, we find the largest flows between these two states and a slightly higher propensity to move into informal self-employment than into its formal counterpart. What is also interesting is the fact that the formally self-employed have a dominant propensity to move into formal salaried work, while the informally self-employed exhibit nearly even propensities for informal salaried employment as well as unemployment. So, there seems to be a lot of churning between these two states and informal self-employment, while at the same time the propensity to move from informal self-employment to formal salaried employment relative to the corresponding transition in the Q-matrix is very high. Finally, comparing the entries in the Q- and V-matrix presenting the transitions and propensities from unemployment into the four employment states, it clearly transpires that Ukrainian workers have a preference for formal employment relationships but that some of these workers are forced to take up informal jobs.

The moves between labor market states for young workers are similar to those of the core group, as Table A.2 in the appendix reveals. Unsurprisingly, there exists more churning between states for the young, but the relative transitions and propensities that we discussed for the core group are roughly also valid for them. In contrast, older workers have quite different patterns (see Table A.3). For example, older informal salaried workers move into

formal dependent employment or into non-employment, while the formal self-employed remain in that state or move out of the labor force.

How different are the transitions in the Mexican labor market? A direct comparison of the numbers provided by us for Ukraine and by Maloney (1999) for Mexico makes little sense since the sample of workers analyzed is different<sup>21</sup> and the employment structures of the two economies differ substantially as argued above. So, we restrict ourselves to the corresponding entries in the V-matrices<sup>22</sup> and highlight the relative magnitudes of the various propensities to move.

Formal salaried workers have the highest propensity to formal self-employment in the Ukrainian case, while formally employed Mexican workers seem to have a predilection for informal salaried work. Also, there is a much higher propensity to move into unemployment in the Ukrainian case, which can be explained by a developed unemployment benefit system. Like in Ukraine, propensities to move between formal and informal salaried employment are roughly equal in Mexico. As discussed above, this does not necessarily imply an absence of segmentation especially in the Ukrainian context where all net employment growth is in informal employment relationships. One stylized fact that seems to come out of the comparison between the two countries is the much higher propensity to move into self-employment from other states of employment in Ukraine. In one sense this is just a statistical artifact insofar as the low turnover in (especially formal) self-employment inflates the entries of the V-matrix when self-employment is the destination state. But this low turnover also has an economic content. In Ukraine, a low turnover in self-employment

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<sup>21</sup> The Mexican numbers (see table 5 of Maloney's paper) are estimates based on males aged between 16 and 65 with high school education or less and residing in urban areas, while the Ukrainian sample consists of female and male workers aged 25 to 49 from urban and rural areas and allows any educational background. Also informality is better captured by the ULMS than the Mexican data.

<sup>22</sup> Panel 3 of table 5 in Maloney's paper.

means that there are few exits from (especially formal) self-employment since professional services are relatively underdeveloped in the country and workers engaged in these activities are able to hold on to them. The comparison with the Mexican data also points to the benefit of sub-dividing self-employment into an informal and formal sector rather than assuming that all self-employment is in some sense informal as done in Maloney (1999) and also in World Bank (2007). When we look at the Mexican propensities from self-employment we see relatively large magnitudes for the destination states unemployment and informal salaried work. The Ukrainian propensities from *formal* self-employment are, on the other hand, high into formal dependent employment, but zero into salaried informal work and relatively small into unemployment, while from *informal* self-employment they are relatively high to both these latter destination states. So, on this evidence at least, it seems that informal self-employment, informal salaried work and unemployment are states between which there is much churning, while there is little interaction between the latter two states and formal self-employment. Again, this can be taken as some evidence that segmentation exists in the Ukrainian labor market.

To take account of the full information that we have in our data set, table 8 reproduces the flows between seven labor market states, among them five employment states, for three age groups of the workforce. The innovation relative to table 7 is the division of informal salaried employment into its voluntary and involuntary components. The last two columns of the upper half of the panels in table 8 present the total flows out of an origin state and its total stock, and the row labeled “Total” shows the total flows into a destination state. The ratio of the former two aggregates can tell us something about the volatility of a state, while the difference between the flows provides us with an estimate of

the growth of a state. Even though flows are often small, the accumulated evidence in table 8 gives us certainly a hunch that segmentation prevails in the Ukrainian labor market.

By far the most stable employment states in the panel of young workers are formal salaried and self-employment. The most volatile state, on the other hand, is “voluntary informal salaried”, where nearly all persons found in that state exit it over the year. Comparing the outflows and inflows we find that formal salaried employment relationships have by far the largest growth in absolute numbers, followed by involuntary salaried informal employment, where the stock is nearly doubled. The two voluntary informal states grow only slightly while formal self-employment shows no growth, a result not surprising given the age of the workers. Most striking is the fact that apart from formal self-employment for all other employment states formal salaried employment is the most frequent destination state. In the case of the two informal salaried states this is particularly pronounced. So, young workers try, if at all possible, to enter formal employment. If that is difficult they are predominantly forced to take up informal jobs of an involuntary nature. We should also stress, that many young workers when entering the labor force end up in unemployment, seemingly preferring this state to informal employment of any kind. Since the flows from unemployment into formal salaried employment are large, we moot that unemployment is utilized as a holding stage to enter formal salaried employment.

Former employment relationships are also for the core group of workers the most stable states, while voluntarily informal salaried workers again show the greatest churning rate. We find strong growth in the stocks of involuntarily informal salaried workers and of the informal self-employed. The stock of formally employed workers shrinks, albeit to a small degree. If we abstract from the formal self-employed the largest flows from all other employment states are into formal dependent employment as is the case with young workers.

The second largest destination state is involuntary dependent employment. It is also noteworthy that the unemployed and those who are not initially in the labor force have these two states as their principal destinations. Finally, we observe large churning within the self-employment sector (formal and informal), although it holds that the informal self-employed move predominantly to formal dependent employment relationships. Given this evidence, we find it hard to maintain that segmentation is absent in the Ukrainian labor market.

Older workers, i.e. workers who are older than 49 years (!), move much less into employment states than their younger counterparts. They above all leave the labor force if they separate from an employment state. The small numbers entering an employment relationship at all come mainly from non-employment states and end up in formal salaried work or as informally self-employed.

Table 8 can also be used to see whether workers locate in those various employment states over their working life that are suggested by e.g. Maloney (1999) and World Bank (2007): according to these sources, workers start their working life choosing informal salaried employment for training, then they enter its formal counterpart to gain human and physical capital. When older, some of them will flow into informal self-employment and eventually into formal self-employment. Going through the three panels of table 8, we can surely state that the flows implied by such a distribution of employment states over persons' working life are not dominant for a majority of workers. We find more evidence for the theory that no matter at what stage of their working life workers find themselves, a majority of them will flow into formal salaried employment relationships, from which we observe relatively little flows to other *employment* states. Again this suggests that there is a substantial degree of segmentation in the Ukrainian labor market.



## 6. Earnings and employment relationships

The determinants of log hourly real earnings for the year 2004 are shown in table 9. Column (1) presents OLS estimates while column (2) shows OLS estimates corrected for selection into employment. There are hardly any differences in the coefficients of the two columns and the coefficient on lambda is not significant. However, the selection equation (see column (1) in table A.4 in the appendix) shows several highly significant exclusion restrictions. The last two columns of table 9 present OLS and Heckit estimates with lagged earnings as a control for unobserved heterogeneity. We do not interpret the coefficient on lagged earnings, since it might be inconsistent, but we follow Wooldridge (2002) in the conviction that inclusion of lagged earnings renders the coefficients on the other variables less biased.

The OLS and Heckit regressions show a large gender wage gap that is still present but substantially reduced when our crude control for unobserved heterogeneity is included. Ukrainians seem to incur a wage penalty that disappears when lagged earnings are included. The age and tenure profiles roughly remain the same no matter what the specification. Age affects wage levels negatively, although the effects are pretty small over the entire age distribution of our sample. Tenure, on the other hand, impacts positively on the level of wages. This effect is particularly strong for relatively short tenures, a result that is plausible in a transition where very long tenure might not be a proxy for accumulated useful firm-specific human capital (Lehmann and Wadsworth, 2000).

Controlling for observables, the various types of employment still maintain the relative rankings that are shown in table 4. When we include our crude control for unobserved heterogeneity, formal self-employment has the highest earnings, with the difference to the earnings of the formally salaried workers remaining significant. The main change that occurs when we go from the specification without to the specification with

lagged earnings is observed with the coefficients on the informal self-employed. In the second model these coefficients become small and insignificant, which might be linked to the fact that this group of workers is particularly heterogeneous and that this heterogeneity is not captured by the observable characteristics included in the regressions.

We also performed regressions, based on the same two specifications, where we interacted age and tenure quadratics as well educational attainment dummies with the various states of employment. Very few interactive terms have any predictive power in these regressions<sup>23</sup>. The only robust result worth highlighting is the large wage penalty for university graduates who work involuntarily in informal salaried jobs: while there is a large wage premium for university graduates in general, this premium is completely wiped out for those who are forced to work in informal jobs even though they have a university education.

Using the panel nature of our data we estimate fixed effects models of wage determination.<sup>24</sup> The coefficients on the employment states are of main interest in table 10. The fixed effects specification implies that these coefficients pick up the effect of moving from one state to another. Each of the four variables takes on the value of 0.5 when there is a move into the employment state and a value of -0.5 when moving out of it. To avoid perfect collinearity between the constant and the transformed employment state dummies we exclude formal salaried employment. The coefficients on the remaining employment state dummies then reflect the effect of moving into or out of any state relative to moving in and out of formal employment. A positive (negative) coefficient has, therefore, to be interpreted as a gain (loss) as a result of a move into a state and as a loss (gain) when moving out of this state. In the first two columns we see gains for workers moving into voluntary informal

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<sup>23</sup> The results are not shown here but available on request.

<sup>24</sup> Random effects models could not be estimated since Hausman tests rejected the null hypothesis of the orthogonality of the random effect and the x variables.

dependent employment and into formal self-employment. Moving into involuntary informal jobs generates a penalty, which is not significant, though.<sup>25</sup> Finally those workers, who change status to informal self-employment, seemingly have no gain relative to those who do not change states.

One obvious source of heterogeneity among the informal self-employed that we have not controlled thus far is the rural-urban divide. As we have seen above, most of the informal self-employed in agriculture are located in the bottom part of the earnings distribution of the informal self-employed, while many of their urban counterparts are not only located in the upper part but also have high earnings relative to workers in other employment states. We, therefore, repeat the fixed effects estimations with the informal self-employed working in agriculture excluded from the sample. While the results for the other states remain roughly the same, we see a dramatic rise in the coefficient on the informal self-employed variable, which now becomes also strongly significant. So, moving into urban informal self-employment provides a large earnings premium, approximately equal to the premium for moving into formal self-employment.<sup>26</sup>

The upshot of the results from these fixed effects regressions seems clear. In table 8 we have seen that most of the flows are into either formal or involuntary salaried employment, while the flows into the other three employment states are limited. Those moving into formal or urban informal self-employment or voluntary salaried employment experience large wage gains relative to those flowing into formal employment while workers who have to take salaried informal jobs even though they would prefer formal ones are

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<sup>25</sup> We should note, though, that when we include formal salaried employment and exclude voluntary informal salaried employment its involuntary counterpart has a significant negative coefficient.

<sup>26</sup> We also estimated the fixed effects model with only the agricultural informal self-employed. The results, which are not shown here but available on request, give a highly significant negative coefficient on the informal self-employment variable.

confronted with a small wage penalty. These workers who are a majority among the informal salaried are in essence prevented from joining formal jobs and are relegated to work in informal employment relationships without any discernible wage gain but with a loss in benefits and job security. On the other hand, a minority of salaried workers moving to informal jobs does so because of the expected wage gain, which is substantial. On this evidence, therefore, even dependent employment seems segmented into three parts in Ukraine, a formal segment where a large majority of workers is located or would like to be, a “lower” informal part where persons are located against their will and an “upper tier” of informal jobs that persons willingly take as these jobs provide ample wage gains. In addition, informal self-employment is segmented along geographical lines, as rural self-employed experience no gain when choosing informality and seemingly engage in subsistence agricultural activities while the urban self-employed who are informal have the same relative gain with respect to dependent formal workers as have the formal self-employed.

The results from the fixed effects estimates are insofar imprecise as they give the effects of moving in or out of a state relative to moves from and into formal employment. To better pin down these effects we compare the wage changes from reference week 2003 to reference week 2004 of those remaining in a particular employment state to the wage change of those leaving from this state for a specific destination state. Therefore, we next construct difference-in-difference (DID) estimators, comparing the one- year change in the log of hourly wages of workers who remain in the same job with the one-year change for workers who moved to another job within the same employment category or to another job in another employment category. The class of these estimators can be written as follows:

$$\{E(w_2 | X; m = 1) - E(w_1 | X; m = 1)\} - \{E(w_2 | X; m = 0) - E(w_1 | X; m = 0)\} (1)$$

or

$$E(w_2 | X; m = 1) - E(w_2 | X; m = 0) + E(w_1 | X; m = 0) - E(w_1 | X; m = 1) (2)$$

where  $w_1$  and  $w_2$  are wages in the first and second period, and  $X$  is a vector of conditioning variables. The variable  $m$  takes a value of one in the treatment case, i.e., movement to another job and zero in the no-treatment case, i.e., the worker remains in the job. If  $E(w_1 | X; m=0) = E(w_1 | X; m=1)$  in equation (2), i.e. if the conditional expectation of the wage before moving were the same for moving workers and those who remain, the effect of moving on earnings would be given by the first two terms in equation (2). Therefore, the earnings change would be identified by this difference-in-differences estimator.<sup>27</sup>

In our case we have five potential destination states, so the difference-in-differences estimator can be implemented with the following equation (Wooldridge, 2002):

$$\ln w = \mathbf{X}'\boldsymbol{\beta} + \gamma t_2 + \sum_{i=1}^5 \delta_i M_i + \sum_{i=1}^5 \xi_i t_2 M_i + \varepsilon \quad (3).$$

We thus perform a pooled regression where we stack wages and the  $x$  variables, where  $t_2$  is a time dummy for the second period,  $M_i$  takes the value 1 if the worker moves to destination state  $i$  (including moves to another job in the same state we have 5 destination states) and where the coefficient on the interaction term  $t_2 M_i$  ( $\xi_i$ ) gives the difference-in-differences estimate of wages of stayers vs. wages of workers moving to state  $i$ . To take account of the rural-urban divide for the informal self-employed, table 11 presents results when all informal self-employed are considered (columns (2) and (3)) and when those working in agriculture are excluded from their pool (columns (4) and (5)).

Some researchers moot that comparing wages of stayers in the formal sector and movers to the informal sector is not appropriate because there are differences in unobserved characteristics between the two groups that impact on the wage level in the second period

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<sup>27</sup> See Manski (1995) for a lucid discussion of identification.

(Badaoui, Strobl, and Walsh, 2007). They propose to compare outcomes only for the sub-group of movers (to other formal and to informal jobs). We do not adopt their approach in our study for two reasons. The number of moves that we observe is too limited to base the DID estimator only on movers. In addition, there might be differences in unobserved characteristics across movers linked to the destination state, e.g., those who move to dependent employment might be different from those who move to self-employment. In other words, by restricting the analysis to movers it is *a priori* not evident that one reduces biases due to unobserved heterogeneity.

The top panel of table 11 shows the wage change of movers vs. stayers in formal salaried employment. The average growth of hourly earnings of all those who were formal salaried workers in 2003 is roughly 20 percent. The difference-in-differences estimates show a rather clear cut pattern across the various destination states even though the magnitudes of some of the flows are quite small. Those workers who move to another formal job experience a wage gain of about 11 percent, while we find large gains in some specifications for the voluntary informal salaried and the informal self-employed. Excluding those in agriculture, the gain of the latter group is particularly pronounced. When we include job controls moving to a formal self-employed activity brings no statistically significant gain. Finally, moves to involuntary salaried employment have no effect.

The additional three panels have voluntary and involuntary informal salaried workers as well as the informal self-employed as stayers. Especially the voluntary sub-group among informal salaried workers has a very low stock in 2003 but the stocks of the other two categories are also pretty small as inspection of table 8 makes clear. Therefore, we find only

few significant effects in these panels<sup>28</sup>. In the third panel we see that a move from involuntary informal salaried employment to formal self-employment raises earnings relative to stayers, while moves to other employment states show no significant difference in the wage changes of movers and stayers. The only robust effect in the last panel is the wage premium for those who move voluntarily to informal salaried employment. Becoming involuntarily an informal salaried worker brings with it a wage penalty, which is however never significant or disappears once we control for job characteristics. Surprisingly, moving to formal dependent employment implies a large negative change, which however becomes insignificant once we include job controls.

Combining the results of the panels, we see that moves into voluntary informal salaried employment are associated with large wage gains, while moves into involuntary informal salaried employment and into formal dependent jobs produce insignificant differences in wage changes between movers and stayers. Persons are willing to move to formal jobs even though they do not gain in terms of wages, so they must value other aspects of such jobs. Another group of workers likes to take up informal jobs because these new jobs bring large wage gains, while a third group of workers is forced to move to informal jobs as they bring no wage gains and also have no other pecuniary benefits. Our analysis, therefore, points to a segmented labor market for dependent workers, which is most in line with the third paradigm: we find formal jobs, “upper tier” informal jobs that are well remunerated, but have restricted access and a majority of informal jobs that workers are forced to take up and that bring no gain when workers move into them. The DID analysis confirms our contention that informal self-employment in urban areas is voluntary since movements into this state are associated with large gains in earnings.

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<sup>28</sup> Since there are only 13 persons in our sample who flow out of formal self-employment to other employment states, we cannot produce an estimator with formal self-employment as the state of stayers.

## **6. Conclusions**

Research on informal employment in transition countries in spite of its great relevance has been very limited mainly because of a lack of appropriate data. A new rich panel data set from Ukraine, the Ukrainian Longitudinal Monitoring Survey (ULMS), enables us to provide some empirical evidence on informal employment in Ukraine in the years 2003 and 2004, a period of strong economic growth. The data allow us to “test” the validity of the three most prominent schools of thought in the literature that discuss the role of informality in the development process. We also investigate to what extent the informal sector plays a role in labor market adjustment in a transition economy and whether informality plays a different role relative to the context of a developing economy.

The analysis undertaken with the help of transition matrices points to the existence of a segmented labor market in Ukraine. Most workers try to enter formal employment and seem to use unemployment as well as informal dependent employment as waiting stages for entry into formal dependent employment. Unlike in Mexico, unemployment is a very important destination state from which workers try to move back to formal dependent employment. The flow analysis presented in table 8 also makes it clear that at all ages workers line up for dependent formal employment, which is by far the most favored destination state. There is, on the other hand, little evidence for workers locating in different employment states over their working life as suggested, e.g., by Maloney (1999). Instead, we find that while workers try to enter formal employment at any stage of their working life, some are forced to take up informal salaried jobs in an involuntary fashion, while a minority is engaged in informal jobs voluntarily. We take this as evidence of some labor market segmentation.



Labor market segmentation is also suggested by the wage analysis undertaken by us. In particular, our analysis points to a segmented labor market for dependent workers: we find formal jobs, “upper tier” informal jobs that are well remunerated, but have restricted access and a majority of informal jobs that workers are forced to take up and that bring no gain when workers move into them. We find less segmentation as far as urban self-employment is concerned as returns to both formal and informal self-employment are of the same magnitude. The difference-in-differences analysis also confirms our contention that informal self-employment in urban areas is voluntary since movements into this state are associated with large gains in earnings. In rural areas, informal self-employment is above all linked to subsistence agriculture with the extremely low returns inherent in this type of economic activity.

In our transition country we, therefore, do not find one school of thought on informality to be all persuasive as far as labor markets in Ukraine are concerned. For dependent employment we find three-fold segmentation since we have formal jobs, which make up the predominant employment relationship, “upper tier” informal jobs that persons like to take up but that are rationed and a majority of informal jobs that are poorly remunerated and that workers are forced into. Whenever possible, workers flow from these latter jobs to formal employment relationships. Consequently, dependent employment in Ukraine is best characterized by three-fold segmentation as espoused in the work of Fields and others. Self-employment, on the other hand, and in particular its urban variant, is a more fluid affair as workers seem to move freely between formal and informal self-employment. Since moving to informal urban self-employment also brings comparable gains to moving into formal self-employment the essence of the “revisionist” school of thought on informality associated recently with Maloney, namely that informality is willingly sought by

some workers with the aim to reach thus higher utility, seems to be borne out in this segment of the Ukrainian labor market.

The peculiar feature of a labor market in transition is, nevertheless, given by the very small share of the self-employed, formal or informal, in total employment when compared with self-employment in developing countries. In the Ukrainian labor market, formal salaried workers clearly dominate not only insofar as their stock is largest but also in the sense that workers use unemployment and informal salaried employment as waiting stages to enter a formal employment relationship. Whether this predilection has something to do with risk attitudes of workers coming out of a centrally planned economy cannot be analyzed with the data at hand but will be the subject of our future research.

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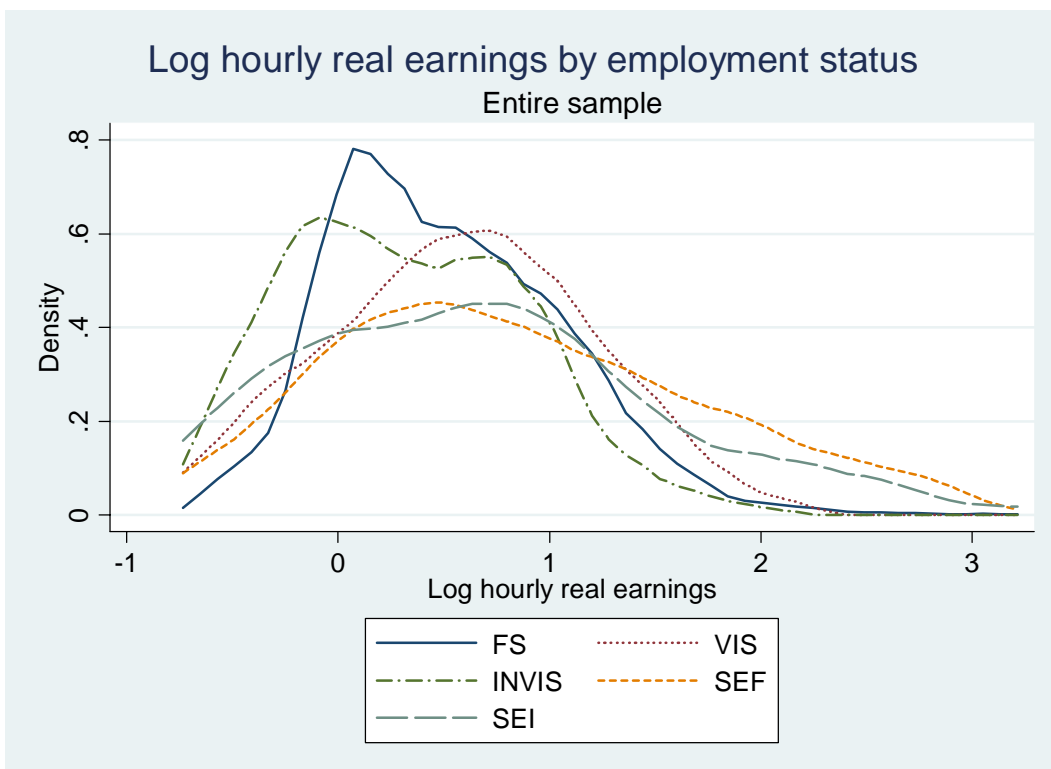
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# FIGURES

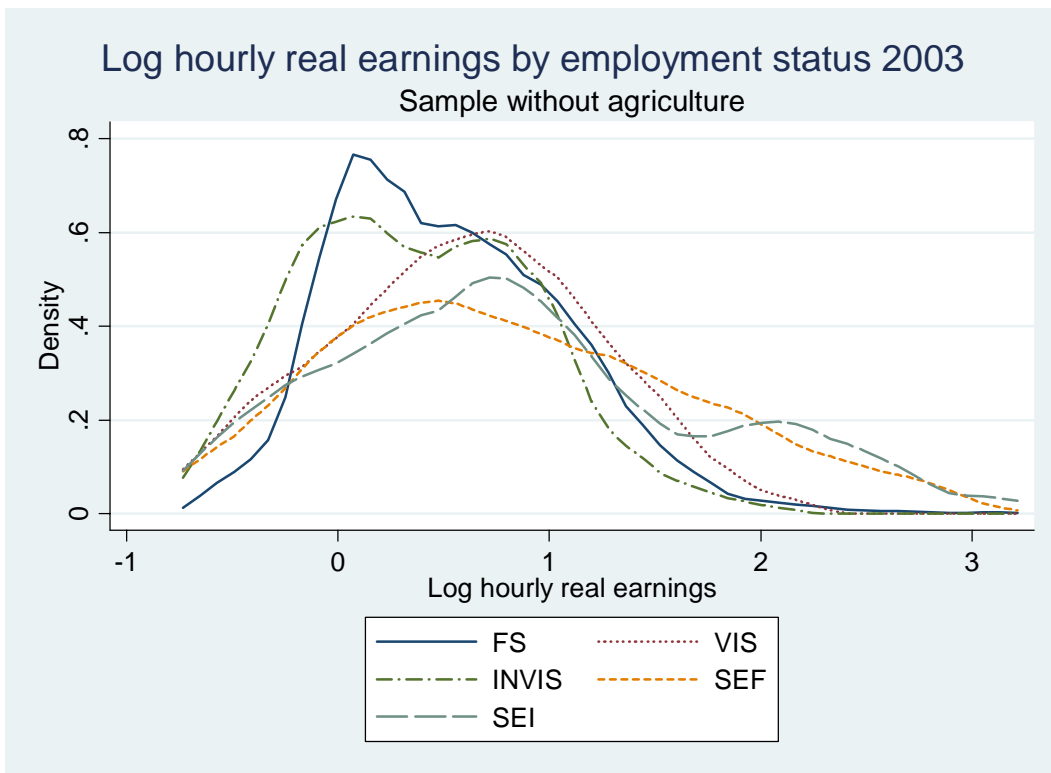
Figure 1



Figure 2



**Figure 3**



**Figure 4**

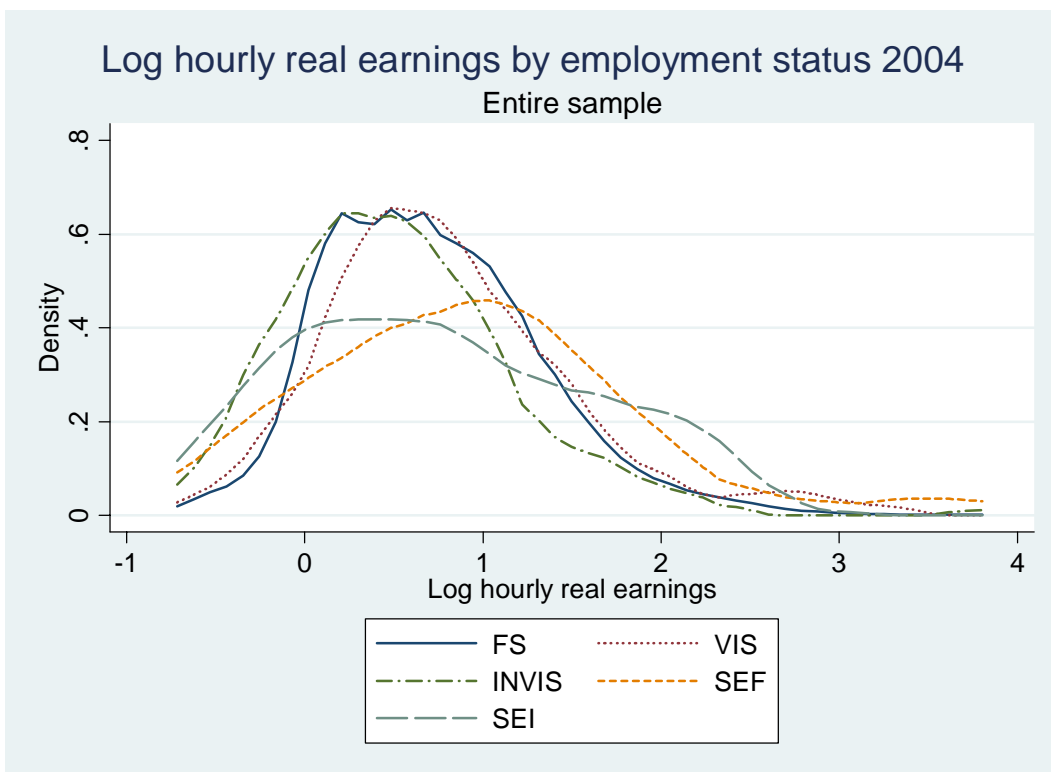
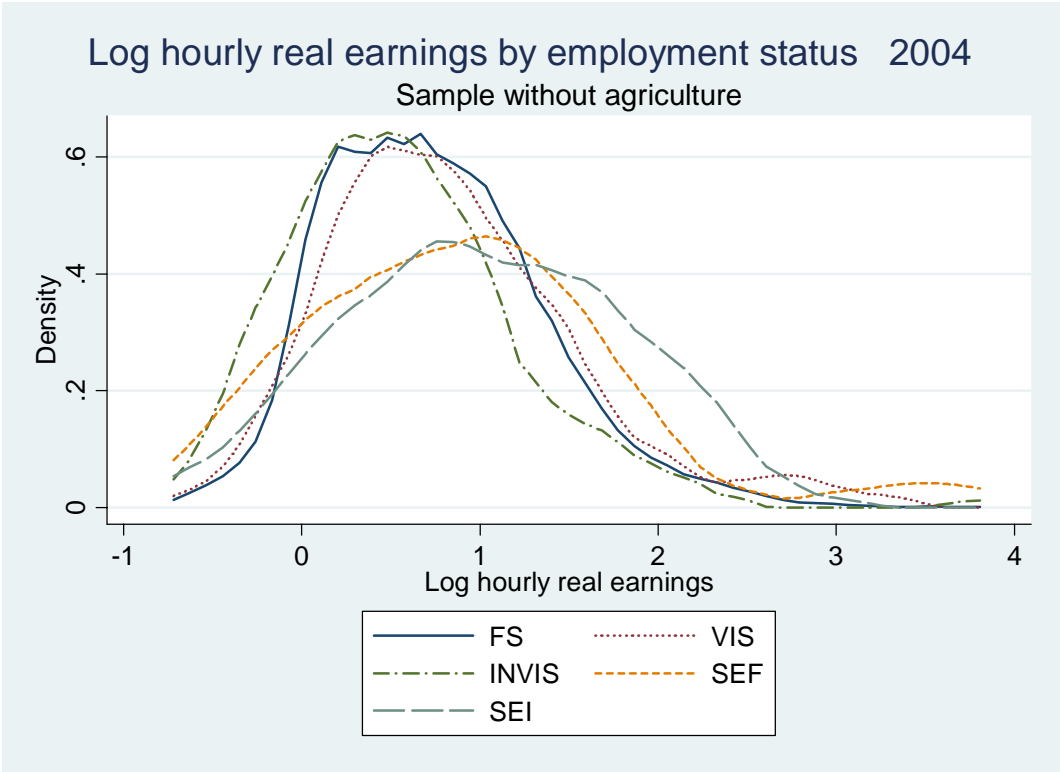


Figure 5



Note: FS=formal salaried; VIS= voluntary informal salaried; INVIS= involuntary informal salaried; SEF=self-employed formal; SEI=self-employed informal.

**TABLES**

**Table 1: Employment changes by sector, ownership and size, 1991-2004**

	Sector <sup>1</sup>			Ownership <sup>2</sup>			Size	
	Agriculture (% share)	Industry (% share)	Services (% share)	Privatized (% share)	New Private (% share)	Non agricultural self- employed (% share)	Employed in Firms with empl<100 (% share)	Employed in Firms with empl<50 (% share)
1991 <sup>a</sup>	15.98	32.01	47.21	1.59	1.26	0.33	33.77	23.54
1997 <sup>a</sup>	16.30	26.21	52.89	11.73	8.33	2.02	41.36	30.13
2004 <sup>b</sup>	13.59	23.07	59.18	19.59 <sup>3</sup>	20.09	4.36	53.98	43.52
Δ share 91- 97	0.32	-5.80	5.68	10.14	7.07	1.69	7.59	6.59
Δ share 97- 04	-2.71	-3.14	6.29	7.86	11.76	2.34	12.62	13.39
<sup>a</sup> End of the year <sup>b</sup> Reference week  Source: ULMS Notes: <sup>1</sup> Share of employed in Public Administration (PA) not shown – The PA share stays roughly at 4% during the whole period (1991-2004) <sup>2</sup> Includes also employees in Public Administration <sup>3</sup> Includes collective enterprises								



<b>Table 2. Composition of Employed</b>				
	2003		2004	
	share	N	share	N
Formal Salaried	0.867	3,340	0.826	2,713
Informal salaried Voluntary	0.021	79	0.026	85
Informal salaried Involuntary	0.039	152	0.062	203
Self-employed Formal	0.036	138	0.035	116
Self-employed Informal	0.037 <sup>a</sup>	144	0.051 <sup>b</sup>	169
<sup>a</sup> 0.016 (62) employed in agriculture and 0.021(82) employed in other sectors; <sup>b</sup> 0.028 (91) employed in agriculture and 0.024 (78) employed in other sectors; Source: ULMS				

<b>Table 3. Share of individuals working informally</b>		
	2003	2004
Informal <sup>1</sup>	0.10	0.15
Semi-informal <sup>2</sup>	0.19	0.24
Extended informality <sup>3</sup>	0.29	0.34
<sup>1</sup> Employees without formal contract and self-employed not registered <sup>2</sup> Informal + formal with secondary jobs, casual activities, plots of land with sale of products, sale of household production <sup>3</sup> Semi-informal + non employed having among their sources of subsistence casual work, casual business activity, agricultural production with sale of products Source: ULMS		

**Table 4: Descriptive statistics**

	Formal Salaried		Voluntary Informal Salaried		Involuntary Informal Salaried		Self-employed Formal		Self-employed Informal	
	Mean 2003	Mean 2004	Mean 2003	Mean 2004	Mean 2003	Mean 2004	Mean 2003	Mean 2004	Mean 2003	Mean 2004
Female	0.528	0.539	0.506	0.424	0.513	0.512	0.362	0.345	0.417	0.467
Ukrainian	0.455	0.444	0.405	0.435	0.296	0.355	0.406	0.345	0.458	0.497
Age	40.781 (11.808)	40.813 (11.950)	32.899 (10.044)	33.847 (12.564)	34.375 (12.897)	33.202 (11.113)	37.957 (10.431)	39.198 (10.158)	38.556 (11.190)	40.787 (13.157)
Secondary education	0.604	0.631	0.658	0.694	0.572	0.596	0.587	0.647	0.674	0.639
University	0.222	0.229	0.101	0.094	0.092	0.064	0.254	0.293	0.118	0.077
Single	0.116	0.127	0.253	0.298	0.289	0.296	0.123	0.086	0.167	0.161
Divorced & other	0.146	0.158	0.101	0.190	0.197	0.167	0.094	0.103	0.097	0.113
Workers with children	0.327	0.311	0.443	0.294	0.309	0.365	0.377	0.422	0.368	0.343
Hourly real earnings	1.974 (1.427)	2.523 (2.190)	2.111 (1.280)	2.974 (3.262)	1.613 (0.981)	2.304 (3.983)	3.350 (3.258)	4.335 (7.358)	2.892 (3.346) [3.576 (4.015)]	3.044 (2.692) [3.576 (2.753)]
	Median 2003	Median 2004	Median 2003	Median 2004	Median 2003	Median 2004	Median 2003	Median 2004	Median 2003	Median 2004
Hourly real earnings	1.563	1.911	1.818	1.966	1.250	1.560	2.018	2.548	1.849	1.967

Source: authors' calculations based on ULMS.

Notes: standard deviations in brackets; hourly earnings for 2004 are in 2003 prices.

**Table 5. Multinomial logit estimates of transitions – marginal effects  
2003-2004**

	From formal employment <sup>1</sup>		From informal employment <sup>2</sup>	
	Other formal employment	Informal employment	Other informal employment	Formal employment
Female	-0.051 (0.012)***	-0.009 (0.005)*	-0.066 (0.052)	-0.238 (0.077)***
Ukrainian	-0.004 (0.012)	-0.004 (0.005)	-0.009 (0.064)	-0.181 (0.072)**
Years of schooling	0.001 (0.002)	-0.003 (0.001)***	0.007 (0.010)	0.018 (0.019)
Age	-0.008 (0.012)	-0.013 (0.006)**	-0.083 (0.060)	0.235 (0.097)**
Age <sup>2</sup> /100	0.005 (0.032)	0.036 (0.016)**	0.253 (0.180)	-0.781 (0.268)***
Age <sup>3</sup> /1000	0.000 (0.003)	-0.003 (0.001)**	-0.024 (0.017)	0.072 (0.023)***
Single	-0.001 (0.019)	0.000 (0.006)	0.250 (0.180)	-0.373 (0.086)***
Divorced et al.	0.001 (0.016)	0.002 (0.007)	-0.056 (0.053)	0.108 (0.117)
Having Children <6 years	-0.006 (0.017)	0.007 (0.009)	0.106 (0.171)	-0.273 (0.056)***
Having Children >6 years	0.006 (0.014)	-0.005 (0.005)	0.080 (0.092)	-0.181 (0.076)**
Number of formal in household	-0.003 (0.006)	-0.003 (0.003)	-0.106 (0.037)***	0.118 (0.054)**
Center North	-0.023 (0.014)	0.011 (0.016)	-0.063 (0.076)	-0.169 (0.069)**
South	-0.016 (0.015)	0.027 (0.028)	0.003 (0.079)	-0.450 (0.067)***
East	-0.008 (0.016)	0.017 (0.016)	-0.018 (0.080)	-0.286 (0.084)***
West	-0.042 (0.012)***	0.009 (0.016)	-0.003 (0.098)	-0.162 (0.069)**
Log initial earnings	-0.010 (0.009)	-0.007 (0.004)	-0.064 (0.036)*	-0.092 (0.049)*
Controlling for sector	YES	YES	YES	YES

Source: ULMS

Clustered standard errors in parentheses

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

Default categories are: Male, Non-Ukrainian, Married, Kyiv City, Agriculture, hunting and Fishing.

<sup>1</sup> Reference group: Formally employed who did not change job.

<sup>2</sup> Reference group: Informally employed who did not change job.

**Table 6. Mobility in Ukrainian Labor market – 2003 to 2004**  
**4 Labor market states – Age 25-49**

<b>TRANSITION PROBABILITIES : P<sub>ij</sub></b>					
	F	I	U	NLF	P <sub>i.</sub>
Formal	0.883	0.032	0.040	0.045	0.634
Informal	0.232	0.613	0.094	0.061	0.063
Unemployed	0.266	0.144	0.354	0.235	0.123
Not in labor force	0.143	0.091	0.151	0.616	0.180
<b>P<sub>.j</sub></b>	0.633	0.093	0.102	0.172	

<b>Q MATRIX: P<sub>ij</sub>/P<sub>.j</sub> - "Probability standardized by size of the destination state at the end of the period"</b>					
	F	I	U	NLF	
Formal		0.343	0.393	0.261	
Informal	0.367		0.921	0.353	
Unemployed	0.421	1.555		1.365	
Not in labor force	0.226	0.977	1.477		

<b>V MATRIX: P<sub>ij</sub> / (P<sub>.j</sub>*(1-P<sub>ii</sub>)*(1-P<sub>jj</sub>)) - "Disposition to move to a sector"</b>					
	F	I	U	NLF	
Formal		7.579	5.205	5.818	
Informal	8.109		3.688	2.375	
Unemployed	5.572	6.226		5.502	
Not in labor force	5.026	6.574	5.953		

Source: ULMS

Note: **P<sub>i.</sub>** is the relative size of a sector at the beginning of the period; **P<sub>.j</sub>** is the relative size of a sector at the end of a period.

**Table 7. Mobility in Ukrainian Labor market – 2003 to 2004**  
**6 Labor market states – Age 25-49**

**TRANSITION PROBABILITIES : P<sub>ij</sub>**

	FS	IS	SEF	SEI	U	NLF	P <sub>i.</sub>
Formal salaried	0.877	0.023	0.007	0.007	0.041	0.045	0.610
Informal salaried	0.265	0.490	0.039	0.059	0.078	0.069	0.035
Self-employed formal	0.059	-	0.809	0.074	0.015	0.044	0.024
Self-employed informal	0.089	0.051	0.051	0.646	0.114	0.051	0.027
Unemployed	0.255	0.108	0.011	0.037	0.354	0.235	0.123
Not in labor force	0.131	0.058	0.012	0.033	0.151	0.616	0.180
<b>P<sub>.j</sub></b>	0.603	0.057	0.030	0.036	0.102	0.172	

**Q MATRIX: P<sub>ij</sub>/P<sub>.j</sub> - "Probability standardized by size of the destination state at the end of the period"**

	FS	IS	SEF	SEI	U	NLF
Formal salaried		0.412	0.231	0.189	0.403	0.262
Informal salaried	0.439		1.326	1.626	0.769	0.398
Self-employed formal	0.097	-		2.032	0.144	0.256
Self-employed informal	0.147	0.893	1.712		1.117	0.294
Unemployed	0.423	1.898	0.383	1.018		1.365
Not in labor force	0.218	1.021	0.392	0.907	1.477	

**V MATRIX: P<sub>ij</sub> / (P<sub>.j</sub>\*(1-P<sub>ii</sub>)\*(1-P<sub>jj</sub>)) - "Disposition to move to a sector"**

	FS	IS	SEF	SEI	U	NLF
Formal salaried		6.565	9.826	4.332	5.062	5.528
Informal salaried	6.988		13.605	8.996	2.336	2.034
Self-employed formal	4.141	-		29.988	1.168	3.488
Self-employed informal	3.365	4.941	25.266		4.881	2.159
Unemployed	5.313	5.764	3.103	4.446		5.502
Not in labor force	4.599	5.214	5.333	6.661	5.953	

Source: ULMS

Note: **P<sub>i.</sub>** is the relative size of a sector at the beginning of the period;  
**P<sub>.j</sub>** is the relative size of a sector at the end of a period.

**Table 8. Flows between labor market states – 2003-2004**

**7 states – age group: < 25 years**

	FS	VIS	INVIS	SEF	SEI	U	NLF	Tot Flows	Tot Stock
Formal salaried		4	15	2	4	12	16	53	272
Voluntary Informal Salaried	7		3	2	0	1	0	13	15
Involuntary Informal Salaried	8	2		0	2	2	5	19	34
Self-employed formal	1	1	0		2	0	1	5	12
Self-employed informal	2	2	1	1		3	3	12	20
Unemployed	43	7	12	0	2		43	107	147
Not in labor force	72	11	17	0	6	95		201	726
<b>Total</b>	<b>133</b>	<b>27</b>	<b>48</b>	<b>5</b>	<b>16</b>	<b>113</b>	<b>68</b>	<b>410</b>	<b>1,226</b>

	FS	VIS	INVIS	SEF	SEI	U	NLF		
Formal salaried		0.08	0.28	0.04	0.08	0.23	0.30		
Voluntary Informal Salaried	0.54		0.23	0.15	-	0.08	-		
Involuntary Informal Salaried	0.42	0.11		0.00	0.11	0.11	0.26		
Self-employed formal	0.20	0.20	-		0.40	-	0.20		
Self-employed informal	0.17	0.17	0.08	0.08		0.25	0.25		
Unemployed	0.40	0.07	0.11	-	0.02		0.40		
Not in labor force	0.36	0.05	0.08	-	0.03	0.47			

**7 states – age group: 25-49 years**

	FS	VIS	INVIS	SEF	SEI	U	NLF	Tot Flows	Tot Stock
Formal salaried		10	31	12	12	72	79	216	1,754
Voluntary Informal Salaried	11		12	1	1	0	2	27	36
Involuntary Informal Salaried	16	0		3	5	8	5	37	66
Self-employed formal	4	0	0		5	1	3	13	68
Self-employed informal	7	1	3	4		9	4	28	79
Unemployed	90	8	30	4	13		83	228	353
Not in labor force	68	9	21	6	17	78		199	518
<b>Total</b>	<b>196</b>	<b>28</b>	<b>97</b>	<b>30</b>	<b>53</b>	<b>168</b>	<b>176</b>	<b>748</b>	<b>2,874</b>

	FS	VIS	INVIS	SEF	SEI	U	NLF		
Formal salaried		0.05	0.14	0.06	0.06	0.33	0.37		
Voluntary Informal Salaried	0.41		0.44	0.04	0.04	-	0.07		
Involuntary Informal Salaried	0.43	-		0.08	0.14	0.22	0.14		
Self-employed formal	0.31	0.00	-		0.38	0.08	0.23		
Self-employed informal	0.25	0.04	0.11	0.14		0.32	0.14		
Unemployed	0.39	0.04	0.13	0.02	0.06		0.36		
Not in labor force	0.34	0.05	0.11	0.03	0.09	0.39			

**Table 8. Flows between labor market states – 2003-2004 (continued)**

**7 states – age group: >49 years**

	FS	VIS	INVIS	SEF	SEI	U	NLF	Tot Flows	Tot Stock
Formal salaried		1	3	0	0	15	101	120	684
Voluntary Informal Salaried	2		1	0	0	0	0	3	6
Involuntary Informal Salaried	2	1		0	0	3	5	11	14
Self-employed formal	0	0	0		0	0	3	3	15
Self-employed informal	0	2	0	2		1	3	8	19
Unemployed	13	2	2	0	3		40	60	98
Not in labor force	25	3	2	1	22	34		87	1,609
<b>Total</b>	<b>42</b>	<b>9</b>	<b>8</b>	<b>3</b>	<b>25</b>	<b>53</b>	<b>152</b>	<b>292</b>	<b>2,445</b>
	FS	VIS	INVIS	SEF	SEI	U	NLF		
Formal salaried		0.01	0.03	-	-	0.13	0.84		
Voluntary Informal Salaried	0.67		0.33	-	-	-	-		
Involuntary Informal Salaried	0.18	0.09		-	-	0.27	0.45		
Self-employed formal	-	-	-		-	-	1.00		
Self-employed informal	-	0.25	-	0.25		0.13	0.38		
Unemployed	0.22	0.03	0.03	-	0.05		0.67		
Not in labor force	0.29	0.03	0.02	0.01	0.25	0.39			

**Table 9. Determinants of log hourly real earnings: 2004**

	(1)	(2)	(3)	(4)
	OLS	Heckit	OLS	Heckit
Female	-0.262 (0.024)***	-0.245 (0.033)***	-0.133 (0.025)***	-0.134 (0.029)***
Ukrainian	-0.082 (0.030)***	-0.075 (0.032)**	-0.006 (0.030)	-0.008 (0.032)
Age	-0.046 (0.026)*	-0.064 (0.032)**	-0.057 (0.029)**	-0.055 (0.036)
Age <sup>2</sup> /100	0.125 (0.065)*	0.156 (0.070)**	0.154 (0.070)**	0.150 (0.080)*
Age <sup>3</sup> /1000	-0.012 (0.005)**	-0.013 (0.005)***	-0.014 (0.005)**	-0.013 (0.006)**
Secondary	0.194 (0.031)***	0.178 (0.038)***	0.114 (0.031)***	0.116 (0.038)***
University	0.590 (0.040)***	0.552 (0.063)***	0.338 (0.043)***	0.342 (0.063)***
Tenure	0.031 (0.008)***	0.031 (0.008)***	0.018 (0.009)**	0.018 (0.009)**
Tenure <sup>2</sup> /100	-0.110 (0.047)**	-0.113 (0.050)**	-0.076 (0.049)	-0.075 (0.051)
Tenure <sup>3</sup> /1000	0.013 (0.008)*	0.014 (0.008)*	0.011 (0.007)	0.011 (0.008)
Part Time	0.098 (0.070)	0.099 (0.070)	0.074 (0.069)	0.069 (0.071)
Voluntary Informal Salaried	0.197 (0.099)**	0.198 (0.096)**	0.190 (0.192)	0.190 (0.201)
Involuntary Informal Salaried	-0.064 (0.060)	-0.062 (0.057)	-0.044 (0.071)	-0.044 (0.068)
Self-employed Formal	0.221 (0.137)	0.221 (0.131)*	0.334 (0.185)*	0.334 (0.173)*
Self-employed Informal	0.316 (0.097)***	0.318 (0.099)***	0.033 (0.131)	0.034 (0.145)
Δ job	0.175 (0.052)***	0.175 (0.050)***	0.175 (0.055)***	0.175 (0.052)***
Δ occupation	0.000 (0.026)	0.001 (0.026)	0.014 (0.025)	0.014 (0.024)
Intermediate non-employment	0.048 (0.089)	0.048 (0.089)	0.057 (0.095)	0.057 (0.093)
Constant	1.072 (0.324)***	1.422 (0.511)***	0.973 (0.371)***	0.932 (0.562)*
Log hourly earnings in t-1			0.577 (0.027)***	0.578 (0.027)***
Wage arrears controls <sup>a, b</sup>	YES	YES	YES	YES
Regional controls <sup>c</sup>	YES	YES	YES	YES
Lambda		-0.092 (0.107)		0.008 (0.088)
Observations	2385	5682	1759	5056
R-squared	0.24		0.44	

Clustered standard errors in parentheses

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

Default categories are: Male, Non Ukrainian (mostly Russian), Less than secondary education, Full time, Formal Salaried, Agriculture hunting and fishing, New private enterprises, Kyiv City.

<sup>a</sup> back pay of wage arrears or other unexpected increase in monthly earnings

<sup>b</sup> wage arrears or other unexpected decrease in monthly earnings

<sup>c</sup> Job controls include: sector controls and ownership controls.



**Table 10. Determinants of log hourly real earnings 2003-2004**

**Fixed effects**

	(1)	(2)	(3)	(4)
	Without selection	With selection	Without selection <sup>d</sup>	With selection <sup>d</sup>
Age	0.057 (0.135)	0.063 (0.097)	0.063 (0.134)	0.069 (0.096)
Age <sup>2</sup> /100	0.442 (0.340)	0.425 (0.240)*	0.424 (0.340)	0.407 (0.237)*
Age <sup>3</sup> /1000	-0.034 (0.027)	-0.033 (0.019)*	-0.033 (0.027)	-0.031 (0.018)*
Secondary	0.018 (0.030)	0.016 (0.019)	0.019 (0.030)	0.017 (0.020)
University	0.059 (0.077)	0.057 (0.061)	0.075 (0.077)	0.074 (0.060)
Tenure	-0.013 (0.013)	-0.013 (0.009)	-0.016 (0.013)	-0.016 (0.010)*
Tenure <sup>2</sup> /100	0.091 (0.091)	0.093 (0.061)	0.112 (0.091)	0.114 (0.067)*
Tenure <sup>3</sup> /1000	-0.014 (0.017)	-0.014 (0.011)	-0.017 (0.017)	-0.018 (0.012)
Part time	0.138 (0.052)***	0.134 (0.047)***	0.154 (0.052)***	0.150 (0.044)***
Voluntary Informal Salaried	0.240 (0.105)**	0.241 (0.127)*	0.248 (0.105)**	0.249 (0.123)**
Involuntary Informal Salaried	-0.026 (0.072)	-0.026 (0.062)	-0.016 (0.073)	-0.016 (0.065)
Self-employed Formal	0.427 (0.155)***	0.426 (0.169)**	0.333 (0.172)*	0.332 (0.184)*
Self-employed Informal	0.117 (0.133)	0.117 (0.141)	0.341 (0.148)**	0.340 (0.137)**
Wage arrears controls <sup>a, b</sup>	YES	YES	YES	YES
Job controls <sup>c</sup>	YES	YES	YES	YES
Regional controls	YES	YES	YES	YES
Constant	-6.796 (1.735)***	-0.001 (0.011)	-6.806 (1.735)***	-0.001 (0.010)
Lambda		0.0010 (0.0106)		0.0011 (0.0096)
Observations	5437	11144	5367	11066

Source: ULMS

Clustered standard errors are in brackets.

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

<sup>a</sup> back pay of wage arrears or other unexpected increase in monthly earnings

<sup>b</sup> wage arrears or other unexpected decrease in monthly earnings

<sup>c</sup> Job controls include: occupation controls, sector controls and ownership controls.

<sup>d</sup> Informal self-employed in agriculture are excluded.

Default categories are: Less than secondary education, Full time, Occupations 1-3 (ISCO), Agriculture hunting and fishing, New private enterprises, Kyiv City.

**Table 11. Difference-in-Differences estimates in log hourly real earnings: movers vs. stayers**

State of stayers: Formal Salaried	All		Excluding informal self-employed in agriculture	
2 <sup>nd</sup> period	0.195 (0.018)***	0.211 (0.017)***	0.195 (0.018)***	0.211 (0.017)***
Other Formal*2nd period	0.111 (0.068)	0.115 (0.063)*	0.111 (0.068)	0.115 (0.063)*
Voluntary Informal *2nd period	0.528 (0.319)*	0.460 (0.306)	0.529 (0.319)*	0.460 (0.306)
Involuntary Informal *2nd period	0.018 (0.137)	-0.047 (0.134)	0.019 (0.137)	-0.048 (0.134)
Self-employed Formal*2 <sup>nd</sup> period	0.316 (0.474)	0.064 (0.410)	0.317 (0.474)	0.065 (0.411)
Self-employed Informal*2 <sup>nd</sup> period	0.722 (0.263)***	0.595 (0.243)**	0.926 (0.247)***	0.721 (0.224)***
State of stayers: Voluntary Informal <sup>a</sup>	All		Excluding informal self-employed in agriculture	
2nd period	-0.231 (0.351)	0.043 (0.274)	n/a	n/a
Other Voluntary Informal *2 <sup>nd</sup> period	0.484 (0.435)	0.306 (0.413)	n/a	n/a
Formal salaried*2nd period	0.318 (0.422)	0.021 (0.369)	n/a	n/a
Involuntary Informal *2nd period	0.431 (0.388)	0.278 (0.353)	n/a	n/a
Self-employed Formal*2 <sup>nd</sup> period	-0.243 (0.408)	-0.149 (0.605)	n/a	n/a
State of stayers: Informal Involuntary	All		Excluding informal self-employed in agriculture	
2nd period	0.254 (0.141)*	0.172 (0.128)	0.254 (0.141)*	0.170 (0.129)
Other Involuntary Informal *2 <sup>nd</sup> period	0.017 (0.298)	-0.166 (0.263)	0.008 (0.299)	-0.159 (0.271)
Formal Salaried*2nd period	0.088 (0.240)	0.083 (0.247)	0.082 (0.240)	0.072 (0.246)
Informal Voluntary*2nd period	-0.217 (0.426)	-0.166 (0.483)	-0.214 (0.435)	-0.175 (0.488)
Self-employed Formal*2 <sup>nd</sup> period	0.615 (0.294)**	0.322 (0.403)	0.585 (0.303)*	0.397 (0.388)
Self-employed Informal*2 <sup>nd</sup> period	0.365 (0.411)	0.391 (0.378)	0.456 (0.377)	0.455 (0.394)

<sup>a</sup> Here Self-employed Informal are dropped because of lack of observations.

**Table 11. Difference-in-Differences estimates in log hourly real earnings: movers vs. stayers, continued.**

State of stayers: Self-employed Informal	All		Excluding informal self-employed in agriculture	
	2nd period	0.028 (0.198)	0.206 (0.219)	0.328 (0.336)
Other Self-employed Informal*2nd period	1.625 (0.570)***	0.981 (0.623)	2.438 (0.626)***	1.730 (1.802)
Formal Salaried*2nd period	-0.921 (0.586)	-0.366 (0.775)	-2.139 (0.564)***	-1.585 (1.600)
Informal Voluntary*2nd period	0.867 (0.430)**	0.843 (0.492)*	0.636 (0.643)	1.347 (0.752)*
Informal Involuntary*2nd period	-0.796 (1.083)	-0.640 (0.762)	-0.889 (1.190)	0.160 (0.836)
Self-employed Formal*2nd period	0.970 (0.287)***	0.616 (0.400)	0.677 (0.462)	0.293 (0.611)
Personal controls	Yes	Yes	Yes	Yes
Job controls	No	Yes	No	Yes

Source: ULMS;  
\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%;  
Robust standard errors are in brackets.

APPENDIX

**Table A1. Determinants of attrition between 2003 and 2004 – Probit**

	(1)	(2)	
	Estimates	Marginal effects	X-mean
Female	-0.145 (0.029)***	-0.038 (0.007)***	0.579
Ukrainian	-0.011 (0.054)	-0.003 (0.014)	0.473
Age	0.100 (0.033)***	0.026 (0.009)***	42.197
Age <sup>2</sup> /100	-0.269 (0.083)***	-0.069 (0.021)***	20.422
Age <sup>3</sup> /1000	0.021 (0.006)***	0.005 (0.002)***	108.012
Secondary	-0.005 (0.044)	-0.001 (0.011)	0.547
University	0.114 (0.062)*	0.030 (0.017)*	0.145
Single	-0.000 (0.081)	-0.000 (0.021)	0.189
Divorced & other	0.015 (0.052)	0.004 (0.013)	0.155
Children<6	0.047 (0.085)	0.012 (0.023)	0.087
Children>6	-0.036 (0.065)	-0.009 (0.016)	0.161
Informal Salaried	0.197 (0.101)*	0.055 (0.030)*	0.028
Self-Employed Formal	0.237 (0.130)*	0.067 (0.040)*	0.017
Self-employed Informal	-0.228 (0.140)	-0.052 (0.028)*	0.018
Unemployed	0.163 (0.060)***	0.044 (0.017)***	0.095
Out of labor force	0.061 (0.046)	0.016 (0.012)	0.434
Center-North	-0.606 (0.099)***	-0.133 (0.018)***	0.240
South	0.208 (0.103)**	0.057 (0.030)*	0.157
East	-0.478 (0.098)***	-0.113 (0.021)***	0.322
West	-0.208 (0.102)**	-0.050 (0.023)**	0.224
Constant	-1.553 (0.423)***		
Observations	8178		
Observed P		0.186	
Predicted P		0.173 (at X-mean)	

Source: ULMS Clustered standard errors in parentheses.

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

Default categories are: Male, Non Ukrainian (mostly Russians), Less than secondary education,, Married, Formal Salaried, Kyiv City.

Sample consists of respondents in all labor market states.

**Table A2. Mobility in Ukrainian Labor market – 2003 to 2004**  
**6 Labor market states – < 25 years**

**TRANSITION PROBABILITIES : P<sub>ij</sub>**

	FS	IS	SEF	SEI	U	NLF	P <sub>i.</sub>
Formal salaried	0.805	0.070	0.007	0.015	0.044	0.059	0.222
Informal salaried	0.306	0.449	0.041	0.041	0.061	0.102	0.040
Self-employed formal	0.083	0.083	0.583	0.167	0.000	0.083	0.010
Self-employed informal	0.100	0.150	0.050	0.400	0.150	0.150	0.016
Unemployed	0.293	0.129	0.000	0.014	0.272	0.293	0.120
Not in labor force	0.099	0.039	0.000	0.008	0.131	0.723	0.592
<b>P<sub>.j</sub></b>	0.287	0.075	0.010	0.020	0.125	0.484	

**Q MATRIX: P<sub>ij</sub>/P<sub>.j</sub> - "Probability standardized by size of the destination state at the end of the period"**

	FS	IS	SEF	SEI	U	NLF
Formal salaried		0.931	0.751	0.751	0.354	0.122
Informal salaried	1.066		4.170	2.085	0.491	0.211
Self-employed formal	0.290	1.111		8.514	0.000	0.172
Self-employed informal	0.348	1.999	5.108		1.202	0.310
Unemployed	1.019	1.722	0.000	0.695		0.605
Not in labor force	0.345	0.514	0.000	0.422	1.049	

**V MATRIX: P<sub>ij</sub> / (P<sub>.j</sub>\*(1-P<sub>ii</sub>)\*(1-P<sub>jj</sub>)) - "Disposition to move to a sector"**

	FS	IS	SEF	SEI	U	NLF
Formal salaried		8.670	9.253	6.426	2.493	2.254
Informal salaried	9.930		18.163	6.307	1.223	1.383
Self-employed formal	3.575	4.837		34.056	0.000	1.494
Self-employed informal	2.979	6.046	20.433		2.752	1.867
Unemployed	7.183	4.294	0.000	1.591		3.001
Not in labor force	6.403	3.369	0.000	2.541	5.203	

Source: ULMS

Note: **P<sub>i.</sub>** is the relative size of a sector at the beginning of the period;

**P<sub>.j</sub>** is the relative size of a sector at the end of a period.

**Table A3. Mobility in Ukrainian Labor market – 2003 to 2004**  
**6 Labor market states – > 49 years**

**TRANSITION PROBABILITIES : P<sub>ij</sub>**

	FS	IS	SEF	SEI	U	NLF	P <sub>i.</sub>
Formal salaried	0.825	0.006	0.000	0.000	0.022	0.148	0.280
Informal salaried	0.200	0.400	0.000	0.000	0.150	0.250	0.008
Self-employed formal	0.000	0.000	0.800	0.000	0.000	0.200	0.006
Self-employed informal	0.000	0.105	0.105	0.579	0.053	0.158	0.008
Unemployed	0.133	0.041	0.000	0.031	0.388	0.408	0.040
Not in labor force	0.016	0.003	0.001	0.014	0.021	0.946	0.658
<b>P<sub>.j</sub></b>	0.248	0.009	0.006	0.015	0.037	0.685	

**Q MATRIX: P<sub>ij</sub>/P<sub>.j</sub> - "Probability standardized by size of the destination state at the end of the period"**

	FS	IS	SEF	SEI	U	NLF
Formal salaried		0.622	0.000	0.000	0.589	0.216
Informal salaried	0.807		0.000	0.000	4.030	0.365
Self-employed formal	0.000	0.000		0.000	0.000	0.292
Self-employed informal	0.000	11.190	17.158		1.414	0.231
Unemployed	0.535	4.339	0.000	2.079		0.596
Not in labor force	0.063	0.330	0.101	0.929	0.568	

**V MATRIX: P<sub>ij</sub> / (P<sub>.j</sub>\*(1-P<sub>ii</sub>)\*(1-P<sub>jj</sub>)) - "Disposition to move to a sector"**

	FS	IS	SEF	SEI	U	NLF
Formal salaried		5.906	0.000	0.000	5.486	22.735
Informal salaried	7.666		0.000	0.000	10.971	11.255
Self-employed formal	0.000	0.000		0.000	0.000	27.012
Self-employed informal	0.000	44.293	203.750		5.486	10.130
Unemployed	4.983	11.812	0.000	8.065		18.008
Not in labor force	6.608	10.182	9.368	40.789	17.150	

Source: ULMS

Note: **P<sub>i.</sub>** is the relative size of a sector at the beginning of the period;

**P<sub>.j</sub>** is the relative size of a sector at the end of a period.

**Table A4. Selection equations for Heckit models in tables 9 and 10**

	(1)	(2)	(3)	(4)
Female	-0.348	-0.338	-0.306	-0.301
	(0.039)***	(0.044)***	(0.031)***	(0.030)***
Ukrainian	-0.130	-0.140	-0.082	-0.081
	(0.047)***	(0.056)**	(0.038)**	(0.036)**
Age	0.523	0.584	0.502	0.504
	(0.040)***	(0.043)***	(0.027)***	(0.028)***
Age <sup>2</sup> /100	-1.045	-1.154	-0.965	-0.969
	(0.101)***	(0.109)***	(0.070)***	(0.072)***
Age <sup>3</sup> /1000	0.058	0.065	0.051	0.052
	(0.008)***	(0.008)***	(0.006)***	(0.006)***
Secondary	0.251	0.295	0.290	0.298
	(0.050)***	(0.054)***	(0.034)***	(0.037)***
University	0.692	0.793	0.801	0.802
	(0.065)***	(0.069)***	(0.047)***	(0.047)***
Number of formal in household	0.143	0.189	0.174	0.178
	(0.026)***	(0.029)***	(0.020)***	(0.019)***
Children<6	0.064	0.022	0.035	0.034
	(0.270)	(0.316)	(0.225)	(0.230)
Children>6	-0.274	-0.134	-0.051	-0.059
	(0.208)	(0.252)	(0.156)	(0.163)
Children<6*Age	-0.017	-0.017	-0.015	-0.015
	(0.009)*	(0.011)	(0.008)**	(0.008)**
Children>6*Age	0.004	0.000	-0.002	-0.002
	(0.006)	(0.007)	(0.004)	(0.004)
2 <sup>nd</sup> year dummy			0.176	0.170
			(0.028)***	(0.030)***
Constant	-7.126	-8.461	-7.464	-7.494
	(0.481)***	(0.529)***	(0.324)***	(0.336)***
Regional controls	YES	YES	YES	YES
Observations	5682	5056	11144	11066

Source: ULMS

Clustered standard errors are in brackets.

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

Default categories are: Male, Non Ukrainian (mostly Russian), Less than secondary education, Kyiv City.

Column (1) reports the results for the selection equation relative to column 2 of table 9;

Column (2) reports the results for the selection equation relative to column 4 of table 9;

Column (3) reports the results for the selection equation relative to column 2 of table 10;

Column (4) reports the results for the selection equation relative to column 4 of table 10.

**Table A5. Variables used in regressions**

Log hourly real earnings	Log of: monthly earnings in 2003 consumer prices divided by the number of hours worked in the last 4 weeks multiplied by 1.075
Female	Dummy variable: 1 if individual is female, 0 otherwise
Ukrainian	Dummy variable: 1 if individual is Ukrainian, 0 otherwise
Age	Continuous variable: year of reference week (2003 or 2004) – year of birth
Secondary	Dummy variable: 1 if individual's highest level of education is completed secondary education, 0 otherwise
University	Dummy variable: 1 if individual's highest level of education is completed university education, 0 otherwise
Tenure	Continuous variable: year and month of reference week (2003 or 2004) – year and month in which the job started
Part Time	Dummy variable: 1 if individual is working part time, 0 otherwise
Formal Salaried	Dummy variable: 1 if the individual is a dependent worker who is officially registered at the job he is doing, 0 otherwise
Voluntary Informal Salaried	Dummy variable: 1 if the individual is a dependent worker who chose not to be officially registered at the job he is doing, 0 otherwise
Involuntary Informal Salaried	Dummy variable: 1 if the individual is a dependent worker who did not choose not to be officially registered at the job he is doing, 0 otherwise
Self-employed Formal	Dummy variable: 1 if the individual is a self-employed who decided to register his activity, 0 otherwise
Self-employed Informal	Dummy variable: 1 if the individual is a self-employed who decided not to register his activity, 0 otherwise
Informal Salaried	Dummy variable: 1 if the individual is a dependent worker who is not officially registered at the job he is doing, 0 otherwise
Unemployed	Dummy variable: 1 if the individual is unemployed, 0 otherwise
Out of labor force	Dummy variable: 1 if the individual is out of the labor force, 0 otherwise
$\Delta$ job	Dummy variable: 1 if the individual changed job, 0 otherwise
$\Delta$ occupation	Dummy variable: 1 if the individual changed occupation, 0 otherwise
Intermediate non-employment	Dummy variable: 1 if the individual experienced a period of non-employment before going back to work, 0 otherwise
Single	Dummy variable: 1 if individual is single, 0 otherwise
Divorced & other	Dummy variable: 1 if individual is divorced or widow/er, 0 otherwise
Children<6	Dummy variable: 1 if individual has at least one child aged less than 6, 0 otherwise
Children>6	Dummy variable: 1 if individual has at least one child aged more than 6, 0 otherwise
Center-North	Dummy variable: 1 if individual lives/works in the Center-North region, 0 otherwise
South	Dummy variable: 1 if individual lives/works in the Southern region, 0 otherwise
East	Dummy variable: 1 if individual lives/works in the Eastern region, 0 otherwise
West	Dummy variable: 1 if individual lives/works in the Western region, 0 otherwise
Source: ULMS	