

WAGE AND UNEMPLOYMENT
EFFECTS OF GRADUATING IN A
RECESSION: THE CASE OF
UKRAINE

by

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Abstract

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I study the effect of initial labor market conditions on subsequent wages and unemployment of the youth in Ukraine, a country in transition with a relatively flexible labor market. Estimates are based on 2013 and 2015 survey waves of School-to-Work Transition Survey of 15 to 29-year-old men and women. The study revealed that individuals who graduated in 2008 or 2010 were earning 19-20% less on interview day than the 2006 cohort, controlling for other characteristics. An increase in the local unemployment rate by 1 percentage point decreases wage on interview day by 2-3 % for all individuals. This effect is larger than for the most flexible labor markets but smaller than for the most rigid ones. University graduates' unemployment is sensitive to initial macroeconomic conditions, while this is not the case for the less educated. Indirect evidence indicates that wage effects on initial labor market condition last for at least five years since graduation, while unemployment effects last for less than three years.

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LIST OF ABBREVIATIONS

ATO zone. Anti-Terrorist Operation Zone in Ukraine

EPL. Employment protection legislation.

ILO. The International Labor organization

IV. Instrumental variable

SWTS. School-to-Work Transition Survey.

Ukrstat. State Statistics Service of Ukraine

The US. The United States

Chapter 1

INTRODUCTION

It is widely known to economists that costs of recessions spread across the population unevenly, with the most vulnerable population bearing a greater part. During a typical recession (defined as a situation with adverse labor market conditions, measured by high unemployment), youth unemployment can rise several times faster than unemployment among the adult population. Moreover, losses tend to last even after the economy recovers. The Great Recession in 2008-2009 raised concerns about the issue.

Many authors have demonstrated a long-lasting effect of recessions empirically. For instance, according to Kahn (2010), earning losses last for at least fifteen years since graduation for American college graduates. American and Japanese male high school graduates, who entered the labor market during a downturn, are more likely to be unemployed up to twelve years afterward. Moreover, wage losses last up to twelve years for Japanese young men, and for three years for American young men (Genda et al. 2010).

The presence and degree of persistence of the effects depend on characteristics of an individual, such as sex, education level, and country. It also depends on what labor market outcome is considered (earnings, hours worked, employment status or another) and the degree of labor market rigidity.

The current study aims to investigate how graduating in a recession in Ukraine affects the subsequent wages and probability of unemployment. The goal is to cover several gaps in the existing literature. First, many papers have restricted

their samples to college graduates (such as Kahn 2010 and Oreopoulos et al. 2012) or men (Brunner and Kuhn 2014). The current study covers both the male and female population of all education levels. Second, many papers described the situation in North America and the European Union. However, developing countries stayed behind economists' attention. Choudhry et al. (2012), who study European Transition economies, are an exception, but this study, too, does not cover the situation in Ukraine.

The case of Ukraine is particularly compelling. Ukraine has recently survived two major economic crises. Because of the Great Recession, it suffered negative GDP growth of 14.8% in 2009, worse than most other countries in the world. The military crisis with Russia followed in 2014, leading to Ukraine losing control over the part of its territory. Although the conflict continues, the economy starts to recover gradually. In 2016, Ukraine managed to achieve a positive GDP growth (Ukrstat). It is interesting to study whether these troubled times have changed careers of recent graduates. Findings of this paper justify the need for policy actions to help unlucky cohorts catch up with the rest of the population. The investigation of such an issue is vital if we pursue an equitable society.

This thesis consists of five chapters. Chapter 2 provides an overview of the existing literature about the effects of graduating in a recession. Chapter 3 describes the data and presents graphical evidence. Chapter 4 outlines the estimation procedure and discusses the estimation results. Finally, Chapter 5 concludes and provides policy recommendations.

LITERATURE REVIEW

2.1. Mechanisms behind the losses

Bad initial conditions upon entry to the labor market are likely to put an individual into unemployment or a lower-paying job. But why should the effects of starting conditions be that important? Why do these effects persist, sometimes for longer than a decade?

One possible explanation lies in the damaging effects of initial unemployment. Regarding this, several channels can be proposed. First, if human capital is accumulated at work, graduates entering unemployment forego such an opportunity. Even worse, unutilized skills, particularly those acquired during education, were found to depreciate during a spell of unemployment (Edin and Gustavsson 2008).

Second, the scarring effects of unemployment also arise from stigmatization of the unemployed. A field experiment revealed that employers offer lower wages to applicants, who were unemployed for a long time (Eriksson et al. 2014).

Empirical facts confirm the idea of damaging effects of unemployment. Scans (2004) found that initial unemployment both cut earnings and increased the risk of subsequent unemployment for five years after graduation. Arulampalam (2001) estimated that the first unemployment spell did the most significant damage.

The explanation that lies in initial unemployment cannot describe the whole picture, because many young individuals incur losses despite finding a job right after graduation. It also remains unclear why the losses are sometimes permanent, because scarring effect of initial unemployment was found to fade over time.

Oreopoulos et al. (2008) proposed another model to explain the phenomenon. Their model is built upon several assumptions. First, recessions contract job offers at higher-paying jobs. Second, according to the classical job search theory, workers who did not obtain a well-paying job try to recover from initial losses by searching for better workplaces. Third, workers of higher ability search jobs more intensively. Finally, search costs intensify with age (for example, because of increased mobility constraints of workers who have formed families). Such a combination of initial conditions produces a situation when workers of higher ability recover from initial losses faster because they search more intensively. On the contrary, less capable workers search jobs less intensively and may never recover, because search costs accumulate more quickly than they could find a job that fits them best.

Oreopoulos et al.'s model predicts that the first employment experience has a deterministic effect on a worker's future because the entry wage affects subsequent wages. As a demonstration of their proposed model, Brunner and Kuhn (2013) showed that weak labor market at the time of graduation resulted in net lifetime earnings losses of 1.3% for Austrian men and that the characteristics of the first employer explained the biggest part of this effect.

A third model to explain the losses was proposed by Liu et al. (2016). The model is based upon a critical assumption that skills depreciate if they are not utilized. Worker's wage is a sum of two things: sector-specific productivity shock and individual productivity, which depends on the match between the sector and the

sector-specific skill of a worker. Workers choose which sector to work in based on current wages plus the expectation of future wages. Although at some configuration of shocks workers may prefer to borrow but remain in their native sectors, credit constraints may force them to accept wage offers from the firms that do not value their skills much. Thus, skill mismatches intensify with market inefficiencies, leading to permanent wage losses. Moreover, skill mismatches were shown to be procyclical.

2.2. Individual characteristics associated with the losses: sex and education

The literature suggests that losses from recessions upon entry to the labor market vary according to sex and education level.

According to Hershbrein (2012), for women, home production and child care are more frequently the alternatives for work than for men. Because women supply labor more elastically than men, they are likely to react differently to adverse initial labor market conditions. The paper empirically shows the heterogeneity in effects for men and women. For three years after graduating from school in a severe economic environment, women are less likely to be in the labor force or to work fewer hours, while there is no such effect for male school graduates.

The negative effect of a recession on women's employment is likely to create a positive selection of women who still work. As a result, recession at graduation was found to contract wages of women less severely than of men.

High unemployment at graduation induces men to postpone labor market entry by enrolling in college. This factor does not drive women's decisions to gain a college degree.

More educated are generally better protected against scarring effects of recessions than less educated. As Cutler et al. (2014) demonstrate for European countries, each year of schooling weakens the negative impact of the unemployment rate at labor market entry on current income.

2.3. Institutional characteristics associated with the losses: labor market rigidity

Kawaguchi and Murao (2014) used data over 1960-2010 for 20 OECD countries to demonstrate that labor market rigidity is an essential determinant of the size and duration of losses. They constructed an index of labor market rigidity, based on measures of employment protection legislation, union coverage, and unemployment insurance benefit duration. The analysis showed that the adverse effect of bad initial labor market conditions on subsequent unemployment is more persistent in rigid labor markets.

Cockx (2016) argues that the consequences of entering a depressed labor market upon graduation depend on both the degree of labor market rigidity and education level.

In flexible labor markets, lower-educated youth is punished severely regarding unemployment, but the effects are short-lived. According to different studies, the effect fades one to three years after graduation. For more educated young men and women, the effects are mild but long-lasting. Men and women with more years of education are less frequently unemployed because they are usually less geographically constrained and can downgrade (move to a less demanding job). Their penalties are mostly found in wages rather than unemployment. As Cockx (2016) put it:

“College graduates typically enter high-quality jobs in companies that invest in human resources training and offer long-term incentive contracts. In a recession, these high-quality career jobs are in reduced supply. Thus, college students graduating during a bust phase in the business cycle end up working in lower-quality jobs paying lower wages and offering fewer opportunities for promotion and training than students graduating during a boom phase. When labor demand recovers, these college-educated youths will have forgone valuable human capital accumulation and will have invested instead in task-specific competencies that have little value in higher-quality jobs, putting them behind their luckier cohorts who graduated during a boom.”

Also, penalties for the more educated are long-lasting, fading after ten years in the labor market.

Highly rigid labor markets reinforce the scarring effect of recessions. Adverse employment effects for less educated are more pronounced. More educated suffer greater wage losses, which may well persist for fifteen years.

The ideas by Cockx are demonstrated by Genda et al. (2010) for two extreme cases: flexible American and highly rigid Japanese labor markets. Recession upon entry to the labor market persistently worsens the employment prospects of Japanese school graduates. An increase in the unemployment rate by one percentage point decreases their chances of being employed by 4 percent twelve years after entering the labor market. The similar effect for the US school graduates is much smaller, minus 0.5 percent. There is almost no employment effect for more educated graduates in both countries, indicating that a college degree protects the employment prospects against recessions. For the US graduates of all education levels, the wage effects are relatively temporal and fade after about ten years. Their Japanese counterparts are, however, penalized more

severely. Their losses are greater in size and do not disappear even after twelve years.

I should note that the case of Japan is unique in many terms, because of legal impediments for firing workers, and because of schools' mediation of transition to work. The case for Belgium, a highly rigid labor market, studied by Cockx and Ghirelli (2016), may provide a more universal example. For the less educated, hourly wage is unaffected, because minimum wage restriction is binding. However, working time reduces for up to twelve years in the labor market. On the contrary, there are no employment effects of the recession for the more educated young individuals, but this group incurs high and persistent wage losses of 6 percent ten years since entry.

2.4. The degree of labor market rigidity in Ukraine

Labor market rigidity is a multi-dimensional concept. The evidence about the degree of rigidity of the labor market in Ukraine is conflicting. On the one hand, the employment protection legislation in Ukraine, as measured by EPL index, is among the highest in the group of 15 USSR successor countries (Muravyev 2010). On the other hand, a recent survey revealed that Ukrainian firms view the employment protection legislations as one of the least important obstacles for growth. This can be explained by the existence of opportunities for evasion from the laws (Del Carpio et al. 2017).

Some labor market indicators point out that the labor market in Ukraine is highly flexible. In fact, it is close to the United States market regarding flexibility. For instance, average unemployment duration was 4 to 9 months in the US and 5 to 7 months in Ukraine over 2005-2016. Over the same time span, average yearly

job destruction rates in the United States ranged from 11 to 16 %. In Ukraine, twice as many jobs were destroyed per year: from 22 to 30 % (ILO statistics). This contrasts to figures for Belgium, a highly rigid labor market, where average unemployment duration exceeded 20 months, and annual job destruction rate averaged at the low 6 % over 1990-1999 (Cockx and Ghirelli 2016).

While even in the most flexible labor markets there were found at least some costs from graduating in a recession, we may expect to find some evidence for Ukraine as well.

DATA DESCRIPTION AND GRAPHICAL EVIDENCE

3.1. Description of the School-to-Work Transition Survey and sample construction

To analyze my research question, I make use of the data from School-to-Work Transition Survey. Two waves were conducted in Ukraine by the Centre of Social Monitoring: the first in January-February 2013, and the second in April-May 2015. The survey inquired 15 to 29-year-old individuals about their family background, job market experience and their employment status at the date of the interview. The dataset has very rich information on the previous job experience, so I have a unique opportunity to use it in my analysis. Respondents were asked to describe the whole history of their activities related to paid and unpaid work, self-employment, and fulfillment of family responsibilities. Individuals responded whether their employment activities were formal or informal and told about the duration of their contracts.

The dataset is cross-sectional and contains around 6.7 thousand observations. In 2013, the survey sample covered the whole territory of Ukraine. In 2015, however, due to the military conflict between Ukraine and Russia, the entire territory of the Crimea was excluded from the sample. Also, the survey only covered parts of areas of Luhansk and Donetsk oblast, which were under control by the Ukrainian government.

I undertake the study of the subsample of 3.6 thousand individuals, who have already completed their education, roughly 55 % of the sample. The years of

graduation range from 1997 to 2015. I dropped 67 individuals who graduated in 1997-2000 and 2015 due to the small size of the group. Appendix A provides distribution table of surveyed graduates by survey wave and oblast.

Only employed individuals reported their cash earnings on the interview day. Therefore, the data on wages is cross-sectional. Unfortunately, many individuals were reluctant to report their earnings, so earning of only half of the sample are known (Table 1). To obtain hourly wages, I divided the cash earnings by corresponding working hours in the reported period.

Table 1. Summary for graduates, by graduation year and reported wages

Graduation year	N	% reported wages	% unemployed at survey date
2001	44	36.4	13.6
2002	86	51.2	12.8
2003	107	45.8	8.4
2004	178	41.0	12.4
2005	202	49.0	8.9
2006	274	46.7	6.9
2007	342	51.5	9.9
2008	370	48.4	6.0
2009	362	53.3	9.1
2010	425	48.5	9.7
2011	409	46.5	11.5
2012	488	46.1	15.0
2013	228	43.0	10.1
2014	194	39.7	15.0
Total	3709	47.3	10.4

Source: own calculations based on School-to-Work Transition Survey

Note: employment status was reported by 100% of all surveyed individuals

Appendix B contains summary statistics of the variables used in my analysis. Individuals with lower levels of education are more often unemployed than the more educated. They demonstrate much lower attachment to the labor force and live in rural areas more often. Women are on average less frequently unemployed than men. However, fewer women are attached to the labor force, and women

on average have less working experience. The discrepancy in labor force attachment is less visible for women with university education. From Table 1 it can be noted that unemployment is more prevalent among early graduates (2001 and 2002), who are mostly less educated, and recent graduates (2012 to 2014), who are mostly inexperienced.

3.2. Graphical evidence for wages of the youth in Ukraine

From Figure 1 and Figure 2, we can notice a substantial geographical variation in wages of youth. Wages in most oblasts fell notably in 2015 since 2013. Wages were comparably low in central and western oblasts. They remained the highest in the capital. Wages drastically declined in Donetsk and Luhansk oblasts in 2015, due to proximity to the ATO zone.

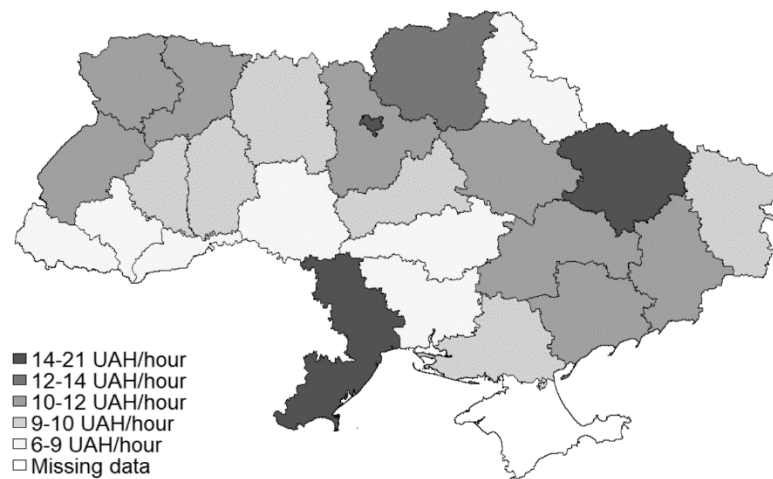


Figure 1. Median hourly wages by oblast in 2013, in nominal UAH
Source: constructed based on School-to-Work Transition Survey



Figure 2. Median hourly wages by oblast in 2015, in 2013 UAH
 Source: constructed based on School-to-Work Transition Survey

Graphical evidence in Figure 3 suggests that there is not much variation in wages due to graduation years. In contrast to results for other countries, there are no wage costs of recessions in terms of wages in Ukraine.

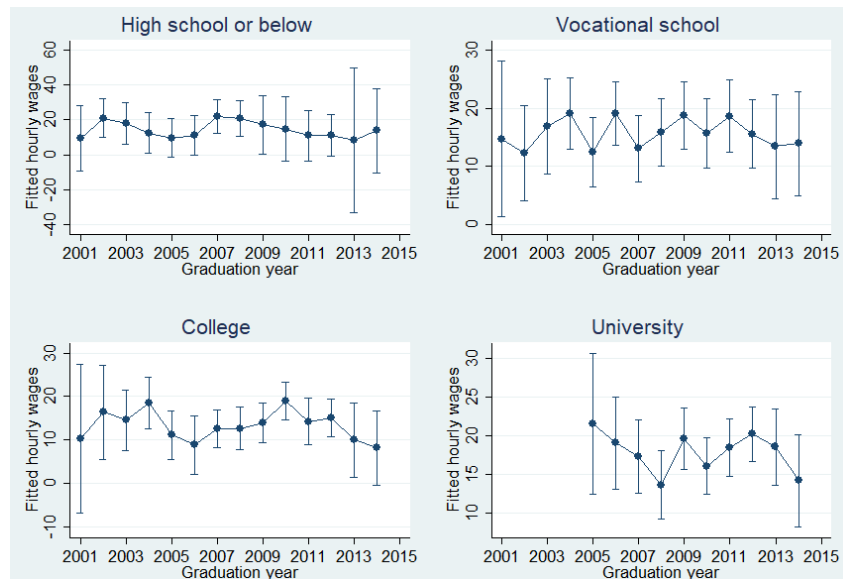


Figure 3. 95% profile plots of wages by education groups, in 2013 UAH
 Source: constructed based on School-to-Work Transition Survey
 Note: education groups are described in Appendix C

3.3. Graphical evidence for youth unemployment in Ukraine

Youth unemployment ranges from 12 to 26 percent in Ukraine. It is naturally higher than for adults because the young are usually more disadvantaged on the labor market. As already mentioned in the introduction, Ukraine has recently suffered two major economic downturns: one in 2008-2009 and another in 2014-2015. Both youth and total unemployment rate increased during that period, and GDP dropped (Figure 4). Interestingly, youth unemployment rates were reluctant to get back to previous levels after the crises were over, suggesting that the effects of economic downturns on the labor market last longer than a year.

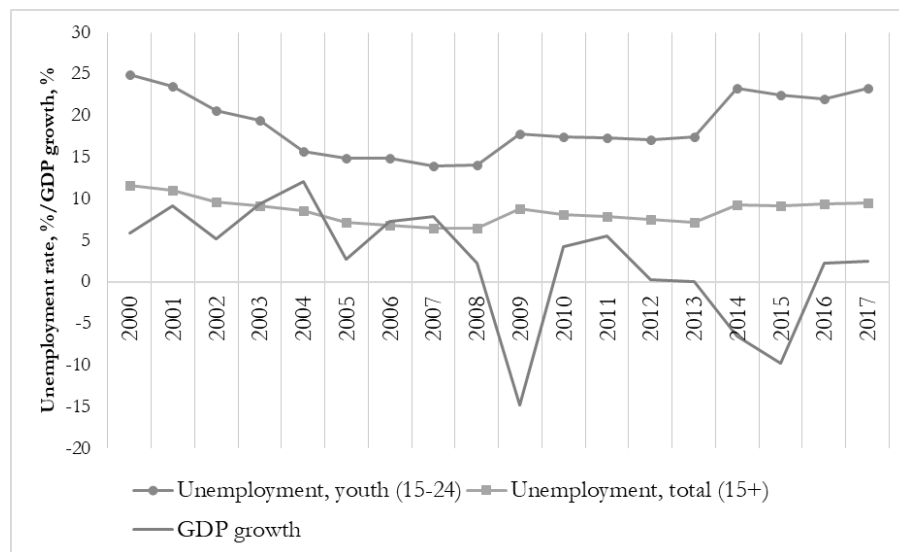


Figure 4. Youth and total unemployment rates and GDP growth
Source: own calculations based on ILO statistics and Ukraine State Statistics

Another piece of evidence reveals the same fact. In Figure 5, I assumed that all individuals enter the labor market in 22, which is the mode age at graduation in Ukraine (see Appendix B). With this assumption, it takes 3 to 4 years for the cohort of 2008 graduates to catch up with the luckier cohort of 2004 graduates. 2009 cohort did not catch up after four years.

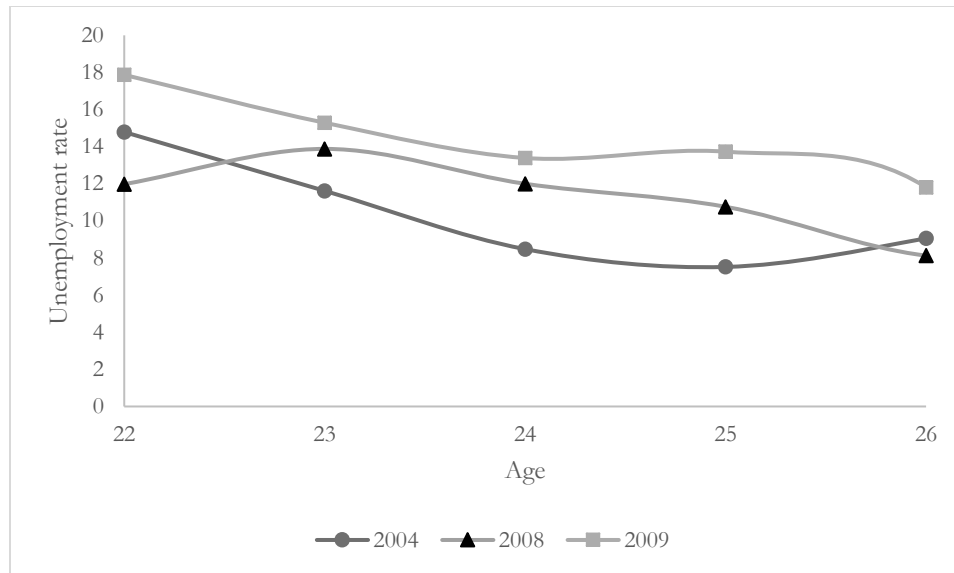


Figure 5. Unemployment rate by age of 2004, 2008 and 2009 cohorts
 Source: own calculations based on Ukrainian Labor Force Survey
 Note: cohort is defined as year at age 22, mode age at graduation

The data from School-to-Work Transition Survey conveys a somewhat different story. Figure 6 depicts life-cycle unemployment among the two graduate cohorts, 2007 and 2009. 2009 graduates entered a much more adverse environment than it was in 2007 because the Great Recession started. As a result, these graduates were more frequently unemployed at ages 17-20. But from the age 21, the unemployment gap disappears. This occurs because graduates of the universities, who mostly finish education at ages 21-22, enter the sample. We can thus conclude that adverse labor market conditions upon entry do not push the more educated into unemployment.

The data from School-to-Work Transition Survey conveys a somewhat different story. Figure 6 depicts life-cycle unemployment among the two graduate cohorts, 2007 and 2009. Individuals who graduated in 2009 entered a much more adverse labor market than in 2007, because the Great Recession started. As a result, these graduates were more frequently unemployed at ages 17-20. But from the age 21,

the unemployment gap disappears. This occurs because graduates of the universities, who mostly finish education at ages 21-22, enter the sample. We can thus conclude that adverse labor market conditions upon entry do not push the more educated into unemployment.

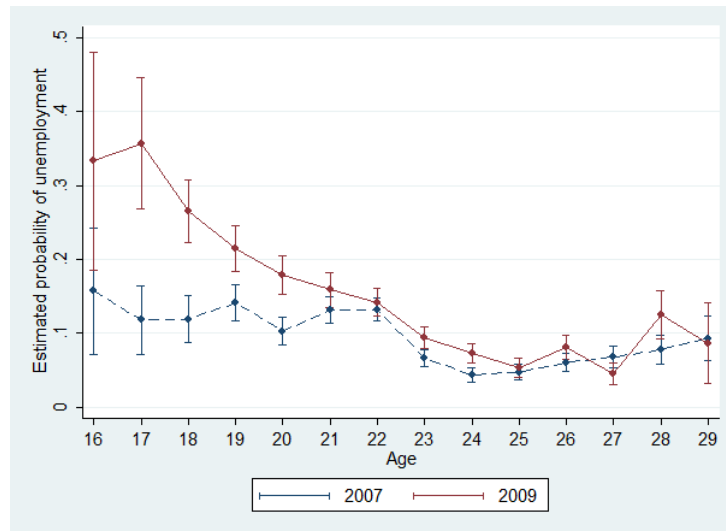


Figure 6. Unemployment dynamics of the 2007 and 2009 graduate cohorts
Source: own calculations based on School-to-Work Transition Survey

Descriptive analysis of the data has posed several hypotheses to check in regression analysis. First, we should check whether wages of individuals do not depend on the specific year of graduation. Second, we should evaluate whether crisis increases the probability of the less educated being unemployed.

METHODOLOGY AND ESTIMATION RESULTS

4.1. Wage model

The goal of this study is to estimate the effect of labor market conditions at the time of graduation on individuals' subsequent wages and unemployment. For wages, I use Mincer (1974) equation augmented with proxies for initial labor market conditions and job and demographic characteristics:

$$\begin{aligned} \ln(\text{hourly wage}_i) = & \beta_0 + \\ & \beta_1 \text{labor market condition at graduation} + \\ & \sum_j \beta_j \text{education} + \beta_2 \text{experience} + \\ & \beta_3 \text{experience}^2 + \beta_4 \text{female} + \\ & \sum_k \beta_k \text{firm size} + \beta_5 \text{private sector} + \\ & \beta_6 \text{occupation prestige index} + \sum_n \beta_n \text{industry}_n + \\ & \beta_7 \text{rural} + \sum_r \beta_r \text{economic region}_r + \beta_8 \text{ATO proximity} + \\ & \beta_9 \text{wave}_{2015} + u_i \end{aligned} \tag{1}$$

Appendix C contains summary for variables used in regression analysis. For specification (1) I use the pooled cross-sectional earnings data reported at interview day in either 2013 or 2015. Wages were obtained by dividing cash earnings by the number of hours in the reported period. Wages were inflation adjusted using the Consumer Price Index to the year 2013. I dropped wage outliers less than 2 UAH/hour and more than 200 UAH/hour.

The labor market conditions upon graduation are proxied using three approaches. The first approach is to include a set of dummies for each graduation year. The goal is to capture the effect of graduating in each specific year. If there are adverse effects of graduating in a recession, the coefficients will be positive for good years and the opposite for bad years.

The second and third approaches are to proxy the initial labor market conditions with national and local (oblast or Kyiv city) unemployment rates, respectively. They are extensively used in the literature to measure the effect of adverse labor market conditions, for example, in Oreopoulos (2006), Kahn (2010), and Cockx and Ghirelli (2016). If costs of graduating in a recession are present, the coefficients are expected to be significantly negative.

Both latter approaches have their benefits and drawbacks. The local unemployment rate is more accurate for individuals who seek job in their area. However, more educated individuals are usually more mobile. If they have problems finding a suitable job in their neighborhood, they might start to seek in other places. Thus, for more educated individuals the national unemployment rate might be a better proxy.

In my dataset, the timing of relocation is not specified for the individuals who changed their place of residence. Consequently, the area where an individual lived at the time of education completion cannot be correctly determined for movers. Thus, I estimate the local unemployment rate approach for non-movers only. If an individual responded she moved to obtain education, I imputed that she spent her entire work history in her current area of residence. If she moved from another place in the same oblast, I considered her to be a non-mover.

Equation (1) is estimated for the whole sample of graduates and separately for university and non-university graduates. The latter includes college, vocational school, high school graduates and individuals who did not complete high school. 39 respondents reported having completed education in 2001-2004 and having university education. I assumed them to have college education instead since they would have been too young to complete even a bachelor's degree. Separate estimations by education group will allow to investigate whether individuals of different educational backgrounds react differently to initial labor market conditions.

Following Mincer (1974), I include a set of education dummies into equation (1). Gorodnichenko and Sabirianova (2005) found positive but small returns to education in Ukraine. Education is potentially endogenous in the full sample case because information on ability is missing. Following the classical approach in labor economics (Wooldridge 2009), I instrumented education with mother's and father's education. For a variable to be a good instrument, it needs to be relevant and exogenous. Relevance requires that:

$$Cov(\text{instrument}; \text{endogenous variable}) \neq 0 \quad (2)$$

mother education and *father education* are indeed relevant, because in an ordered probit regression of *education* on *mother education* and *father education* both variables are statistically significant at 0.001 confidence level. Moreover, it is a common assumption in economics that *mother education* and *father education* are **exogenous** in equation (2), that is, they have no partial effect on wages, once all other factors are controlled for (Wooldridge 2009). When one of the variables was missing, I assumed father's education to equal to mother's and vice versa.

female dummy captures the female wage differential. Many studies have shown it to be negative. Women are potentially penalized in terms of wages due to motherhood, extra commitment to child care, career interruptions due to births and discrimination (Nizalova and Sliusarenko 2013).

Experience is expected to have a positive effect on wages with decreasing returns (Mincer 1974).

Job characteristics are also included in the specification (1). Firm size, private firm ownership, occupation prestige, and industry are controlled for.

The information on occupations was recorded in one- or two-digit ISCO-08 groups. To measure the information prestige, I transformed the ISCO-08 groups into an occupation prestige index, ISEI-08 (International Socio-Economic Index of occupational status), as described in Appendix C. Greater values are attached to more prestigious occupations. In the dataset, the index ranges from 15 (Agricultural, forestry and fishery laborers) to 70 (health professionals).

Descriptive statistics showed that there is substantial geographic variation in wages. *Rural* dummy captures the effect of living in rural areas. Wages substantively vary by oblast (Figure 1) but including a dummy for each oblast would be redundant. To concisely capture the variation, I grouped oblasts into ten economic regions (see Appendices C and D). Nine correspond to the economic regions of Ukraine, as proposed by Maslyak and Shishchenko (1996). The last group comprises Kyiv because wages in the capital are significantly larger than in other regions (see Figure 1 and Figure 2).

Wages in Ukraine have substantially decreased in Luhansk and Donetsk oblasts in 2015. This is due to the proximity to the zone of Antiterrorist operation, which

started in 2014 in the East of Ukraine. To control for this fact, included an *ATO proximity* dummy. It equals 1 if an individual lived in Luhansk or Donetsk oblast in 2015 and 0 otherwise.

Wages vastly decreased for the whole population in 2015, as one can tell from a comparison of Figure 1 and Figure 2. To control for this effect, I have included *wave₂₀₁₅* dummy. It combines the fixed effect of the 2015 year and the seasonal effect, as the 2015 survey was conducted in a different month. Table 2 summarizes the expected directions of variable effects.

Table 2. Expected directions of the effects of variables in equation (1)

Variable	Expected direction on the effect
graduation year	positive for good years, negative for bad years (or none)
national unemployment at graduation	negative or none
local unemployment at graduation	negative or none
education	small but positive for higher education levels, compared to “high school or below” category
experience	positive
experience ²	negative due to diminishing returns to experience
female	negative
firm size	positive for bigger firms, compared to small firms
private sector	positive, because private firms are potentially more productive
occupation prestige index	positive
industry	industry-specific
rural	negative
economic region	positive for relatively depressed regions, and negative for capital and other more developed regions
ATO proximity	negative
wave ₂₀₁₅	negative

Source: constructed based on School-to-Work Transition Survey

This section outlined the procedure to estimate the effects on initial labor market conditions on subsequent wages, and section 4.3 provides the estimates. The next section, 4.2, describes the similar estimation procedure for unemployment.

4.2. Unemployment model

This section briefly describes the estimation procedure for unemployment, which is similar to the procedure for wages. The estimation equation is as follows:

$$\begin{aligned} \Pr(\text{unemployed}_i) = & \beta_0 + \\ & \beta_1 \text{labor market condition at graduation} + \\ & \beta_2 \text{contemporaneous oblast unemployment} + \\ & \sum_j \beta_j \text{education} + \beta_4 \text{experience} + \beta_5 \text{experience}^2 + \\ & \beta_6 \text{LTU} + \beta_7 \text{female} + \beta_8 \text{rural} + \\ & \sum_r \beta_r \text{economic region}_r + \beta_9 \text{ATO proximity} + \\ & \beta_{10} \text{wave}_{2015} + u_i \end{aligned} \tag{3}$$

Labor market condition upon graduation is proxied using three approaches described in section 4.1: graduation year dummies, national unemployment at graduation, and local unemployment at graduation.

I controlled for initial long-term unemployment, *LTU*. It equals 1 if an individual was unemployed for 6 or more months since he or she graduated, and 0 otherwise. *LTU* estimates whether there is a stigma effect from prolonged unemployment.

I include contemporaneous year dummy *wave*₂₀₁₅ and the unemployment rate in the area of individual's residence at the interview day. According to Kahn (2010), "these variables insure that the effects of a subsequent economic shock are not spuriously attributed to the graduation unemployment rate".

I have included the same characteristics of current individual's residence as in specification (1).

Table 3 summarizes the expected directions of variables' effects.

Table 3. Expected directions of the effects of variables in equation (3)

Variable	Expected direction on the effect
graduation year	negative for good years, positive for bad years (or none)
national unemployment at graduation	positive or none
local unemployment at graduation	positive or none
contemporaneous local unemployment	positive
education	negative for higher education levels, compared to "high school or below" category
experience	negative
experience ²	positive due to diminishing returns to experience
LTU (initial long-term unemployment)	positive (if there is unemployment stigma) or none
female	negative, because women are statistically less frequently unemployed
rural	positive, due to small labor demand in rural areas
economic region	positive for relatively depressed regions, and negative for capital and other more developed regions
ATO proximity	positive
wave ₂₀₁₅	positive, due to the recession, as compared to year 2013

Note: based on own assumptions

This section outlined the procedure to estimate the effect of initial labor market conditions on probability of subsequent unemployment. The estimates are provided in section 4.4.

4.3. Wage estimation results

Section 4.1 described the procedure to estimate the effects of initial labor market. This section provides and discusses the results. Full estimation tables for dummy approach based on equation (1) is presented in Appendix E. All other estimation tables are available upon request. Table 4 provides a summary of the effects of key explanatory variables on wages.

Table 4. Summary table for the effects of initial labor market conditions on the logarithm of wages at interview date (2013 or 2015)

Subsample:	All education levels		University	Non-university ^d	Non-university ^d
	IV ^c	OLS	OLS	IV ^c	OLS
Graduation year approach^b					
Graduation year dummies (2006 is the base):					
2001	0.052	-0.024	–	-0.058	-0.067
2002	0.020	-0.043	–	-0.055	-0.063
2003	0.061	-0.021	–	-0.014	-0.015
2004	0.173	0.108	–	0.115	0.138
2005	-0.025	-0.072	0.122	-0.097	-0.111
2007	-0.020	-0.018	-0.086	0.017	0.007
2008	-0.055	-0.027	-0.189*	0.055	0.070
2009	0.020	0.057	-0.052	0.095	0.112
2010	-0.082	-0.034	-0.198*	0.108	0.118
2011	-0.093	-0.024	-0.094	-0.002	0.017
2012	-0.006	0.050	-0.031	0.048	0.085
2013	-0.170*	-0.081	-0.184	-0.056	-0.033
2014	-0.192*	-0.114	-0.318**	0.012	0.065
Observations	1,645	1,693	810	855	883
R ²	0.124	0.170	0.187	0.172	0.190
National unemployment approach					
national unemployment at					
graduation	0.022	0.010	0.039*	-0.004	-0.006
Observations	1,645	1,693	810	855	883
R ²	0.112	0.163	0.172	0.164	0.177
National unemployment approach (estimated for subsample of non-movers)					
national unemployment at					
graduation	0.020	0.006	0.034	-0.009	-0.011
Observations	1,542	1,587	761	800	826
R ²	0.111	0.167	0.182	0.165	0.179
Local unemployment approach (estimated for subsample of non-movers)					
local unemployment at					
graduation	-0.028***	-0.029***	-0.039**	-0.028**	-0.026**
Observations	1,542	1,587	761	800	826
R ²	0.124	0.172	0.185	0.168	0.183

Source: own calculations based on School-to-Work Transition Survey.

Notes:

- * denotes $p < 0.1$, ** denotes $p < 0.05$, *** denotes $p < 0.01$.
- Full estimation table is given in Appendix E
- In IV specifications, education level is instrumented with mother's and father's education
- Non-university subsample includes college, vocational school and high school graduates and individuals who did not complete high school.

2006 is the base graduation year in all specifications. This was the year of relatively favourable macroeconomic conditions, as can be seen from Figure 4 of unemployment and GDP dynamics.

Negative wage effects from graduating in a specific year are found only for individuals with higher education. Controlling for individual experience, demographic and job characteristics and a time fixed effect, and compared to 2006 graduates, 2014 graduates earned about 32% less per hour in 2015. One explanation to this effect is that university graduates were affected by economic slowdown of 2014, caused by military conflict with Russian Federation. The labor market conditions were adverse for the youth in 2014, which was expressed in high youth unemployment (Figure 4). However, negative wage effect of graduating in 2014 can also be attributed to fresh graduates' lack of experience. Although work experience is controlled for in all specifications, the lack of experience could still have its detrimental effect.

2010 and 2008 university graduates earn 19-20% less than the younger 2006 cohort, although the evidence is marginal. In light of this fact, it is surprising that 2009 year has an insignificant coefficient. The initial hypothesis posed from visual analysis of the data in Chapter 3 has not been confirmed. In fact, when all factors in equation (1) are controlled for, wages do depend on specific year of graduation.

An increase in local unemployment rate has a detrimental effect of both education subgroups who did not change their place of residence. An increase in the rate by 1 percentage point above the average level diminishes hourly wage by 3 to 4 %. At the same time, wages of individuals mostly insensitive to the national unemployment rate. This result does not change if only non-movers are considered. From these observations we can derive that negative results for local unemployment rate are driven by the fact that *all* graduates are sensitive to the local macroeconomic situation, not only *less mobile* graduates.

As a robustness check, I conducted the same estimation procedure for full-time workers. In this case, the dependent variable is the logarithm of real monthly earnings. The results are given in Table 5.

Table 5. Summary table for the effects of initial labor market conditions on the logarithm of monthly earnings at interview date (2013 or 2015): robustness check for full-time workers

Subsample:	All education levels		University	Non-university ^c	Non-university ^c
	IV ^b	OLS	OLS	IV ^b	OLS
Graduation year approach					
Graduation year dummies (2006 is the base):					
2001	-0.027	-0.021	–	-0.040	-0.015
2002	-0.117	-0.060	–	-0.124	-0.074
2003	-0.018	-0.012	–	-0.067	-0.026
2004	0.099	0.080	–	0.071	0.099
2005	-0.003	-0.017	0.188*	-0.069	-0.070
2007	-0.018	0.010	-0.032	0.023	0.020
2008	-0.070	-0.014	-0.142*	0.064	0.083
2009	-0.074	-0.050	-0.108	0.021	-0.013
2010	-0.046	-0.008	-0.109	0.145*	0.110
2011	-0.079	-0.033	-0.086	0.023	-0.000
2012	-0.077	-0.007	-0.067	0.033	0.054
2013	-0.208**	-0.129**	-0.198**	-0.095	-0.123
2014	-0.187**	-0.121*	-0.256***	-0.008	-0.011
Observations	1,597	1,643	796	821	847
R ²	0.202	0.343	0.365	0.327	0.371
National unemployment approach					
national unemployment at graduation					
	0.001	-0.005	0.012	-0.018	-0.016
Observations	1,597	1,643	796	821	847
R ²	0.205	0.338	0.349	0.309	0.359
National unemployment approach (estimated for subsample of non-movers)					
national unemployment at graduation					
	-0.001	-0.007	0.010	-0.021*	-0.020
Observations	1,498	1,541	748	769	793
R ²	0.245	0.349	0.361	0.325	0.371
Oblast unemployment approach (estimated for subsample of non-movers)					
local unemployment at graduation					
	-0.032***	-0.035***	-0.029**	-0.039***	-0.040***
Observations	1,498	1,541	748	769	793
Adj. R ²	0.264	0.358	0.365	0.350	0.384

Source: own calculations based on School-to-Work Transition Survey.

Notes:

- * denotes $p < 0.1$, ** denotes $p < 0.05$, *** denotes $p < 0.01$.
- In IV specifications, education level is instrumented with mother's and father's education
- Non-university subsample includes college, vocational school and high school graduates and individuals who did not complete high school.

The results for full-time workers are similar to previous results but for a couple of differences. Coefficient for 2008 remains significant, but 2010 does not. 2005 university graduates earn 19 % more per month than the 2006 cohort, which was unexpected. Also, there is marginal evidence that wages of the less educated are sensitive to overall macroeconomic situation at the time of graduation.

Full-time workers with higher education of the 2013 cohort earn less compared to 2006 graduates. Because the labor market was relatively favourable in 2013, this effect can be attributed to lack of working experience.

Another robustness check was to estimate equation (1) without job characteristics. Table 6 provides a summary of results. Again, the results are similar to original specification. However, marginal evidence for the positive effect of national unemployment rate is contradictory. In this specification, the effect of graduating in 2008 and 2010 for higher educated individuals has become significant at 5% confidence level. Significance of 2004 dummy for non-university graduates is an unexpected finding.

In all three tables, the 2008 dummy for university graduates had a negative coefficient, which was at least marginally significant. Considering the fact that the dependent variable was measured at either 2013 or 2015, we can conclude that the negative wage effect lasts at for least five years.

To conclude, wage losses from graduating in a recession exist both for university and non-university graduates. On the one hand, this contradicts the literature for developed countries, which says that wage losses due to graduating in a recession are mostly found for the high-educated youth (Cockx 2016). On the other hand, a subsample of non-university graduates includes those who finished college.

They may also be considered to belong to the “more educated” group. From this point of view, my findings are in line with the theory.

Table 6. Summary table for the effects of initial labor market conditions on the logarithm of wages at interview date (2013 or 2015): robustness check without job characteristics

Subsample:	All education levels		University	Non-university ^c	Non-university ^c
	IV ^b	OLS	OLS	IV ^b	OLS
Graduation year approach					
Graduation year dummies (2006 is the base):					
2001	-0.031	-0.102	–	-0.092	-0.121
2002	-0.009	-0.074	–	-0.046	-0.070
2003	0.065	-0.009	–	0.015	0.012
2004	0.174*	0.130	–	0.133	0.161*
2005	-0.067	-0.113	0.083	-0.129	-0.137
2007	-0.043	-0.048	-0.114	-0.019	-0.023
2008	-0.068	-0.049	-0.229**	0.057	0.071
2009	0.006	0.035	-0.072	0.045	0.076
2010	-0.079	-0.038	-0.214**	0.100	0.122
2011	-0.096	-0.040	-0.120	-0.038	-0.015
2012	-0.025	0.018	-0.081	0.030	0.066
2013	-0.155	-0.087	-0.242*	0.006	0.029
2014	-0.205**	-0.137	-0.347**	0.006	0.056
Observations	1,680	1,730	825	875	905
R ²	0.093	0.128	0.122	0.123	0.147
National unemployment approach:					
national unemployment at graduation					
	0.019	0.009	0.040*	-0.003	-0.006
Observations	1,680	1,730	825	875	905
R ²	0.082	0.119	0.107	0.115	0.130
National unemployment approach (estimated for subsample of non-movers):					
national unemployment at graduation					
	0.017	0.006	0.038*	-0.006	-0.009
Observations	1,574	1,620	776	817	844
R ²	0.088	0.124	0.112	0.110	0.134
Oblast unemployment approach (estimated for subsample of non-movers):					
oblast unemployment at graduation					
	-0.028***	-0.029***	-0.039**	-0.029**	-0.027**
Observations	1,574	1,620	776	817	844
R ²	0.102	0.129	0.114	0.114	0.139

Source: own calculations based on School-to-Work Transition Survey.

Notes:

- * denotes $p < 0.1$, ** denotes $p < 0.05$, *** denotes $p < 0.01$.
- In IV specifications, education level is instrumented with mother’s and father’s education
- Non-university subsample includes college, vocational school and high school graduates and individuals who did not complete high school.

This section has revealed and discussed the evidence for costs of graduating in a recession in Ukraine. 2008 and 2010 graduates are earning substantively less than 2006 graduates. Both more and less educated earn less if they graduate when local macroeconomic environment is bad. The next section discusses the estimates for unemployment.

4.4. Unemployment estimation results

This section discusses the effects of initial labor market conditions on unemployment, obtained by procedure from section 4.2 and summarized by equation (3). Full estimation tables for various specifications are given in Appendix F. Table 7 provides the summary for the effects of key explanatory variables on the probability of unemployment.

The probability of being unemployed is 0.07 percent higher for 2012 university graduates than for 2006 graduates, controlling for the place of residence, employment experience, contemporaneous local unemployment and time fixed effect. Also, there is marginal positive effect from graduating 2007 for all graduates. These results were unexpected. The positive effect of graduating in 2014 for university graduates is only marginal. It can be attributed to either the recession or lack of working experience. The initial hypothesis posed by visual data analysis has not been confirmed. In fact, unemployment of more educated individuals *does* depend on the timing of graduation.

Table 7. Summary table for the effect of initial labor market conditions on the probability of unemployment at interview date (2013 or 2015), average partial effects

Subsample:	All education levels	University	Non-university^d
Method:	Probit	Probit	Probit
Graduation year approach^c			
Graduation year dummies (2006 is the base):			
2001	0.074	–	0.102
2002	0.071	–	0.094
2003	0.036	–	0.049
2004	0.057	–	0.070
2005	0.027	0.043	0.020
2007	0.057*	0.051	0.055
2008	-0.010	-0.007	-0.010
2009	0.023	0.037	0.009
2010	0.029	0.014	0.058
2011	0.030	0.028	0.033
2012	0.055**	0.072**	0.036
2013	0.011	0.047	-0.024
2014	0.041	0.093*	-0.003
Observations	2,897	1,333	1,564
Pseudo R ²	0.133	0.114	0.136
National unemployment approach:			
national unemployment at			
graduation	0.009*	0.013	0.011
Observations	2,896	1,333	1,563
Pseudo R ²	0.129	0.101	0.131
National unemployment approach (estimated for subsample of non-movers):			
national unemployment at			
graduation	0.009*	0.015*	0.010
Observations	2,692	1,237	1,455
Pseudo R ²	0.132	0.105	0.132
Local unemployment approach (estimated for subsample of non-movers):			
local unemployment at			
graduation	0.001	0.004	0.002
Observations	2,693	1,237	1,456
Pseudo R ²	0.131	0.100	0.131

Source: own calculations based on School-to-Work Transition Survey.

Notes:

- a. * denotes $p < 0.1$, ** denotes $p < 0.05$, *** denotes $p < 0.01$
- b. unemployment is defined as 1 if an individual is unemployed at interview date (2013 or 2015) and 0 if an individual is employed
- c. Full estimation table is provided in Appendix F
- d. Non-university subsample includes college, vocational school, high school graduates and individuals who did not complete high school

No effect was found for 2008, 2009 or 2010 “crisis” graduation years. This indirectly shows that the initial effect of adverse labor market conditions lasts no longer than three years, since the dependent variable was measured in 2013.

An increase in national unemployment rate at graduation by one percentage point above the average level increases probability of a less mobile higher-educated individual being unemployed by 0.02 percent, although evidence is marginal. At the same time, local macroeconomic environment does not affect a graduate's probability of being unemployed in subsequent years. Moreover, the less educated graduates are not susceptible to macroeconomic situation upon education completion.

The evidence for developed countries suggests that the less educated graduates suffer from bad macroeconomic conditions upon graduation, while the more educated do not (Cockx 2010). The obtained results in my estimation procedure did not confirm these results. Exactly the contrary is true: the more educated university graduates were susceptible to initial macroeconomic conditions in the country, while the less educated were not.

CONCLUSIONS AND POLICY RECOMMENDATIONS

The empirical investigation of the effects of graduating in a bad economy has revealed several important findings. First and foremost, graduating in Ukraine when the labor market is depressed has a detrimental effect on wages and unemployment.

In Ukraine, wages of both university and non-university graduates are affected by local macroeconomic conditions. An increase in local unemployment rate by 1 percentage point decreases wage on the interview day by 2-3 %. This result is higher than that was found for the US, a highly flexible labor market (Oreopoulos et al. 2012), and lower than in Belgium, a highly rigid labor market (Cockx and Ghirelli 2016). This confirms that the labor market in Ukraine is moderately flexible.

University graduates are sensitive to graduating in a specific year. For instance, 2008 and 2010 graduates were earning 19-20% less on the day of interview than the luckier 2006 cohort, controlling for other characteristics. The effects for higher educated individuals last for at least five years, which is also in line with international evidence. For instance, in the US wage effects of recession upon graduation fade after ten years, and in Belgium they last even longer (Oreopoulos et al. 2012, Kahn 2010).

Unemployment prospects of less educated Ukrainian graduates are unaffected by initial macroeconomic shocks. The opposite is true for university graduates. These findings contradict the literature for developed countries. The literature

suggests that unemployment prospects of the more educated are unaffected by initial recessions because they can downgrade when a recession hits (Cockx 2016). This raises a question whether university graduates in Ukraine can be treated as “more educated”.

An interesting finding was that wages are sensitive to the local unemployment rate, while unemployment reacts to the national unemployment rate.

The fact that 2008 graduates earned much less than earlier graduates in 2013 provides a rationale for policy actions. All educational institutions (schools, colleges, and universities) who are interested in good job placement of their graduates are encouraged to monitor the local macroeconomic situation. Extra effort will be needed in turbulent times. Possible policy actions include: carrying out of job fairs; dissemination of information about current vacancies; training on job seeking, writing CVs and behaving at job interviews. These methods, however, are universal and should be used at any point of the business cycle.

The costs of recessions last longer for young graduates than for the overall economy. Unemployment stigma effect is one of the channels through which long-term consequences of graduating in bad times arise. According to the study, long-term unemployment right after graduation increases probability subsequent unemployed by 5 percent. Because of that, the government should step in to help youth find jobs during hard times. It could prevent youth from being unemployed for a long period of time by upskilling the young. Another option is to stimulate labor demand during recessions by creating workplaces in the public sector targeted at youth. The government could also incentivise job creation in the private sector by providing subsidies to employers of youth i.e. giving discounts on social security contributions. The key idea is to prevent skill

depreciation of young men and women, and to allow them to accumulate human capital even at times of crises.

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APPENDIX A

Table 8. Distribution of surveyed individuals by survey wave and oblast

Oblast	Survey wave		Total
	2013	2015	
AR Crimea	120	0	120
Vinnysia	74	68	142
Volyn	49	48	97
Dnipropetrovsk	149	129	278
Donetsk	172	190	362
Zhytomyr	56	59	115
Zakarpattia	49	47	96
Zaporizhzhia	79	62	141
Ivano-Frankivsk	65	53	118
Kyiv oblast	55	70	125
Kyiv city	108	102	210
Kirovohrad	45	43	88
Luhansk	90	98	188
Lviv	91	94	185
Mykolaiv	54	52	106
Odesa	116	98	214
Poltava	54	61	115
Rivne	45	54	99
Sumy	41	44	85
Ternopil	48	47	95
Kharkiv	137	119	256
Kherson	45	48	93
Khmelnyskyi	61	49	110
Cherkasy	29	56	85
Chernivtsi	48	50	98
Chernihiv	45	43	88
Ukraine	1,925	1,784	3,709

Source: own cross-tabulation constructed from School-to-Work Transition Survey

APPENDIX B

Table 9. Summary statistics for graduates by education groups, School-to-work-Transition Survey, 2013 and 2015 waves

Indicator	Women	Men	Total
All education levels			
Observations	1,943	1,820	3,763
Mode year of education completion	2012	2012	2012
Mode age at education completion	22	22	22
Average age on interview day	25.1	25.2	25.1
% employed	57.9	80.5	69.4
% unemployed	8.4	12.1	10.2
% urban	31.5	32.4	31.9
Average years of experience	2.6	3.8	3.1
University or college			
Observations	1,222	898	2,120
Mode year of education completion	2012	2012	2012
Mode age at education completion	22	22	22
Average age on interview day	25.6	25.6	25.6
% employed	65.8	86.8	75.2
% unemployed	7.2	8.1	7.6
% urban	28.2	30.3	29.2
Average years of experience	2.5	3.3	2.9
Vocational school			
Observations	468	643	1,111
Mode year of education completion	2010	2004	2006
Mode age at education completion	19	18	19
Average age on interview day	24.5	24.9	24.8
% employed	51.8	79.5	68.7
% unemployed	8.6	14.1	12.0
% urban	32.2	31.6	31.8
Average years of experience	2.8	4.2	3.7
High school or below			
Observations	253	279	532
Mode year of education completion	2012	2005	2012
Mode age at education completion	17	17	17
Average age on interview day	23.8	24.0	23.9
% employed	30.1	60.4	46.6
% unemployed	13.2	20.5	17.1
% urban	47.6	42.8	45.0
Average years of experience	2.5	4.2	3.4

Source: own cross-tabulation constructed from School-to-Work Transition Survey

Note:

- a. averages were calculated using statistical weights
- b. see appendix C for description of education groups

APPENDIX C

Table 10. Variable description and construction

Variable	Variable description
hourly wage	Self-reported cash earnings divided by corresponding working in reported period. Inflation adjusted to year 2013 using the Consumer Price Index. Outliers less than 2 UAH/hour and more than 200 UAH/hour were dropped.
unemployed	Equals 1 if a person is unemployed on interview day, 0 if a person is employed, and missing if a person is out of the labor force.
graduation year	Year of graduation
national unemployment at graduation	Quarterly unemployment rate in Ukraine over 2001-2015. Values were duplicated for 2001 and 2002 as only annual observations were available.
local unemployment at graduation	Annual unemployment rate in Ukraine blasts and Kyiv over 2001-2015.
education	<p>Four education groups with corresponding categories in the questionnaire:</p> <p>a. High school or below:</p> <ul style="list-style-type: none"> • None • Elementary education (completed the 4th grade of the secondary school) • Basic secondary education (completed the 9th grade of the secondary school) • Secondary school (completed the 11th grade of the secondary school) <p>b. Vocational school:</p> <ul style="list-style-type: none"> • Vocational school (on the base of the 9th grade) • Vocational school (on the base of the 11th grade) <p>c. College:</p> <ul style="list-style-type: none"> • Incomplete higher education (junior specialist – diploma of institute of higher education I-II levels of accreditation) <p>d. University:</p> <ul style="list-style-type: none"> • Basic higher education (bachelor's degree) • Complete higher education (specialist's degree, master's degree – – diploma of institute of higher education III-IV levels of accreditation) • Post-graduate education (following higher education, advanced studies' courses) • PhD studentship, post-doctoral level
female	Equals 1 for women and 0 for men
experience	Working experience, in years
experience ²	Working experience, in years, squared
LTU	Denotes long-term unemployment right after graduation, equals 1 for initial unemployment longer than 6 months and 0 otherwise
firm size	Dummy variables for number of employees at firm with the following intervals: less than 5, 5 to 9, 10 to 19, 20 to 49, 50 to 499, and 500 or more
private sector	Equals 1 for individuals working in a private firms, farm of household and 0 otherwise
industry	21 industry dummies. 20 are according to 1-letter ISIC Rev. 4. The 21 st denotes non-reported industry.
occupation prestige index	1-digit ISCO-08 groups (2013 wave) and 2-digit ISCO-08 groups (2015 wave), transformed into ISEI-08 index (International Socio-Economic Index of occupational status), developed by Ganzeboom, 2010. Greater values are attached to more prestigious occupations. In the dataset, the index ranges from 15 (Agricultural, forestry and fishery labourers) to 70 (health professionals).

Table 10 – continued

Variable	Variable description
rural	Equals 1 if individual lives in rural area and 0 otherwise
economic region	9 economic regions of Ukraine, as proposed by Maslyak and Shishchenko, 1996, plus Kyiv as a separate group (see Appendix D), with corresponding oblasts: a. Black sea (AR Crimea, Mykolaiv, Odesa, Kherson) b. Central (Kirovohrad, Cherkasy) c. Capital (Zhytomyr, Kyiv oblast) d. Kyiv city e. Prydniprovsky (Dnipropetrovsk, Zaporizhzhia) f. Donetsk (Luhansk, Donetsk) g. Podil (Vinnytsia, Ternopil, Khmelnytskyi) h. Carpathians (Zakarpattia, Lviv, Ivano-Frankivsk, Chernivtsi) i. Northwest (Volyn, Rivne) j. Northeast (Poltava, Sumy, Kharkiv)
wave ₂₀₁₅	Equals 1 for 2015 survey wave and 0 for 2013 survey wave
ATO proximity	Equals 1 if two conditions hold: individual lives in Donetsk or Luhansk oblast, and the survey took place in 2015. Equals 0 otherwise.

Source: constructed based on School-to-Work Transition Survey

APPENDIX D

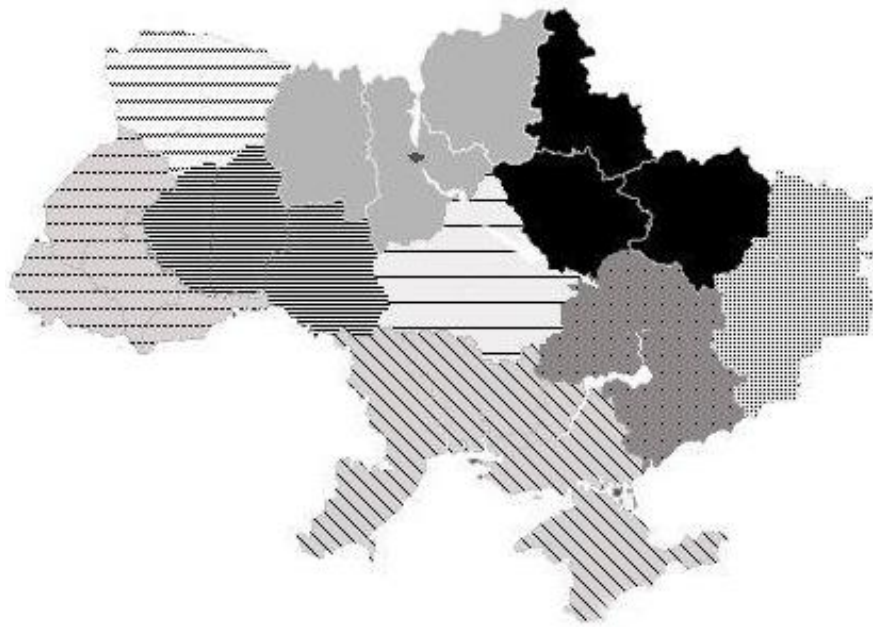


Figure 7. Map of economic regions of Ukraine
Source: Created using Bing Maps add-in in Excel 2016

APPENDIX E

Table 11. The effects of graduating in a specific year on the logarithm of wages at interview date (2013 or 2015)

Subsample:	All education levels		University	Non-university ^c	Non-university ^c
	IV ^b	OLS	OLS	IV ^b	OLS
Graduation year dummies (2006 is the base):					
2001	0.052 (0.173)	-0.024 (0.156)	–	-0.058 (0.162)	-0.067 (0.163)
2002	0.020 (0.136)	-0.043 (0.106)	–	-0.055 (0.118)	-0.063 (0.115)
2003	0.061 (0.135)	-0.021 (0.100)	–	-0.014 (0.112)	-0.015 (0.108)
2004	0.173 (0.107)	0.108 (0.086)	–	0.115 (0.092)	0.138 (0.093)
2005	-0.025 (0.085)	-0.072 (0.077)	0.122 (0.157)	-0.097 (0.090)	-0.111 (0.090)
2007	-0.020 (0.071)	-0.018 (0.067)	-0.086 (0.109)	0.017 (0.087)	0.007 (0.085)
2008	-0.055 (0.071)	-0.027 (0.067)	-0.189* (0.107)	0.055 (0.089)	0.070 (0.088)
2009	0.020 (0.075)	0.057 (0.067)	-0.052 (0.104)	0.095 (0.097)	0.112 (0.091)
2010	-0.082 (0.075)	-0.034 (0.067)	-0.198* (0.103)	0.108 (0.096)	0.118 (0.091)
2011	-0.093 (0.078)	-0.024 (0.069)	-0.094 (0.105)	-0.002 (0.098)	0.017 (0.097)
2012	-0.006 (0.077)	0.050 (0.067)	-0.031 (0.103)	0.048 (0.095)	0.085 (0.093)
2013	-0.170* (0.103)	-0.081 (0.086)	-0.184 (0.124)	-0.056 (0.136)	-0.033 (0.133)
2014	-0.192* (0.100)	-0.114 (0.092)	-0.318** (0.138)	0.012 (0.129)	0.065 (0.130)
Education dummies (“high school or below” is the base):					
Vocational school	0.034 (0.450)	0.056 (0.055)	–	0.204 (0.349)	0.047 (0.056)
College	-0.121 (0.454)	0.059 (0.063)	–	0.185 (0.353)	0.039 (0.064)
University	0.361 (0.424)	0.168*** (0.060)	–	–	–
experience	0.013 (0.016)	0.010 (0.015)	0.002 (0.023)	0.015 (0.021)	0.010 (0.020)
experience ²	-0.001 (0.002)	-0.001 (0.002)	-0.000 (0.003)	-0.000 (0.002)	-0.000 (0.002)
female	-0.163*** (0.032)	-0.164*** (0.030)	-0.131*** (0.044)	-0.199*** (0.044)	-0.206*** (0.044)
rural	-0.015 (0.041)	-0.048 (0.034)	-0.073 (0.052)	-0.031 (0.045)	-0.041 (0.045)

Table 11– continued

Subsample:	All education levels		University	Non-university ^c	Non-university ^c
	IV ^b	OLS	OLS	IV ^b	OLS
Firm size dummies (“less than 5” is the base):					
5-9 employees	0.024 (0.074)	0.033 (0.059)	0.144 (0.101)	0.008 (0.084)	0.008 (0.075)
10-19 employees	0.066 (0.071)	0.078 (0.056)	0.220** (0.095)	0.000 (0.086)	0.026 (0.071)
20-49 employees	0.053 (0.063)	0.091* (0.053)	0.268*** (0.089)	-0.035 (0.073)	-0.010 (0.069)
50-499 employees	0.066 (0.068)	0.084 (0.052)	0.274*** (0.089)	-0.050 (0.080)	-0.027 (0.067)
500+ employees	0.202*** (0.070)	0.218*** (0.063)	0.376*** (0.105)	0.109 (0.083)	0.130 (0.081)
private sector	0.136*** (0.040)	0.125*** (0.033)	0.174*** (0.049)	0.107* (0.058)	0.087* (0.049)
occupation prestige index	0.000 (0.002)	0.003** (0.001)	0.001 (0.002)	0.004* (0.002)	0.004** (0.002)
Economic region dummies (“Black sea” is the base):					
Central	-0.104 (0.073)	-0.117* (0.066)	-0.139 (0.112)	-0.090 (0.089)	-0.089 (0.082)
Capital	0.079 (0.081)	0.101 (0.070)	0.031 (0.099)	0.114 (0.113)	0.135 (0.108)
Kyiv city	0.362*** (0.076)	0.422*** (0.069)	0.384*** (0.099)	0.349*** (0.105)	0.376*** (0.103)
Prydniprovsky	0.017 (0.064)	0.017 (0.056)	-0.013 (0.092)	0.045 (0.078)	0.045 (0.071)
Donetsk	0.133* (0.074)	0.127** (0.064)	0.058 (0.102)	0.147 (0.096)	0.155* (0.084)
Podil	-0.083 (0.068)	-0.100* (0.059)	-0.121 (0.089)	-0.095 (0.093)	-0.111 (0.081)
Carpathians	-0.146** (0.067)	-0.145*** (0.056)	-0.187** (0.087)	-0.112 (0.089)	-0.096 (0.076)
Northwest	-0.097 (0.079)	-0.091 (0.072)	-0.156 (0.106)	-0.033 (0.111)	-0.015 (0.102)
Northeast	0.026 (0.056)	0.031 (0.055)	-0.069 (0.087)	0.128* (0.073)	0.123* (0.073)
ATO proximity	-0.155* (0.088)	-0.216*** (0.079)	-0.229* (0.129)	-0.159 (0.103)	-0.168* (0.102)
wave 2015	0.054 (0.059)	0.050 (0.059)	0.217** (0.101)	-0.036 (0.072)	-0.043 (0.074)
ISIC industry dummies	-3.742 (6.738)	-3.424 (6.684)	-22.006* (11.364)	6.177 (8.182)	7.129 (8.363)
Constant	(6.713)	(6.683)	(11.301)	(8.184)	(8.399)
Observations	1,645	1,693	810	855	883
R-squared	0.124	0.170	0.187	0.172	0.190
Adj. R-squared	0.0915	0.140	0.134	0.113	0.134

Source: own calculations based on School-to-Work Transition Survey.

Notes:

- * denotes $p < 0.1$, ** denotes $p < 0.05$, *** denotes $p < 0.01$.
- In IV specification, education level is instrumented with mother’s and father’s education
- Non-university subsample includes college, vocational school, high school graduates and individuals who did not complete high school.

APPENDIX F

Table 12. The effects of graduating in a specific year on the probability of unemployment at interview date (2013 or 2015), average partial effects

Subsample:	All education levels	University	Non-university ^c
Method:	Probit	Probit	Probit
Graduation year dummies (2006 is the base):			
2001	0.074 (0.070)	–	0.102 (0.087)
2002	0.071 (0.052)	–	0.094 (0.065)
2003	0.036 (0.044)	–	0.049 (0.057)
2004	0.057 (0.036)	–	0.070 (0.046)
2005	0.027 (0.033)	0.043 (0.054)	0.020 (0.045)
2007	0.057* (0.030)	0.051 (0.039)	0.055 (0.043)
2008	-0.010 (0.027)	-0.007 (0.031)	-0.010 (0.041)
2009	0.023 (0.028)	0.037 (0.034)	0.009 (0.042)
2010	0.029 (0.028)	0.014 (0.032)	0.058 (0.045)
2011	0.030 (0.028)	0.028 (0.032)	0.033 (0.043)
2012	0.055** (0.028)	0.072** (0.034)	0.036 (0.041)
2013	0.011 (0.033)	0.047 (0.041)	-0.024 (0.049)
2014	0.041 (0.036)	0.093* (0.052)	-0.003 (0.050)
contemporaneous oblast unemployment	-0.006 (0.006)	-0.008 (0.007)	0.002 (0.009)
Education dummies (“high school or below” is the base):			
Vocational school	-0.139*** (0.029)	–	-0.141*** (0.028)
College	-0.159*** (0.031)	–	-0.160*** (0.031)
University	-0.204*** (0.028)	–	–
experience	-0.035*** (0.007)	-0.029*** (0.009)	-0.044*** (0.010)
experience ²	0.002** (0.001)	0.002** (0.001)	0.002 (0.001)
LTU	0.054*** (0.019)	0.057** (0.025)	0.053* (0.027)

Table 12 – continued

Subsample:	All education levels	University	Non-university^c
Method:	Probit	Probit	Probit
female	-0.007 (0.012)	0.016 (0.015)	-0.029 (0.019)
rural	0.022* (0.013)	0.019 (0.018)	0.030 (0.020)
Economic region dummies (“Black sea” is the base):			
Central	-0.109*** (0.031)	-0.081 (0.053)	-0.144*** (0.041)
Capital	-0.077** (0.031)	-0.080** (0.041)	-0.100** (0.046)
Kyiv city	-0.095*** (0.032)	-0.124*** (0.036)	-0.054 (0.059)
Prydniprovsky	-0.085*** (0.026)	-0.093** (0.038)	-0.084** (0.038)
Donetsk	-0.096*** (0.030)	-0.099** (0.044)	-0.105** (0.043)
Podil	-0.057* (0.033)	-0.088** (0.044)	-0.043 (0.049)
Carpathians	-0.031 (0.028)	-0.060 (0.040)	-0.012 (0.040)
Northwest	-0.106*** (0.032)	-0.144*** (0.039)	-0.081 (0.050)
Northeast	-0.134*** (0.024)	-0.119*** (0.037)	-0.157*** (0.034)
ATO proximity	0.091* (0.047)	0.034 (0.066)	0.096 (0.068)
wave 2015	0.012 (0.010)	0.000 (0.013)	0.013 (0.015)
ISIC industry dummies	+	+	+
Observations	2,897	1,333	1,564
Pseudo-R2	0.133	0.114	0.136

Source: own calculations based on School-to-Work Transition Survey.

Notes:

- unemployment is defined as 1 if an individual is unemployed at interview date (2013 or 2015) and 0 if an individual is employed
- * denotes $p < 0.1$, ** denotes $p < 0.05$, *** denotes $p < 0.01$.
- Non-university subsample includes college, vocational school, high school graduates and individuals who did not complete high school