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Analysis of youth underemployment in Macedonia, Montenegro and Serbia

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Abstract

The vulnerability of the youth labour force in Western Balkan countries is a main policy concern since their unemployment rates lie far above the EU average. Thus, in this paper, we investigate the effect of youth underemployment on wages in three countries of the Western Balkans: Macedonia, Serbia and Montenegro. Our empirical analysis builds on a recent ILO school-to-work transition survey and controls for the sample selection bias and the endogeneity between underemployment and real hourly wages. The identification of the causal effect relies on a traditional and a novel instrumental approach. While in the former, the main instrument is a regional unemployment rate indicator, in the latter we exploit underemployment conditional heteroscedasticity to generate valid instruments. Our findings verify the negative relationship between underemployment where Macedonia exhibits the strongest effect, followed by Montenegro and Serbia. These findings support the need for more aggressive youth employment policies, composed of internship and traineeship programs, qualification, re-training and adequate profiling of the youth.

Keywords: youth, underemployment, wages, Western Balkan countries

JEL codes: J64, J30

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1. Introduction

When a worker underuses his/her skills, training and experience, he/she is said to be underemployed (Bonnal, 2009). According to the literature, underemployment may be defined from two different strands: 1) According to the International Labour Organization (ILO), the underemployed labor force is comprised by those working less than 35 hours per week but wishing to work more, and 2) From a broader definition or multidimensional approach (Feldman, 1996; McKee-Ryan and Harvey, 2011): working less than 35 hours per week but wishing to work more (ILO indicator); overqualification for a given job (McKee-Ryan and Harvey, 2011), insecurity on a job (Clark et al. 2010; Prause and Dooley, 2011); underpayment i.e. salary is below the reservation wage (Verhaest et al. 2015); and lack of formal working conditions i.e. the person is with temporary or no written contract (Ruiz-Quintanilla and Claes, 1996) or is in involuntary part-time or contingent work (Bashshur et al. 2011). Studies analyzing the relationship between underemployment and wages have found that wage penalties exist for workers with mismatched skills, occupations and education (Korpi & Tahlin, 2009; Nordin et al. 2010; Pecoraro, 2014; Kleibrink, 2016). Similarly, there is evidence that underemployment - measured as underutilization of working hours - may negatively affect subjective wellbeing (Angrave & Charlwood, 2015).

Especially prone to underemployment are, expectedly, youth. They are less experienced in job search, less powerful in wage negotiations, less financially secure and more exposed to psychological distress (Reynolds, 2012), hence more prone to accept underpaid jobs that do not match their skills leading to low job satisfaction. Factors beyond lack of labor market experience may exacerbate underemployment, such as educational attainment, gender, marital status, as well job-specific characteristics, like sector of employment or occupation. In particular, youth females may be even further prone to underemployment, due to their increased inactivity on the labor market, driven by the factors as child- and elderly care, household chores, conservative cultural beliefs and so on (Mojsoska-Blazevski et al. 2017).

Underemployment consequences are further aggravated in Western Balkan countries – Macedonia, Montenegro and Serbia - where labor markets are characterized by high unemployment rates and slow job creation. These countries face large and persistent overall unemployment rates in between 18-25% and, in particular, youth unemployment rates being twice high. Compared to the EU-28 average, these rates

are up to double, but they also have the feature of structural and not cyclical unemployment. On top, the share of youth who are not in employment, education or training (NEET) remains large – between 17% and 25%. The youth underemployment rates resonate this labor-market picture. According to the ILO definition, the youth underemployment rate in these countries ranges from 12.5% in Macedonia to 19.4% in Montenegro, whereas according to the broader definition, the data are further alarming: Between half and two thirds of employed youth in the analysed countries possess at least two out of five underemployment conditions.

Despite such general context, the issue of youth underemployment has not been studied nor tackled by policymakers. Prime reason may be sought in the unavailability of statistical information related to underemployment. Only ILO published an underemployment rate for the overall working-age population. Recently, though, with the collection of the School-to-Work-Transition (SWT) Surveys of the ILO, it has been possible to understand the magnitude of youth underemployment, initiate policy oriented research and hence boost policies that may tackle this issue.

The objective of this paper is to estimate the impact of underemployment on wages in three Western Balkan countries: Macedonia, Serbia and Montenegro. We also provide some insights into underemployment determinants. Defined this way, the paper brings a couple of novelties in the current research. First, it is among the few studies in the literature that sheds light on the issue of youth underemployment and certainly the first in the region. Second, the study provides extensive discussion and treatment of the issue of endogeneity of underemployment with respect to real hourly wages. Third, the study has pronounced policy implications, as it will open an issue that is neglected in the region while being key in the public debate related to youth unemployment and emigration. Finally, the study is based on fairly new datasets, the School-to-work Transition Surveys of three countries, which provide rich information for thorough inspection of the youth situation in the Western Balkan region.

The paper is organized as follows. Section 1 reviews the existing literature and provides theoretical foundations of underemployment. Section 2 gives a descriptive analysis of the labour markets and underemployment in all three countries. Section 3 describes the used methodology. Section 4 analyzes and discusses the results. The last section concludes and provides some policy advice.

2. Theoretical foundations and empirical considerations

2.1. Underemployment and its determinants

The issues we explore here do have eclectic theoretical roots. The original theoretical conceptualization of underemployment has been the Labor Utilization Framework (Clogg, 1979, Sullivan, 1978). According to it, underemployment includes sub-employment, unemployment and economically inadequate employment, where the latter includes low-wage and low-hour employment, but also other subcategories like intermittent unemployment (adequate employment with recent history of unemployment, reflecting job insecurity), over-qualification, and the like. As such, the underemployment, actually, appears on a continuum between unemployment and having a decent job (Dooley and Prause, 2004). The Labor Utilization Framework offers theoretical grounds for analysing the gradients of underemployment on such employment continuum (Grzywacz and Dooley, 2003). As argued before, the definition of underemployment in the paper is consistent with that used in economics: unused skills, education, and time; inadequate pay; and insecure workplace; all of which indicate an inefficient labour market.

Two main theories underlie the factors explaining underemployment. Firstly, the Human Capital Theory of Becker (1962) establishes that education and skills, as human-capital characteristics, may explain certain labor-market outcomes, including underemployment. Worker's education is key in assessing the extent to which there is a mismatch between acquired skills and the skills required by particular jobs (Hersch, 1991); such mismatch may be a source of underemployment. However, Allen and van der Velden (2001) argue that experience – hence, skills learnt on the job – may be more important in predicting underemployment. The empirical evidence on the determinants of underemployment primarily documents a set of personal characteristics to be related with underemployment. Ruiz-Quintanilla and Claes (1996) found that gender plays a significant role in underemployment where females have a statistically higher significant level of probability to be underemployed during their early career. Also, education level is found to be significant, where primary school individuals have about 5 p.p. higher probability to be underemployed during their early career. Similar, Bonnal et al. (2009) found that higher education decreases the chance for being underemployed for 12.3 p.p.

Secondly, the Theory of the 'tied mover/tied stayer' (Kain, 1962) may explain portions of underemployment, as some population cohorts, like females, may be prevented to commute due to family or other ties. This is important when the local labor market does not provide sufficient opportunities for better-skilled workers, hence forcing them to be underemployed if they refuse to commute. However, on the other hand, youth workers are considered more willing to commute, hence to overcome such spatial restrictions and mitigate underemployment. Aside the lower likelihood to commute in order to avoid underemployment, women may be further prone to underemployment due to increased likelihood for labor-market non-participation. This is rooted in the home-economy literature (Becker, 1991), according to which household and child-raising tasks of females encourage labor-market deactivation, especially in patriarchal societies. The inability to fully participate on the labor market may make some females to consider themselves underemployed.

Although underemployment rates varied across age, education, race, and ethnicity, there is a tendency that underemployment is dominant among the most vulnerable or disenfranchised groups such as young workers, old workers, high school dropouts, workers without postsecondary college degrees and in some service and blue-collar professions (Sum and Khatiwada, 2010). Especially prone to underemployment are, expectedly, youth. They are less experienced in job search, less powerful in wage negotiations, less financially secure and more exposed to psychological distress (Reynolds, 2012), hence more prone to accept jobs that do not match their skills and earning potential, hence driving low job satisfaction. Women, minorities, the young, the old and those with low educational attainment are susceptible and vulnerable to underemployment (Jensen and Slack, 2003).

The empirical evidence on the determinants of underemployment primarily documents a set of personal characteristics to be related with underemployment. Some prominent studies include: Gong and Namara (2011); Wilkins (2006); Chan and Steven (2004); Koeber and Wright (2001); Ruiz-Quintanilla and Claes (1996); Wooden (1993); Leppel and Clain (1988). Other papers consider the local labor-market characteristics as important for underemployment (Bonnal et al. 2009; Wilkins, 2006; Prause and Dooley, 2011 offer a review). Wilkins (2006) found that intermediate and elementary clerical jobs, trade jobs, intermediate production and labourer jobs increase the probability for underemployment of employed males from 4 to 10 p.p. and from 4 to 16 p.p. for employed females. He also found that the probability of

being underemployed is higher for persons working in less skilled occupations (sales and personal service workers, plant and machine operators, labourers and related workers) and for those working in the recreation and personal services and construction industries. Gorg and Strobl (2001) found that underemployed are less likely to work in large firms thus confirming the fact that smaller firms tend to be part of the informal sector. In relation to the visibly underemployed and the voluntary part-timers, the characteristics of the underemployed show that they tend to be less educated, female and likely to live in an urban area. The sector is found to be significant for the underemployment in the literature. Workers in forestry/fishing and agriculture are 2 times more likely to be underemployed than those in the service industry (Jensen and Slack, 2004). On the other hand, Nord (1989) found that service sectors tend to lower the labour force participation rate and increase underemployment. The reason is that secondary workers are pushed into the labour market in an effort to support their households and not due to higher availability of service jobs. In turn, the growth of underemployment is induced because of the growing concentration of low-paying service jobs (Nord, 1989).

2.2. Underemployment and wages

While the empirical findings on the relationship and causation between underemployment and wellbeing indicators such as psychological, subjective and physical wellbeing have been also abundant (Jensen and Slack, 2003; Grzywacz and Dooley, 2003; Feldman et al. 2002; Angrave and Charlwood, 2015; Prause and Dooley, 2011), there has been scarce research on the effects of underemployment on financial welfare such as wages.

Feldman et al. (2002) note that underemployment tends to be related with loss of wages. Those who find themselves underemployed may experience an initial wage penalty that would persist overtime, which would lower their earning potential throughout entire careers (Mckee-Ryan and Harvey, 2011). Korpi and Tahlin (2009) analyze the impact of the educational mismatch on wages. The authors find that overeducated people, on average, receive wage penalty early on from which they do not recover. In terms of youth, Pecoraro (2014) notes that graduates who are overeducated and mismatched in skills are the most pay penalized. Additionally, this notion is still valid when unobserved ability is accounted for while it is not significant for

overeducated graduates but matched in skills. This means that to a certain extent overeducation reflects a lack of unobserved attributes. Kleibrink (2016) rejects the notion that mismatched workers compensate for unobserved productivity differences by arguing that wage differentials are mostly explained by a poor matching in the labor market. The author argues that while negative effects on wages have become a stylized fact, structural problems between the educational system and labor markets might be the cause of such wage differences.

Nordin et al. (2010) examine the consequences of education-occupation mismatches for men and women. The authors find that income penalty on highly educated individuals is large for both men and women. When comparing men and women with the same educational background (field of education, years of schooling and having/not having a degree), the mismatched men and women suffer 32 and 28 percent income penalty, respectively. The authors argue income penalty potentially decreases with work experience especially for men, therefore suggesting that working experience serves as substitute that closes the gap by helping the individual to transit from part-time or temporary employment to full-time and permanent one. Moreover, full-time, full-year higher-educated men and women receive significant and substantial income penalty for being mismatched.

Annex 1 provides a thorough review of the existing studies on the topic and their findings.

3. Stylized facts

3.1. Underemployment incidence in Macedonia, Serbia and Montenegro

The labor markets of Macedonia, Montenegro and Serbia face large and persistent overall and, particularly, youth unemployment rates (Table 1). Compared to the EU-28 average, these rates are up to double, but they also have the feature of structural and not cyclical unemployment. On top, the share of youth who are not in employment, education or training (NEET) remains large.

Table 1 – Labor market indicators for youth (15-24)

	Macedonia	Montenegro	Serbia	EU-28
Overall unemployment rate	25%	18%	18%	10%
Youth unemployment rate	47%	38%	43%	25%
Youth NEET (share)	25%	17%	20%	16%*

*Source: ILO. Data for 2015, except for the EU, 2014. * refers to age group 15-34.*

Table 2 suggests that underemployment is not a hot issue for the overall working-age population, at least not in Macedonia and Montenegro, and not compared to the EU-28 average. However, when these rates are calculated for youth, a source of concern emerges. According to the ILO definition, the youth underemployment rates appear twice to eight times higher than the one of the overall working-age population, providing initial support to the claim that youth are more prone to underemployment. In addition, youth in the three Western Balkan countries are double more prone to underemployment than those in the EU-28. Moreover, the narrow ILO definition actually relegates the issue of youth underemployment: it considers a person to be underemployed only when he/she works less than 35 hours a week but wants to work more. We need to consider that the negotiation power at the onset of the career is very low; for major part of the jobs, the conditions of the workplace are given/prescribed by the employer. The incidence of jobs with less than 40 hours per week is very limited if at all existent in the investigated countries. Hence, the underemployment indicator according to the narrow definition would hide important information on the severity of the problem.

Table 2 – Underemployment statistics

Shares in total employment	Macedonia	Montenegro	Serbia	EU-28
Underemployment (15-64)	2%	1.8%	9%	4.1%
Youth underemployment (15-29) – ILO definition	12.5%	14.3%	19.4%	7.6%
Female youth underemployment (15-29) – ILO definition	13.9%	15.2%	24.9%	9.3%
Youth underemployment (15-29) – broader definition	57.1%	68.3%	60.9%	NA

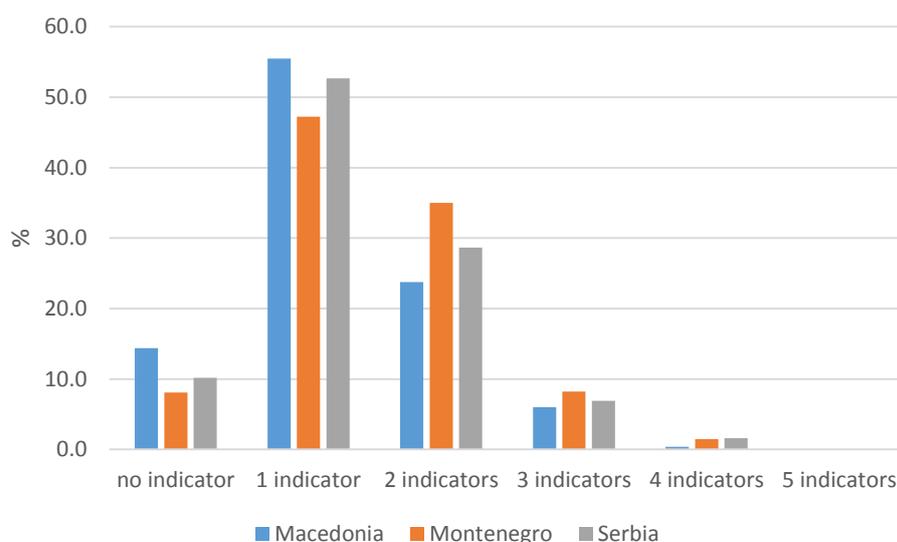
Source: ILO (first indicator); SWTS (the other three indicators); Eurostat (EU-28)

Note: Figures represent shares in total employment. The broader definition covers youth who work less than 35 hours, but want to work more (ILO indicator); the person is overqualified, the person expressed insecurity on the job; persons' salary is below the reservation wage; and the person is with temporary or no written contract.

Indeed, the issue escalates when the broader definition of youth underemployment is considered. In the broader definition, we operate with five indicators, along the lines of Reynolds (2012): the person works less than 35 hours per week but wants to work more (ILO indicator); the person is overqualified, the person expressed insecurity on the job; persons' salary is below the reservation wage; and the person is with temporary or no written contract. One would argue that the additional four indicators on top of the ILO narrow indicator are more prevalent and persistent in the Western Balkans and a source of concern for youth. The broader definition enables incorporating the relation between labor productivity and underemployment: people become underemployed as they learn new skills (Bollinger et al. 2003). In addition, it reveals the intensity of underemployment. For the sake of illustration, we arbitrary take as underemployed those who have at least two of the five broader conditions prevailing. The last row in Table 2 gives their share. The figures are striking: between half and two thirds of employed youth in the analysed countries possess at least two out of five underemployment conditions.

Figure 1 presents underemployment intensity in more details. It corroborates our previous observations: only 8% to 14.3% of youth in the three countries have not faced any form of underemployment. Then, half a more faced one underemployment condition. On the other end of the distribution, none faced all underemployment conditions.

Figure 1: Underemployment intensity by country

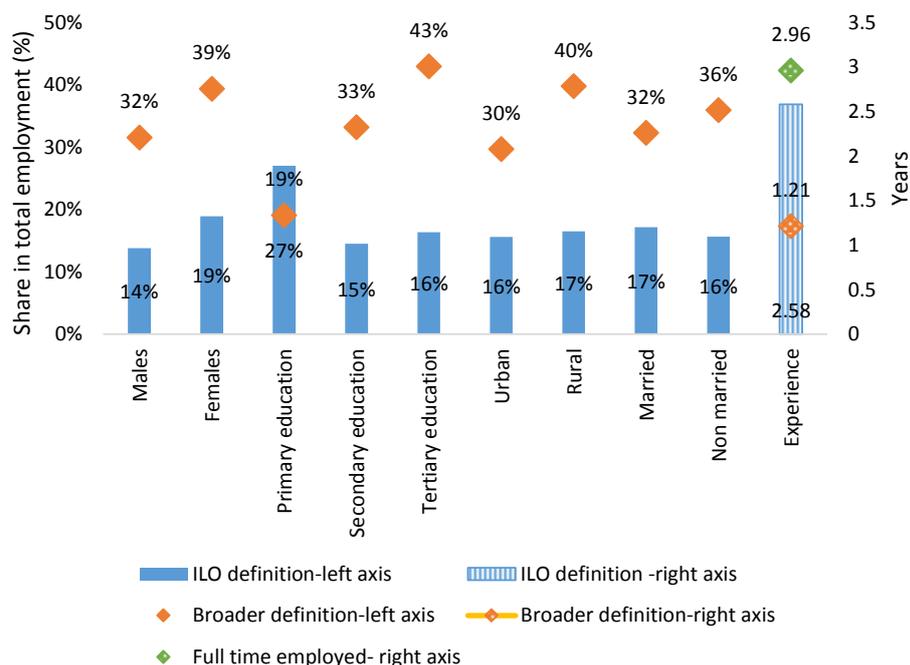


Source: ILO School-to-Work-Transition (SWT) Surveys, 2014-2015

3.2. Underemployment and personal and labor-market characteristics

Figure 2 presents the share of youth underemployed in total youth employed for the key individual and labor-market characteristics: gender, education, geographic location and marital status. Figures suggest that underemployment is higher among females; on average 19% (39% by broader definition) of females are underemployed compared to 14 (32%) of males. Wider differences exist regarding the education of youth. 27% of youth with primary education work less than 35 hours and want to work more, compared to about 15% of youth with secondary and tertiary education. However, almost every second youth with tertiary education is underemployed according to the broader definition, which is mainly driven by the self-perception of over-qualification and the limited duration of the contract. Rural youth are more likely to be underemployed and there are no significant differences between married and non-married individuals. As expected, full-time employed youth are more experienced than those underemployed who work 35 hours but want to work more, and more than double experienced compared to underemployed according to the broader definition.

Figure 2: Underemployment of youth by gender, education, location and marital status*



Source: ILO School-to-Work-Transition (SWT) Surveys, 2014-2015

*Note: Experience – right axis, all other characteristics left axis

Table 3 presents an overview of youth underemployment by sector and occupation. According to the ILO definition, the average underemployment in the three countries is the highest in the sectors of agriculture (38.1%), intellectual services (26.3%) and other service activities and activities of households as employers (26.8%). According to the broader definition, highest underemployment is registered in the services sector: on average, 41.8% of the employees in this sector are considered underemployed. Services sector is composed of trade, transportation, information and communication and finance. While intellectual services are composed of: professional, scientific, education, arts and recreation services. As expected, only 3% of employed in the public sector are underemployed. In the agricultural sector, every third employed person works 35 hours and wants to work more, and the same fraction reported they felt overqualified for the job. In the services sector, the situation is opposite: 85% and 87% of employed in services and intellectual services, respectively, hold limited-duration contract. Every third employee in the services sector reported that he/she was overqualified for the job and every fourth in the intellectual services works 35 hours and wants to work more.

The general conclusions remain when underemployed is observed country by country: underemployment is the highest in the agricultural and services sectors. However, there are notable differences among countries when the broader definition is taken into consideration. In Macedonia, more than 39.5% of the employed in the manufacturing sector and 35.2% in the services sector are underemployed, making these two sectors with the highest underemployment. In Serbia, underemployment is highest in the services sector, in general, including other service activities and activities of households as employers. Between 36% and 44% of employed youth in the services sector are underemployed. In Montenegro, the underemployment is the highest among all three countries. With exclusion of the manufacturing sector, more than 40% of employed in all other sectors are considered underemployed. The underemployment is the highest in the construction sector, where 65% of employed are underemployed according to the broader definition. Interestingly though, only 4% of employed in the same sector are underemployed according to the ILO definition. This indicates that despite the desire to work for more than 35 hours, the broader indicators that explain the underemployment prevail.

Table 3: Job characteristics (sector and occupation) and underemployment

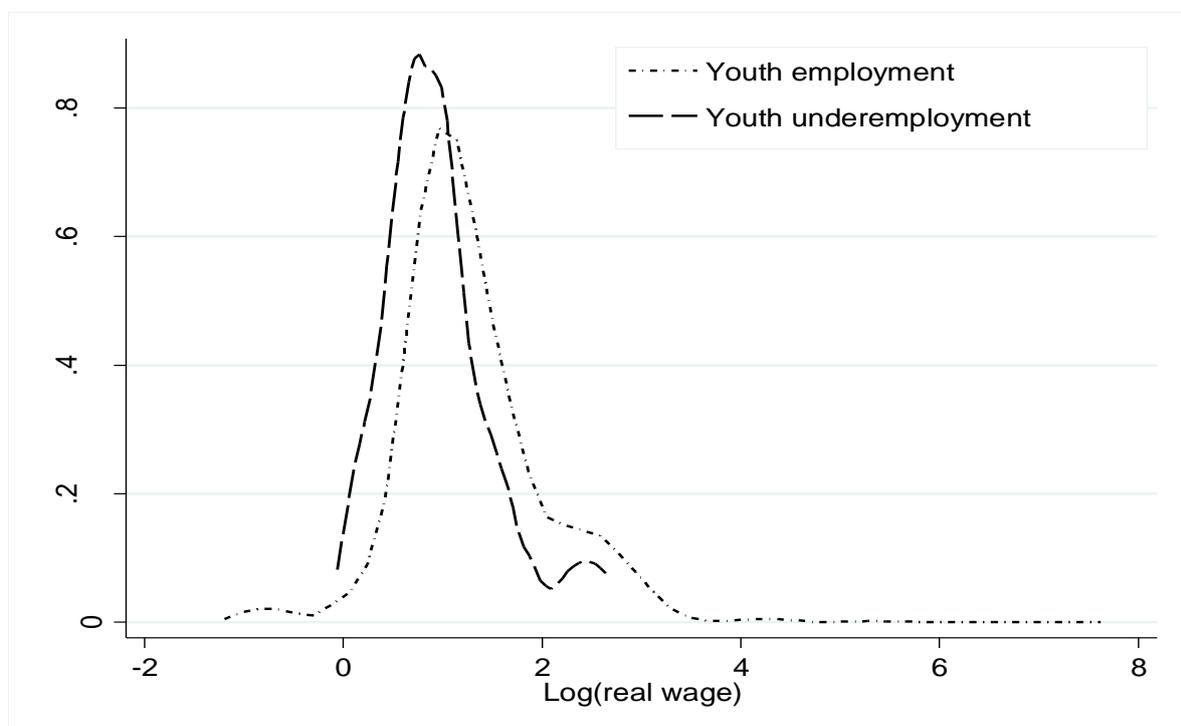
Share of total employment	All three countries		Macedonia		Montenegro		Serbia	
	ILO Definition	Broader Definition	ILO Definition	Broader Definition	ILO Definition	Broader Definition	ILO Definition	Broader Definition
Agriculture	38.10	21.58	30.93	25.37	omitted	omitted	41.74	19.66
Manufacturing	8.90	34.79	7.00	39.52	9.43	26.41	9.88	32.35
Construction	10.93	32.60	12.95	29.57	4.35	65.22	9.47	34.75
Services	12.53	41.80	6.53	35.26	10.28	43.30	14.76	44.24
Intellectual services	26.28	36.68	21.33	27.10	34.14	57.37	28.79	41.54
Public	3.03	15.49		10.58	2.08	45.83	4.66	18.03
Other service activities	26.79	33.52	9.84	17.18	29.16	41.67	29.63	36.23
Occupation								
Managers	9.72	18.61	omitted	omitted	16.67	omitted	11.60	22.26
Professionals	17.23	31.54	18.23	29.59	20.63	31.38	18.63	32.79
Workers w/o agricultural workers	11.96	39.57	12.21	43.80	12.92	46.44	12.49	41.23
Skilled agricultural, forestry and fishery workers	43.21	16.45	48.67	21.14	omitted	omitted	42.32	15.67
Elementary occupations	25.52	39.35	23.54	24.78	33.33	42.86	26.85	49.26

Source: ILO School-to-Work-Transition (SWT) Surveys, 2014/2015

Regarding the distribution of underemployment by occupation, there are no significant differences among the three countries. Underemployment is the highest in the elementary occupations agricultural workers and other workers (including clerical support services, sales, trade and craft workers), as expected. Almost every second worker in the agriculture and other services is underemployed in all three countries. Similar like the sectoral patterns, the underemployment of agricultural, forestry and fishery workers defined by ILO definition is higher than that of the broader definition. This indicates that in this occupation and sector, underemployment is mainly defined by the basic indicator of working less than 35 hours and willing to work more. As expected, employed as managers and professionals have the lowest underemployment incidence.

Figure 3 presents a kernel density function of the wages per hour of youth in the three countries, by their underemployment status. It clearly suggests that wages of the underemployed lay to the left of the wages of those non-underemployed almost along the entire wage distribution, potentially implying that underemployed face systematically lower wages than those in decent employment.

Figure 3: Wage distribution by underemployment status



Source: ILO School-to-Work-Transition (SWT) Surveys, 2014-2015

4. Data and Empirical methodology

4.1. Data

We use ILO's School to Work Transition Surveys (SWTS) gathered for about 30 countries worldwide, out of which for the three ex-Yugoslav transition economies of Macedonia, Montenegro and Serbia (being the only of the Western Balkan region represented in this initiative). Youth 15-29 are surveyed. The survey gathers data on various aspects of youth and their path to employment, including: demographic variables, education, household conditions, employment, inactivity status, perceptions on various aspects during the transition from school to work and so on. These data have been gathered for two years for each country and are freely available. We are utilizing the newer wave of the survey: 2014 for Macedonia and 2015 for Montenegro and Serbia. We drop all youth individuals who are still in education, to arrive at the sample we work with. The sample without those still in education is composed of 4.227 respondents, for all three countries together. The exogenous instrument – the regional unemployment rate – is collected from the regional statistics of the national statistical agencies in the three countries. NUTS-3 level is used, the lowest available.

4.2. Economic model

The objective of this paper is twofold: to describe youth underemployment and investigate its effect on personal wellbeing in Macedonia, Montenegro and Serbia. Following these objectives, our model has the following initial two-stage shape:

$$P(\text{underemployed}_i) = \alpha_1 + \beta_{11}\text{exper}_i + \beta_{12}\text{exper}^2_i + \beta_{13}\text{gender}_i + \beta_{14}\text{primary}_i + \beta_{15}\text{secondary}_i + \beta_{16}\text{married}_i + \beta_{17}\text{parent_edu}_i + \beta_{18}\text{sector}_i + \varepsilon_{19i} \quad (1)$$

$$\log\text{realwage}_i = \alpha_2 + \beta_{21}\text{exper}_i + \beta_{22}\text{exper}^2_i + \beta_{23}\text{gender}_i + \beta_{24}\text{primary}_i + \beta_{25}\text{secondary}_i + \beta_{26}\text{married}_i + \beta_{27}\text{parent_edu}_i + \beta_{28}\text{sector}_i + \gamma_1\text{underemployed}_i + \varepsilon_{29i} \quad (2)$$

Whereby the underemployment condition of person i is a function of individual (personal) and labor-market characteristics. We define underemployment through its intensity form, i.e. the broader definition encompassing various forms of youth underemployment, thus we implement count-based approach in defining the underemployment intensity. It encompasses 5 elements, hence being an ordered variable $[0, 5]$. Note that, zero means that the person is not underemployed, but still

employed (i.e. the job may be considered adequate or decent), while those non-employed have a missing value. We use the broad definition because the two definitions – narrow and broad one – are actually different measures; the former measures specific condition (working less than 35 hours but willing to work more), while the latter underemployment intensity. As argued before (Section 3), underemployment intensity is more important in the Western Balkan countries.

The personal characteristics included are coming from the Human Capital Theory: education, experience, age, marriage and gender. The job characteristics include the sector, composed of industry, construction, market services and public sector. ϵ_i is the error term which is assumed well-behaved. The wellbeing is defined through the wage, measured by real earnings per hours in logarithm and adjusted by purchasing power parity (PPP) rate of euros;

In the literature, probit or ordered probit methods have been usually used for the first equation (Ruiz-Quintanilla and Claes, 1996; Jensen and Slack 2003; Altonji and Paxson, 1988; Wilkins, 2006; Gorg and Srob, 2001), while probit, simple OLS (Feldman et al., 2002; Koeber and Wright, 2001), panel fixed effects (Angrave Charlwood, 2015), 3-Stage Least Squares (Nord, 1989) for the second. However, the estimations presented in the literature usually do not take into consideration the econometric challenges we are discussing next.

4.3. Econometric challenges

Two main econometric challenges are pertinent to estimating the equations: selection into employment and endogeneity of the underemployment and wellbeing.

The first econometric challenge is that underemployment condition is observed only for the employed sample. If the employed labor force is systematically different than the non-employed, then we have a reason of concern of how selection may affect our estimates. Selectivity may be result of observable characteristics like education and experience. By including observable characteristics in the regression, we solve the issue of selectivity due to observable characteristics. Another, more important part of selectivity is due to unobservable characteristics (motivation, informal networks, negotiations skills, etc.). Persons with higher motivation and social capital may be employed easier and at 'matching' jobs than others. To overcome this problem, the Heckman two-stage selection method is frequently employed (see Wooldridge, 2010,

p.670). In the first stage (selection equation), those in the active labor force establish identifying restrictions on whether individuals are employed or not. Then, in the second stage (outcome equation), the probability of being underemployed is regressed on personal and labor-market characteristics only for employed individuals. In the literature, the unemployment rate of the area is used as an instrument to correct selectivity (Bonnal et al, 2009). However, the variable may be valid exclusion restriction only in conditions when unemployment rate is close to the “natural” one. This is not the case in our countries, where unemployment rate is persistently higher than what is considered a natural rate.

The second econometric challenge is that the underemployment may be endogenous with respect to wellbeing. The underemployment may affect the earnings per hour, but at the same time persons originating from poorer households faced with a poverty risk and with increased needs for instant job, may be prone to accept inadequate job positions. If we do not observe all facets of household wealth and personal characteristics, there would be omitted variables correlated with both underemployment and wellbeing. Hence, underemployment would tend to be correlated with the unobserved determinants of wellbeing. Endogeneity stemming from both simultaneity and omitted variables (unobserved variables) is a serious methodological concern.

To overcome the problem, the literature employs instrumental variables approach (Bonnal et al. 2009; Korpi and Tahlin, 2009). Hence, we add a third relationship whereby underemployment is a function of all observables in the first equation, plus a variable affecting only underemployment and not wellbeing (our instrument). The literature provides little guidance at this point. Variables that affect underemployment and not welfare could be hardly found. Historical conditions related to childhood circumstances and community opportunities that will affect future education and business careers are used as variables in part of the literature (e.g. Gregg, 2001). The number of siblings in the household, place of residence during childhood, the condition whether the person grew up with one of the biological parents and whether during childhood he/she had economic problems within the family are historical variables related to the education careers (Korpi and Tahlin, 2009). The number of siblings in the household and the conditions related to childhood are not available in our survey. Instead, as an instrument we propose the average regional unemployment rate at the time the person finished schooling. The instrument has been

originally used by Gregg (2001) and subsequently in Gregg and Tominey (2005), Schmillen and Umkehrer (2013), Ghirelli (2015), Petreski et al. (2017). Actually, all these studies use regional unemployment rates, since they usually analyze one country only and rely on local labor-market conditions as instrument. This is a historical condition of the labor market reflecting the conditions that prevailed at the time the person finished education, so it is expected these to be correlated with the underemployment either positively (higher average unemployment, worse local labor market conditions, higher chance for a person to become underemployed) or negatively (higher area unemployment may spark persons to intensify their job-search efforts, which may yield better job). On the other hand, the average regional unemployment rate at that time is not expected to affect the wellbeing today: wellbeing today depends on today's unemployment rate and labor-market conditions, opportunities for promotion and change of jobs and so on. Hence, we assume that any potential initial correlation between the local labor market conditions (unemployment rate) and personal wellbeing in one single point of time (when the person finished education), fades out over time, i.e. that their link breaks as local conditions change, as the person matures in professional sense, as he/she acquires new skills and so on.

However, we need, at this point, to delineate some lines of caution with the usage of such an instrument, especially given that conclusions critically depend on its usage. First, if in the period in-between the schooling completion and employment youth migrated from one region to other (sometimes to regions with better job opportunity), then the effect of unemployment on the wage perspectives and their wellbeing in general may be underestimated (Petreski et al. 2016). This type of inter-regionally migration is not uncommon in Macedonia, Serbia and Montenegro, where usually migration is from inner cities to the capital. A second line of caution regarding the regional unemployment rate at the time of graduation as instrument is related with the unobservable characteristics of the parents. If some unobserved parental characteristics affect child's later employment outcomes, this will reduce the power of the instrument. Nevertheless, "it does at least take the unobserved heterogeneity back a generation." (Gregg 2001, 637). Since we have no mechanism to improve the instrument regarding the second caution, we should only take it into consideration when interpreting the results.

Given the concerns pertinent to our proposed instrument, we also pursue alternative approach. Namely, Lewbel (2012) proposed a new method that identifies structural parameters in regression models with endogenous regressors. The method is used in the cases when exogeneous instruments or validation studies are missing. In the proposed method, the identification comes from observing vector of variables which are uncorrelated with the product of heteroskedastic errors. The author explains that this is a feature of many models where error correlations are due to an unobserved common factor. Hence, instruments generated from the model data, could be used alone or together with other instruments. For the main model, estimators take the form of modified two stage least squares.

Taking into consideration the two challenges: selectivity bias and endogeneity, our three estimating equations are the following:

$$P(emp_i) = \alpha_3 + \beta_{51}exper_i + \beta_{52}exper_i^2 + \beta_{53}gender_i + \beta_{54}primary_i + \beta_{55}secondary_i + \beta_{56}married_i + \beta_{57}parent_edu_i + \beta_{58}sector_i + \varepsilon_{59i} \quad (5)$$

$$P(underemployed_i) = \alpha_4 + \beta_{61}exper_i + \beta_{62}exper_i^2 + \beta_{63}gender_i + \beta_{64}primary_i + \beta_{65}secondary_i + \beta_{66}married_i + \beta_{67}parent_edu_i + \beta_{68}sector_i + \gamma_2reg_unemp_r + \sum \gamma_j internal_inst_{ij} + \varepsilon_{69i} \quad (6)$$

$$logrealwage_{ij} = \alpha_5 + \beta_{71}exper_i + \beta_{72}exper_i^2 + \beta_{73}gender_i + \beta_{74}primary_i + \beta_{75}secondary_i + \beta_{76}married_i + \beta_{77}parent_edu_i + \beta_{78}sector_i + \gamma_4underemployed + \sigma\lambda + \varepsilon_{79i} \quad (7)$$

Whereby all notations are as before. In addition, $fated_{ij}$ is the father's education specified as [1,3] variable to reflect primary, secondary or tertiary education; reg_unemp_r is the regional unemployment rate at the time the individual finished schooling; $internal_inst_{ij}$ stands for a set of internally-generated instruments a-la Lewbel (2012) and λ is the inverse Mills ratio calculated in (5).

4.4. Estimator

The sequential system of 3 equations (5)-(7) can be estimated by using a Limited Information Maximum Likelihood (LIML) approach as defined by Roodman (2012) conditional mixed process (CMP) package. This LIML approach implies distributional assumptions that lead to efficient estimates. The standard IV approach, however, does not; there is an implied trade-off between both estimators. The CMP method is

appropriate for two broad types of estimation situations: 1) those in which a truly recursive data-generating process is posited and fully modeled; and 2) those in which there is simultaneity but instruments allow the construction of a recursive set of equations, as in two-stage least squares (2SLS) (Roodman, 2011). In the first case, CMP is a full-information maximum likelihood (FIML) estimator, all estimated parameters being structural. In the latter, it is a limited-information (LIML) estimator, and only the final stage's (or stages') parameters are structural, the rest being reduced-form. We could set our CMP estimator in to account for the binary/ordered construct of the dependent variables in (5) and (6), as well of the ordered/continuous construct of the dependent variables in (7), depending on the variable used to approximate wellbeing. However, using ordered probit for (6) imposes cumbersomeness in the calculation and difficulty in achieving convergence, so we simply treat ordered variables as continuous. Moreover, we believe that the use of the people that are still studying but working should also help in resolving the issue of selectivity since this cohort is included with the unemployed.

5. Results

5.1. Baseline results

We next analyze the results of underemployment determinants and its effect on real wage. Table 4 presents the results of the estimated system of equations (5)-(7). We first report results obtained with the CMP method (columns 1-3). These estimates are purged from selection bias, as well endogeneity of underemployment with respect to wages is properly accounted for. However, the standard identification tests cannot be produced. The CMP-based results find no correlation between underemployment and wages, likely implying that selection is not a problem.

Hence, columns (4-6) present the results of a standard IV approach: column (4) uses regional rate of unemployment as instrument, while columns (5) and (6) use internally generated instruments (2SLS and GMM2S estimators, respectively) a-la Lewbel (2012). It is important to note that the last column of Table 4 applies the two-step generalized method of moments (GMM2S), which helps to correct heteroscedasticity in the orthogonality and lowers the variance of the estimators. Hence, it is our preferred method of estimation over 2SLS (column 5).

The instruments' validity tests are provided at the bottom of the table. The validity tests of the usage of the external instrument – the regional unemployment at the time the person graduated - show that the instrument is weak. The underidentification test is above 0 suggesting the model is underidentified. Moreover, Montiel-Pflueger robust weak instrument test that allows analysis when errors are not conditionally homoskedstic and serially uncorrelated shows that the instruments develop coefficients with maximum relative bias of less than 30%, thus additionally showing that the instrument alone is weak. In the case of the Hansen test statistic the results cannot be produced as we have just identified the equation. This usually occurs when using one instrument, hence the Hansen test in this case is irrelevant.

The validity of the instrumental variable and conditional-heteroskedastcity instruments changes when we combine them (columns 5 and 6). The underidentification test of 0.000 indicates the combined usage of the instrumental variable and the data generated instruments fully identifies the model. The first stage F-test of excluded instruments (Joint significance) shows that there is conditional heteroscedasticity, thus proving that the generated instruments explain the endogenous regressor. This is a condition that is needed when using Lewbel's (2012) approach. Moreover, Montiel-Pflueger robust weak instrument test shows that the method is correct since instruments develop coefficients with maximum relative bias of less and unequal to 5%.

Comparing the results across the wage regression (columns (3-6), we note negligible difference in the estimated coefficients. This is a further confirmation that selectivity is not a problem in our data. Still, the effect of underemployment on youth wages is not robustly significant. It is significant in our preferred estimation method (column 6), suggesting that as underemployment intensifies for a unit along its manifestation forms, the wage declines by 8.4% on average. Annex 2 presents sensitivity analysis with altering the dependent variable into a dummy variable. Namely, we provide estimations of how underemployment affects wages if the persons fulfill at least one, two and three of the five underemployment indicators. In general, the results suggest that using a binary variable that identifies an individual according to two or more of the underemployment indicators provides most robust evidence.

We turn to the other wage determinants now. They suggest that persons with primary education have lower wage, overage by 31.8%, compared to tertiary-educated

persons. Married individuals do have a wage dividend, while parental education brings returns for youth as well. There is no gender wage gap for youth, nor experience matters.

Table 4 could also serve for analysis of the underemployment determinants: column (2) reveals this. Most of the explanatory variables are significant for underemployment. Results suggest that underemployment incidence reduces with experience, though the effect is convex. Females have 1.7% higher probability to have higher underemployment intensity compared to males. Taking into consideration the fragile position of females on the labor markets in Macedonia, Serbia and Montenegro (low participation in the labor force, high gender pay gaps, high unemployment and traditional role of women to take care for the household), results are not surprising. Youth with primary and secondary education have lower intensity of underemployment compared to tertiary-educated youth. This is an interesting finding from two aspects. First, one of the underemployment conditions is the skills' mismatch, implying that the correlation between education and underemployment is obvious. The result suggests that skills' and supply/demand mismatches on the labor markets in the investigated countries are more prevalent at higher levels of education. Second, however, the effect of education on underemployment is a-priori ambiguous since low education may diminish over-qualification rates but increase under-qualification. With regards to labor-market characteristics, underemployment differs among sectors. Underemployment intensity is slightly lower in the public sector, and higher in market services than compared to industry.

Table 4: Baseline results

	Overall					
	CMP estimating method			IV	Data generated instruments	
	Employed	Under-employment †	Wage	Wage	Wage (2SLS)	Wage (GMM2S)
	(1)	(2)	(3)	(4)	(5)	(6)
Underemployed			-0.056 (0.037)	0.040 (0.932)	-0.054 (0.037)	-0.082** (0.035)
	Individual characteristics					
Experience (in years)	0.456*** (0.032)	-0.025*** (0.004)	0.029 (0.028)	0.041 (0.042)	0.038 (0.028)	0.038 (0.027)
Experience²	-0.027*** (0.003)	0.001** (0.000)	-0.003 (0.002)	-0.004 (0.003)	-0.004* (0.002)	-0.004* (0.002)
Gender (1=female)	-0.054 (0.068)	0.017* (0.009)	-0.051 (0.055)	-0.062 (0.127)	-0.048 (0.055)	-0.054 (0.050)
Primary education	-0.493*** (0.130)	-0.614*** (0.021)	-0.253* (0.131)	-0.229 (0.241)	-0.248* (0.132)	-0.318*** (0.116)
Secondary education	-0.166** (0.084)	-0.177*** (0.014)	-0.089 (0.067)	-0.071 (0.164)	-0.085 (0.067)	-0.098 (0.064)
Marital status (1=married)	0.226*** (0.084)	-0.038*** (0.010)	0.118* (0.063)	0.119* (0.066)	0.121* (0.063)	0.114* (0.060)
Parents education	-0.079 (0.072)	0.016 (0.011)	0.092* (0.047)	0.094 (0.098)	0.103** (0.046)	0.106** (0.044)
	Labour Market characteristics					
Construction sector		-0.019 (0.017)	-0.094 (0.088)	-0.075 (0.105)	-0.081 (0.088)	-0.094 (0.072)
Market services		0.074*** (0.010)	0.018 (0.057)	0.023 (0.058)	0.022 (0.057)	0.031 (0.052)
Public sector		-0.117*** (0.017)	0.327*** (0.108)	0.358 (0.322)	0.328*** (0.109)	0.313*** (0.106)
Regional unemployment rate		0.001* (0.000)				
Constant	-0.277* (0.155)	1.471*** (0.036)	1.227*** (0.139)	1.028 (1.354)	1.164*** (0.136)	1.217*** (0.133)
Observations	3,644	3,644	3,644	1,064	1,064	1,064
	Test on instruments validity					

Underidentification test (Kleibergen-Paap rk LM p-value)			0.331	0.000	0.000
Montiel-Pflueger robust weak instrument test - F stat			1.200 </ 12.039 (τ=30%)	907.476 </ 21.58 (τ=5%)	907.476 </ 21.58 (τ=5%)
First stage test of excluded instruments (Prob > F)			0.335	0.000	0.000
Hansen J statistic (p-value)			Just identified	0.393	0.393
Rho coefficients					
rho_12		-0.006 (0.040)			
rho_13		-0.044 (0.047)			
rho_23		-0.082** (0.037)			
Source: Authors' estimates Note: *, ** and *** denote significance at the 10, 5 and 1% level, respectively. Standard errors provided in parentheses. Estimates corrected for heteroskedasticity.					

We explore the issue of underemployment determinants further. Table 5 presents the results of an ordered probit regression; the coefficients and their significance corroborate the findings of column (2) in Table 4. They indicate that the most prone to underemployment are the tertiary-educated youth; the finding applies to all three countries, despite the most forcefully functioning in Macedonia. Experience reduces the probability of higher intensity of underemployment, the effect differs among the three countries: from very strong and conves in Macedonia, to mild in Serbia, to no effect in Montenegro. The table provides evidence that working in market services increases the probability of higher underemployment intensity which tends to be in line with previous literature and our stylized facts where the various service sectors were found to have the highest underemployment incidence. The effect is found in Serbia, though. On the other hand, working in the public sector reduces the probability to report higher underemployment intensity, though again the effect is derived from Macedonia only.

Table 5: Determinants of underemployment intensity

Underemployed as dependent variable	Macedonia (1)	Montenegro (2)	Serbia (3)	Overall (4)
Experience (in years)	-0.153*** (0.051)		-0.063*** (0.013)	-0.029* (0.017)
Experience²	0.016*** (0.006)	0.005* (0.003)		
Primary education	-1.487*** (0.224)	-0.994*** (0.294)	-0.515*** (0.153)	-0.994*** (0.303)
Secondary education	-0.363*** (0.100)	-0.483*** (0.109)		-0.273** (0.135)
Marital status (1=married)	-0.243** (0.101)		0.167* (0.090)	
Regional unemployment rate		0.008 (0.005)		-0.003* (0.002)
Labour market characteristics				
Construction sector				
Market services			0.269*** (0.078)	0.141*** (0.045)
Public sector	-0.223** (0.105)			-0.096* (0.054)
Constant	-1.906*** (0.136)	-1.625*** (0.163)	-1.454*** (0.099)	-1.657*** (0.029)
Observations	606	494	817	1,917
Source: Authors' estimates Note: *, ** and *** denote significance at the 10, 5 and 1% level, respectively. Standard errors provided in parentheses. Estimates corrected for heteroskedasticity. Ordered probit regression, estimates are removed based on 15% significance level				

5.2. Country results

Table 5 presents the results by country. Note that we present only the results with the usage of internally-generated instruments with the GMM2S estimators. Namely, in the country-by-country analysis either we were not able to verify the validity of the external instrument – the regional unemployment rate at the time the person graduated. On the other hand, the internally-generated instruments further maintained their strength. The bottom panel of Table 5 suggests that all these instruments are valid, as well the models are properly identified.

Results point out to some differences among the three countries. Underemployment intensity significantly negatively influences youth wages in all three countries although the significance varies. The underemployment in Macedonia has the largest negative effect on wages (14.3%) and is significant at the 1% level. This effect is followed with Montenegro where underemployment intensity decreases youth wages by (11.8%) and is significant at the 1% level. Serbia's underemployment intensity is found to be significant at the 10% level and has a negative impact of 7.8% on youth wages.

The differences in effects could be related with factors like the minimum wage level, labour market policy incentives for youth and informal youth employment. Namely, the minimum wage in Macedonia is the lowest compared to Serbia and Montenegro, while youth became target of the labour market measures only in 2014, which is the year of the survey. Likewise, the incidence of informal employment among youth is highest in Macedonia, suggesting that the share of youth with informal working contracts is prevalently high.

The sensitivity analysis by country presented in Annex 2 corroborates our baseline results. Underemployment is found to negatively influence wages in all three countries: in Macedonia, this effect rises to 26% at 1% significance level, while in Montenegro and Serbia it is around 11% at 10 percent significance level.

The other coefficients are frequently similar across countries and in line with the overall results. We point out to some differences, however. For instance, experience is only significant in Macedonia. Education is generally significant in the three countries, with the negative wage returns being the strongest in Montenegro. Family circumstances (marriage and parental education) seem to matter in Serbia only. In Macedonia and Serbia, public sector young employees are paid more than industry employees, while this applies for the market services in Montenegro. The latter may be related to the

tourism industry in Montenegro which receives a large influx of workers over the summer.

Table 5: Underemployment wage effects by country

	Macedonia	Montenegro	Serbia
Dependent variable wages	(1)	(2)	(3)
Underemployed	-0.143*** (0.041)	-0.118*** (0.046)	-0.078* (0.042)
Individual characteristics			
Experience (in years)	0.060** (0.026)	-0.049 (0.033)	0.012 (0.036)
Experience²	-0.006** (0.003)	0.001 (0.003)	-0.003 (0.003)
Gender (1=female)	0.085 (0.057)	-0.127 (0.086)	-0.039 (0.069)
Primary education	-0.128 (0.143)	-0.513*** (0.155)	-0.355*** (0.134)
Secondary education	-0.261*** (0.073)	-0.255*** (0.095)	-0.048 (0.081)
Marital status (1=married)	0.004 (0.060)	0.620 (0.483)	0.187** (0.075)
Parents education	-0.033 (0.047)	-0.057 (0.110)	0.169*** (0.056)
Labour market characteristics			
Construction sector	0.117 (0.112)	-0.157 (0.159)	-0.186** (0.091)
Market services	0.017 (0.063)	0.239** (0.094)	-0.037 (0.062)
Public sector	0.181* (0.097)	0.026 (0.104)	0.340** (0.158)
Constant	1.396*** (0.140)	1.909*** (0.211)	1.203*** (0.165)
Observations	304	240	520
Instruments' tests			
Underidentification test (Kleibergen-Paap rk LM p-value)	0.000	0.000	0.000
Montiel-Pflueger robust weak instrument test - F stat	313.622 </ 21.58 (τ=5%)	322.782 </ 21.58 (τ=5%)	710.478 </ 21.58 (τ=5%)
First stage test of excluded instruments (Prob > F)	0.0000	0.000	0.000
Hansen J statistic (p-value)	0.145	0.082	0.456
Source: Authors' estimates Note: *, ** and *** denote significance at the 10, 5 and 1% level, respectively. Standard errors provided in parentheses. Estimates corrected for heteroskedasticity. † - 2 Step Generalized Method of Moments (GMM)			

6. Conclusion and recommendations

This paper examines the effect of youth underemployment on wages in three countries of the Western Balkans. To control for the endogeneity between underemployment and real hourly wages - as both are likely to be explained by unobserved ability factors - we implement an instrumental variable approach that

relies on regional unemployment rate indicator and internally-generated instruments (Lewbel, 2012; 2018). We also provide tests for sample selection bias by using maximum likelihood approach (Conditional Mixed Process Estimator) introduced by Roodman (2012).

The key result of the paper is that underemployment intensity lowers wages. The effect is the strongest in Macedonia, followed by Montenegro and Serbia. We find education to be the most common determinant of underemployment across countries. Generally, in line with previous literature about over-education and mismatched skills, tertiary educated youth are found to be the most underemployed. Secondary and primary education tends to lower the chance of underemployment likely suggesting that in these countries there is a higher labor supply for low-skilled workers with vocational and specialized abilities. Overall, there is no clear evidence that experience is helping the youth to cope with underemployment except in Macedonia where experience decreased underemployment for 15%. Though market services sectors increase the underemployment likelihood, in Serbia this magnitude is far more imperative.

At the policy level, results suggest that underemployment generates dissatisfaction and impaired financial welfare, and support the necessity for more aggressive youth employment policies, composed of internship and traineeship programs, qualification, re-training and profiling of the youth into sectors and occupations that need (or will need) additional workforce. Such measures would increase skills, reduce the mismatch between the skills supply and demand, increase demand for job formalization and potentially align wage expectations with reality.

The findings recommend devising policy measures and active programs that will mitigate the negative consequences of underemployment for wellbeing, in the following veins:

- Early interventions of various types in the secondary, but also primary education;
- Provide career counselling for youth who expressed they were over-qualified on their workplace, with the purpose of overcoming mismatches or faster transition to another workplace in the same or other company;
- Devising multi-sector traineeship grant, according to which the company will enable that the newly employed young person will spend at least three months

at three different jobs within the company related to his/her skills, and then make a suggestion of what best fits his/her skills. The preferred job will not be a 'must', but an objective for a reasonable time period of up to a year;

- Skill certification, probably established by state certification agencies. Certification may be offered for different level and type of skills, which may not be guaranteed by the diploma. Skill certification may be free of charge (covered by the government), while providing employers guidance of the specific skills the employee possesses;
- Promoting VET schools and motivating youth for high-skill occupations. Promotion could be through: dual school-company programs; mandatory internship during schooling; promoting non-formal education and subsidizing high-tech companies to design and deliver short-term courses for youth NEET.
- Devising (and/or extending the palette of) various very specific trainings (e.g. argon welder), which will provide opportunities for underemployed to acquaint related skill in case of underemployment;
- Fostering education completion, in particular, for disadvantaged groups (e.g. females).

7. References

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Annex 1 - Empirical literature review background

Papers	Model used	Indicators found significant	Aspects analysed
Bonnal, M., C. Lira, and S.N. Addy (2009) Underemployment and Local Employment Dynamics: New Evidence	Heckman's (1979) two-step selection model The unemployment rate of the area is used as an instrument to correct selectivity.	Marriage (-0.17***), female (0.201***), age (0.021***), education (-0.123***), local underemployment (20.331***), employee turnover (2.828***)	The relationships between underemployment and both labor force characteristics and local labor market conditions
Jensen, L and Slack, T (2003). Underemployment in America: Measurement and Evidence.	Percentage Distribution of Underemployment	Highest prevalence rates: young 18-24 (29.1%), women (15.3%), never married (22.1), primary school (29%), extractive industry (22.7%), wholesale (19.2%)	Wellbeing and social aspects of underemployment
Jensen, L and Slack, T. (2004). Employment Adequacy in Extractive Industries: An Analysis of Underemployment, 1974–1998	Logistic regression model	Agriculture as dependent: male (-0.394**), high school (-0.475**), some college (-0.615**), bachelors or more (-1.022**), never married (0.891**), widowed/divorced (0.285**). Forestry and Fishing as dependent: male (0.428**), age (-0.086), high school (-0.519**), some college (-0.729**), bachelors or more (-1.967**), never married (0.704**), widowed/divorced (0.539**). Mining as dependent: age (-0.087), high school (-0.696**), some college (-1.017**), bachelors or more (-1.424**), never married (0.582**), widowed/divorced (0.743**).	Aspects of underemployment in the extractive industry
Grzywacz JG, Dooley D. (2003) "Good jobs" to "bad jobs": Replicated evidence of an employment continuum from two large surveys	Logistic regression analyses	At status and physical health: Barley adequate employment (0.45*), high school education (0.48*), inadequate employment (0.59**), unemployed (1.81***), age (0.02***), primary school (1.35***), high school (0.48**) At status and depression: inadequate employment (0.72***), unemployment (1.22***), age (0.02***), gender (0.38***), primary school (0.47*), marital status (0.58***)	Inadequate and barley adequate employment and poor/fair physical health and depression
Feldman, D.C, Leana, C.R, and Bolino, M. (2002). Underemployment	OLS structural regression models	Underemployment (by hierarchal level) with relative deprivation: job satisfaction (-0.26***), commitment (-0.27***), trust (-0.19***), careerism (0.13**), job search (0.19***)	Underemployment and wellbeing

and relative deprivation among re-employed executives.		Underemployment (by pay difference) with relative deprivation: job satisfaction (-0.2***), commitment (-0.13**), job search (0.14**) Underemployment (skill utilization) with relative deprivation: job satisfaction (-0.33***), commitment (-0.4***), trust (-0.23***), careerism (-0.21***), job search (0.14***)	
Sum, A and Khatiwada, I. (2010). The Nation's underemployed in the "Great Recession" of 2007-09	Percentage Distribution of Underemployment	Highest underemployment incidence in 2009: women (6.4%), youth 20-24 (10.6%), high school dropouts (16.4%), private households (19.3), construction (13.6%), accommodation and food services (13.3%)	Underemployment and wellbeing
Altonji, J.G and Paxson, C.J. (1988). Labour Supply Preferences, Hours, Constraints, and Hours-Wage Trade-offs	Probit regression models	Marriage (0.867**), education (-0.0863***), experience sqrt (-0.00043***), hours/week (-0.0366***)	Effects of underemployment on working hours and wage
Angrave, D and Charlwood, A. (2015). What is the relationship between long working hours, over-employment, under-employment and the subjective well-being of workers: Longitudinal evidence from the UK	Fixed effects regression models	Association of underemployment and wellbeing (men): life satisfaction and less than 35 hours underemployed (-0.10*), job satisfaction and 35-40 hours underemployed (-0.18***), psychological wellbeing and 35-40 hours underemployed (-0.11***), life satisfaction and 35-40 hours underemployed (-0.09*). Association of underemployment and wellbeing (women): less than 21 hours underemployed and psychological wellbeing (-0.1**), less than 21 hours underemployed and life satisfaction (-0.13**), 21-34 hours underemployed and psychological wellbeing (-0.12*), 21-34 hours underemployed and life satisfaction (-0.16**), 35-40 hours underemployed and job satisfaction (0.06**), 50+ hours underemployed and job satisfaction (-0.07*), 50+ hours underemployment and psychological wellbeing (-0.11***), 50+ hours underemployment and life satisfaction (-0.14***)	Effect of underemployment on working hours and subjective wellbeing
Friedland, D.S. and Price, R.H. (2003). Underemployment: Consequences for the Health and Well-Being of Workers	Multiple Regression of Psychological Well-Being on Employment Status Net of	Life satisfaction as dependent: psychological wellbeing (0.351***), sex (-0.047), marital status (0.062*), hours worked (-0.77*). Depression symptoms as dependent: psychological wellbeing (0.454***), education (-0.056*), underemployment (income based) (0.079**). Positive self-concept as dependent: psychological wellbeing (0.53***), sex (-0.041), underemployment (hours based) (-0.043), underemployment (income	

	Psychological Well-Being	based) (-0.046), underemployment (status based) (-0.049). Job satisfaction as dependent: psychological wellbeing (0.459***), hour worked/week (0.107**)	
Ruiz-Quintanilla, S. and Claes, R. (1996) Determinants of Underemployment of Young Adults: A Multi-Country Study	Independent probit analyses	Part-time as dependent: fixed tactics (-0.285**), previous part-time (0.559**). Temporary employment as dependent: primary education (1***), some college (0.62**), target group (0.286*), disjunctive practices (0.145**), fixed tactics (-0.129*), previous temporary work (1.088***), labour market outlook (-0.15**). Unemployment as dependent: primary education (0.733**), disjunctive tactics (0.191**), previous temporary work (0.260*), labour market outlook (-0.166*). Full-time employment as dependent: primary education (-0.622**), some college degree (-0.390***), target group (-0.328**), disjunctive practices (-0.105**), fixed tactics (0.110*), previous temporary work (-0.854***), labour market outlook (0.093*), Southern Europe (-0.189*)	Determinants of youth underemployment
Wilkins, R. (2006) Personal and Job Characteristics Associated with Underemployment	Multinomial logit models	Underemployment (Males): youth 25-34 (-0.044**), 35-44 (-0.052**), 45-54 (-0.051**), degree (-0.032**), other post-school (-0.024**), disability (0.024*), couple no-children (-0.024**), couple - dep children (-0.049**), having children aged 5-15 (0.039**), having children aged 16-24 (0.103**), father employed when 14 (-0.031**), local unemployment rate (0.361*), not employed lifetime (0.094**), not employed previous year (0.054**), unemployed previous year (0.068**), number of jobs changed previous year (0.027**). Underemployment (Females): 25-34 (-0.066**), 35-44 (-0.059**), 45-54 (-0.087**), 55-64 (-0.079**), degree (-0.052**), other post-school (-0.034**), having children aged 16-24 (-0.064**), not employed lifetime (0.068**), unemployed lifetime (0.269**), not employed previous year (0.047*), unemployed previous year (0.118**), number of jobs changed previous year (0.019**)	Association of personal and job characteristics with underemployment
Gorg, H. and Srobl, E. (2001). The incidence of visible underemployment: Evidence for Trinidad and Tobago	Simple probit model	Visibly underemployed to full-time employed: male (-0.015***), age (-0.001**), primary school (-0.006**), secondary school (-0.014***), university (0.015**), having a child (-0.004*), marital status (0.001**), governmental job (-0.026***), self-employed (-0.019***), family size (-0.039***), commuting job (-0.007***), mobile job (0.025***), work at night (0.020**), work on weekends (-0.014***). Visibly underemployed to voluntary part-time employed: male -0.088**), secondary school (-0.168***), university (-0.435***), urban (0.153***), governmental job (-0.215***), self-employed (-0.336***), work at night (0.206*), work on	Factors influencing the incidence of visible underemployment

		weekends (0.101***). Visibly underemployed to voluntary unemployed: male (0.072***), secondary school (-0.056***), head of household (0.034**), having children (-0.030***), having elderly (-0.055***), marital status (0.020***)	
Nord, S. (1989). The Relationships among Labor-Force Participation, Service-Sector Employment and Underemployment	3 Stage Least Squares Regression modelling	Underemployment as dependent: service sector (0.2971***), high school dropouts (0.3099***), youth (0.1406). Service sector as dependent: underemployment rate (1.47), high school dropouts (-0.7425***), youth (1.093***), female (1.7706***), aged (1.262***). Labour force participation as dependent: underemployment (121.6603***), service sector (-25.8127***), aged (-80.0022****)	Connections of service sector with underemployment, poverty, income inequality
Leppel, K. and Clain, S. (1988) The Growth in Involuntary Part-Time Employment of Men and Women	3 Stage Least Squares Regression modelling	Female involuntary part-time as dependent: population under 5 years old (0.4192**), service sector employment (0.4120**). Male involuntary part-time as dependent: population under 5 years (0.3781**), unskilled males (0.1322*), service sector employment (0.3239**). Unskilled female work force as dependent: young females 16-19 (0.3632**), median schooling years for females 18 and older (-5.2475**), median schooling years for females 16 and older (-5.4407**). Unskilled male work force as dependent: young males 16-19 (0.3506**), median schooling years for males 18 and older (-1.3967**), median schooling years for males 16 and older (-1.3950**).	Reasons of involuntary part-time employment according to gender
Chan, S. and Stevens, A.H. (2001) Job loss and employment patterns of older workers	Probit discrete hazard model	Entry to Work hazard (men): married (0.0186), disability (-0.1675), physical health (-0.0886), high school graduate (0.0348), some college (0.1747), college graduate (0.0466), prior job loss (0.2400). Entry to Work hazard (women): married (-0.1450), disability (-0.1790), physical health (-0.0701), high school graduate (0.0159), some college (0.0424), college graduate (-0.0090), prior job loss (0.3083). Exit form Work hazard (men): married (-0.1234), disability (0.1395), physical health (0.0537), high school graduate (0.0302), some college (0.0228), college graduate (-0.0166), prior job loss (0.2557). Exit to Work hazard (women): married (0.0137), disability (0.1647), physical health (0.0481), high school graduate (-0.0639), some college (-0.0710), college graduate (-0.0540), prior job loss (0.1426).	Analysis of work transitions for older workers
Koeber, C. and Wright, D.W. (2001) Wage bias in worker	OLS regression analysis	Wage difference as dependent: age 50 and over (-0.076***), goods to service job changed (-0.100***), self-employed (-0.106***), higher occupation (0.606***).	Wage penalty due to work

displacement: how industrial structure shapes the job loss and earnings decline of older American workers			displacement in older workers
Korpi, T. and Tahlin, M. (2009). Educational mismatch, wages, and wage growth: Overeducation in Sweden, 1974-2000	OLS regression analysis and 2Stage Least Squares with Instrumental Variable modelling	Undereducated as dependent: experience (3.030 ***), tenure (1.684 ***), verbal ability (-0.150 ***), OLS (-0.025***), OLS adjusted (-0.025***), fixed effects (-0.018***), 2SLS-IV (-0.370**), job satisfaction (-0.038**). Required education as dependent: experience (-0.611 ***), verbal ability (0.282 ***), health problems (-0.217 ***), OLS (0.067***), OLS adjusted 0.067***, fixed effects (0.033***), 2SLS-IV (0.206***), formal training (0.727***), informal training (2.059***), learning opportunity (0.139***), advanced prospects (0.053***), job satisfaction (0.048***). Overeducated as dependent: experience (-1.699 ***), tenure (-0.892 ***), verbal ability (0.208 ***), health problems (-0.117 *), OLS (0.026***), OLS adjusted (0.027***), fixed effects (0.008***), 2SLS-IV (-0.175**), job satisfaction (-0.041***).	Educational effects on wages, wage growth and job quality
Caceres, L.R., and Caceres, S.A.. (2015). Underemployment in Latin America	Vector autoregressive Model	Mean quality employment rate (112.20), mean real wage (99.57), mean unemployment rate (9.87), mean underemployment rate (12.56), mean male participation rate (73.15), mean female participation rate (44.55)	Aspects of underemployment in Latin America.

Annex 2. Instrumental Variable and Data Generated instruments with binary variable for underemployment

A2.1 Underemployed on at least one indicator

	Macedonia	Montenegro	Serbia	Overall
Dependent variable wages	(1)	(2)	(3)	(4)
Underemployed	0.271 (0.188)	N/A N/A	0.134 (0.124)	0.217* (0.112)
Individual characteristics				
Experience (in years)	0.052* (0.027)	N/A N/A	0.029 (0.038)	0.045 (0.028)
Experience ²	-0.005* (0.003)	N/A N/A	-0.004 (0.003)	-0.005** (0.002)
Gender (1=female)	0.039 (0.066)	N/A N/A	-0.051 (0.066)	-0.075 (0.048)
Primary education	-0.208* (0.123)	N/A N/A	-0.386*** (0.128)	-0.309*** (0.111)
Secondary education	-0.225*** (0.080)	N/A N/A	-0.086 (0.079)	-0.085 (0.064)
Marital status (1=married)	-0.020 (0.065)	N/A N/A	0.205*** (0.076)	0.135** (0.060)
Parents education	-0.029 (0.051)	N/A N/A	0.139** (0.058)	0.102** (0.046)
Labour market characteristics				
Construction sector	0.215 (0.131)	N/A N/A	-0.198** (0.099)	-0.032 (0.087)
Market services	0.060 (0.066)	N/A N/A	-0.018 (0.067)	0.051 (0.055)
Public sector	0.257** (0.100)	N/A N/A	0.360** (0.158)	0.369*** (0.107)
Constant	0.929*** (0.226)	N/A N/A	0.980*** (0.186)	0.854*** (0.159)
Observations	304	N/A	520	1,064
Test of instruments validity				
Underidentification test (Kleibergen-Paap rk LM p-value)	0.988	N/A	0.015	0.009
Montiel-Pflueger robust weak instrument test - F stat	1,225.724 </ 21.58 ($\tau=5\%$)	N/A	7,605.098 </ 21.58 ($\tau=5\%$)	4,287.825 </ 21.58 ($\tau=5\%$)
First stage test of excluded instruments (Prob > F)	0.0000	N/A	0.000	0.000
Hansen J statistic (p-value)	0.086	N/A	0.037	0.091
Source: Authors' estimates				
Note: *, ** and *** denote significance at the 10, 5 and 1% level, respectively. Standard errors provided in parentheses. Estimates corrected for heteroskedasticity. Results for Montenegro are not applicable due to collinearities.				
† - 2 Step Generalized Method of Moments (GMM)				

A2.2 Underemployed on at least two indicators

	Macedonia	Montenegro	Serbia	Overall
Dependent variable	(1)	(2)	(3)	(4)
wages				
Underemployed	-0.264*** (0.056)	-0.111* (0.058)	-0.115* (0.066)	-0.164*** (0.054)
Individual characteristics				
Experience (in years)	0.037 (0.025)	-0.051 (0.033)	0.006 (0.037)	0.036 (0.027)
Experience²	-0.003 (0.002)	0.002 (0.003)	-0.002 (0.003)	-0.004* (0.002)
Gender (1=female)	0.081 (0.054)	-0.114 (0.083)	-0.026 (0.066)	-0.043 (0.048)
Primary education	-0.144 (0.136)	-0.481*** (0.152)	-0.310** (0.130)	-0.289*** (0.110)
Secondary education	-0.293*** (0.071)	-0.279*** (0.082)	-0.048 (0.080)	-0.117* (0.063)
Marital status (1=married)	0.011 (0.054)	0.656 (0.573)	0.171** (0.072)	0.092 (0.057)
Parents education	-0.020 (0.046)	0.011 (0.091)	0.159*** (0.053)	0.096** (0.042)
Labour market characteristics				
Construction sector	0.145 (0.125)	-0.130 (0.167)	-0.212** (0.087)	-0.108 (0.075)
Market services	0.040 (0.058)	0.239** (0.106)	-0.052 (0.061)	0.018 (0.051)
Public sector	0.161* (0.093)	0.005 (0.116)	0.323** (0.155)	0.285*** (0.104)
Constant	1.310*** (0.122)	1.663*** (0.195)	1.167*** (0.153)	1.198*** (0.120)
Observations	304	240	520	1,064
Test of instruments validity				
Underidentification test (Kleibergen-Paap rk LM p-value)	0.000	0.0000	0.0000	0.0000
Montiel-Pflueger robust weak instrument test - F stat	419.976 </ 21.58 ($\tau=5\%$)	563.008 </ 21.58 ($\tau=5\%$)	1,218.093 </ 21.58 ($\tau=5\%$)	4,287.825 </ 21.58 ($\tau=5\%$)
First stage test of excluded instruments (Prob > F)	0.0000	0.0000	0.000	0.000
Hansen J statistic (p-value)	0.176	0.111	0.346	0.597
Source: Authors' estimates				
Note: *, ** and *** denote significance at the 10, 5 and 1% level, respectively.				
Standard errors provided in parentheses. Estimates corrected for heteroskedasticity.				
† - 2 Step Generalized Method of Moments (GMM)				

A2.3 Underemployed on at least three indicators

	Macedonia	Montenegro	Serbia	Overall
Dependent variable wages	(1)	(2)	(3)	(4)
Underemployed	-0.078 (0.069)	-0.095 (0.095)	-0.145* (0.088)	-0.119 (0.074)
Individual characteristics				
Experience (in years)	0.044* (0.025)	-0.045 (0.033)	0.024 (0.037)	0.043 (0.028)
Experience²	-0.005* (0.003)	-0.001 (0.003)	-0.003 (0.003)	-0.004* (0.002)
Gender (1=female)	0.052 (0.064)	-0.117 (0.085)	-0.014 (0.074)	-0.052 (0.051)
Primary education	-0.198 (0.126)	-0.479*** (0.148)	-0.291** (0.145)	-0.265** (0.123)
Secondary education	-0.234*** (0.076)	-0.141* (0.085)	-0.063 (0.077)	-0.098 (0.063)
Marital status (1=married)	0.061 (0.058)	0.664 (0.438)	0.166** (0.077)	0.119* (0.061)
Parents education	-0.027 (0.050)	-0.127 (0.099)	0.145** (0.059)	0.099** (0.046)
Labour market characteristics				
Construction sector	0.092 (0.102)	-0.165 (0.161)	-0.216** (0.104)	-0.141* (0.081)
Market services	0.024 (0.064)	0.183* (0.096)	-0.054 (0.070)	0.017 (0.056)
Public sector	0.228** (0.103)	0.082 (0.102)	0.353** (0.161)	0.324*** (0.108)
Constant	1.215*** (0.139)	1.789*** (0.192)	1.113*** (0.151)	1.104*** (0.120)
Observations	304	240	520	1,064
Test of instruments validity				
Underidentification test (Kleibergen-Paap rk LM p-value)	0.010	0.0000	0.0000	0.0000
Montiel-Pflueger robust weak instrument test - F stat	155.350 </ 21.58 ($\tau=5\%$)	175.867 </ 21.58 ($\tau=5\%$)	289.124 </ 21.58 ($\tau=5\%$)	393.140 </ 21.58 ($\tau=5\%$)
First stage test of excluded instruments (Prob > F)	0.0000	0.0000	0.0000	0.0000
Hansen J statistic (p-value)	0.009	0.359	0.475	0.524
Source: Authors' estimates				
Note: *, ** and *** denote significance at the 10, 5 and 1% level, respectively. Standard errors provided in parentheses. Estimates corrected for heteroskedasticity.				
† - 2 Step Generalized Method of Moments (GMM)				