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Analysis of Youth Underemployment in Macedonia, Montenegro, and Serbia

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Abstract

The vulnerability of working youth in Western Balkan countries is a major policy concern because their unemployment rates lie far above the EU average. We investigated the effect of youth underemployment on wages in three countries in the Western Balkans: Macedonia, Serbia, and Montenegro. Our empirical analysis built on a recent ILO school-to-work transition survey and controlled for sample-selection bias and endogeneity between underemployment and real hourly wages. The identification of the causal effect relied on traditional and novel instruments. In the former, the main instrument was a regional-unemployment indicator; in the latter, we exploited the conditional heteroskedasticity of underemployment to generate valid instruments. Our findings verified the negative relationship between underemployment and wages, which is strongest in Macedonia, followed by Montenegro and Serbia. These findings support the need for more aggressive youth-employment policies, including internship and traineeship programs, qualification, re-training, and adequate assessment of skills and competence.

Keywords: youth, underemployment, wages, Western Balkan countries

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I. Introduction

When workers underuse their skills, training, and experience, they are said to be underemployed (Bonnal, Lira & Addy, 2009). Underemployment may be defined in two different ways: 1) according to the International Labour Organization (ILO), the underemployed labor force is composed of those who work less than thirty-five hours per week but wish to work more; or, 2) from a broader or multidimensional approach (Feldman, 1996; McKee-Ryan & Harvey, 2011), the underemployed are those who work less than thirty-five hours per week but wish to work more (ILO indicator), are overqualified for a given job (McKee-Ryan & Harvey, 2011); who experience insecurity in a job (Clark, Kanabe & Ratzel, 2010; Prause & Dooley, 2011); who are underpaid (i.e., their salary is below the reservation wage) (Verhaest, Schatteman & Trier, 2015); who lack formal working conditions (i.e., have or no written contract (Ruiz-Quintanilla & Claes, 1996); or are 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 whose skills, occupations, or education are mismatched (Korpi & Tahlin, 2009; Nordin, Persson & Rooth, 2010); Pecoraro, 2014; Kleibrink, 2016). Similarly, there is evidence that underemployment, measured as underutilization of working hours, may negatively affect subjective well-being (Angrave & Charlwood, 2015).

As expected, youth are especially prone to underemployment. They are less experienced in job searching, less powerful in wage negotiations, less financially secure, and more exposed to psychological distress (Reynolds, 2012). As a result, they are more likely to accept underpaid jobs that do not match their skills and, thus, to experience low job satisfaction. Factors beyond lack of labor-market experience (educational attainment, gender, or marital status, for example) may exacerbate underemployment as do such job-specific characteristics as sector of employment or occupation. Young women may be even further prone to underemployment as a consequence of their greater inactivity in the labor market, driven by such factors as child- and elder care, household chores, conservative cultural beliefs, and other issues (Mojsoska-Blazevski, Petreski & Ayhan, 2017).

The consequences of underemployment are further aggravated in Western Balkan countries (Macedonia, Montenegro, and Serbia) where labor markets are characterized by

high unemployment and slow job creation. These countries face large and persistent general unemployment of between 18-25%; the rates for youth are as high as double the EU-28 average. At the same time, youth unemployment is also structural and not cyclical.

Moreover, the share of youth who are not employed or are not in educational or training programs (NEET) remains large: between 17% and 25%. Youth underemployment rates reflect this labor-market picture. According to the ILO definition, the youth underemployment rate ranges from 12.5% in Macedonia to 19.4% in Montenegro; according to the broader definition, however, the data are even more alarming: Between half and two thirds of employed youth in Macedonia, Montenegro, and Serbia possess at least two out of five underemployment conditions.

Despite this general context, the issue of youth underemployment has not been studied or tackled by policymakers. A prime reason may be the unavailability of statistical information related to underemployment. The ILO is the only body to have published an underemployment rate for the overall working-age population. Recently, however, with the ILO's School-to-Work-Transition Surveys (SWTS), it has been possible to understand the magnitude of youth underemployment, initiate policy-oriented research, and boost policies that may address this issue.

This paper estimates the impact of underemployment on wages in Macedonia, Serbia, and Montenegro and provides insight into the determinants of underemployment, introducing a number of novel approaches. First, this is the first study to examine youth underemployment in the region. Second, we provide extensive discussion and treatment of the endogeneity of underemployment with respect to real hourly wages. Third, our findings have pronounced policy implications for the public debate related to youth unemployment and emigration. Finally, our study is based on fairly new datasets—School-to-Work Transition Surveys in the three countries—that provide rich information for an examination of the situation of young workers in the Western Balkans.

II. Theoretical Foundations and Empirical Considerations

2.1. Underemployment and its Determinants

The issues we explore here have eclectic theoretical roots. The original theoretical conceptualization of underemployment is the Labor Utilization Framework (Clogg, 1979; Sullivan, 1978), according to which underemployment includes sub-employment, unemployment, and economically inadequate employment (meaning low-wage and low-hour employment) as well as other subcategories such as intermittent unemployment (adequate employment with recent history of unemployment, reflecting job insecurity), over-qualification, and similar factors. As such, underemployment actually appears on a continuum between unemployment and holding a decent job (Dooley & Prause, 2004). The Labor Utilization Framework offers theoretical grounds for analyzing the gradients of underemployment on such an employment continuum (Grzywacz & Dooley, 2003). As argued before, the definition of underemployment in this paper is consistent with that used in economics: unused skills, education, and time; inadequate pay; and insecure workplace; all of which indicate an inefficient labor market.

Two main theories underlie the factors that explain underemployment. First, the Human Capital Theory of Becker (1962) establishes that education and skills, as human-capital characteristics, may explain certain labor-market outcomes, including underemployment. A worker's education is key to assessing the extent to which a mismatch exists between the skills a worker may have acquired and the skills required by a particular job (Hersch, 1991), which is one source of underemployment. Allen and van der Velden (2001), however, argued that experience and, hence, skills learned on the job, may be more important in predicting underemployment.

The empirical evidence regarding the determinants of underemployment primarily documents a set of personal characteristics. Studies in this area include those of Gong and McNamara (2011); Wilkins (2006); Chan and Stevens (2001; Koeber and Wright (2001); Ruiz-Quintanilla and Claes (1996); Wooden (1993); and Leppel and Clain (1988). Ruiz-Quintanilla and Claes (1996) found that gender played a significant role in underemployment because women had a statistically higher (and significant) probability of being underemployed during

their early careers. Educational level was also significant: individuals with only a primary-school education were about 5% more likely to be underemployed in their early careers. Similarly, Bonnal, Lira, and Addy (2009) found that higher education decreased the chance of being underemployed by 12.3 percentage points.

Secondly, the Theory of the "Tied Mover/Tied Stayer" (Kain, 1968) may explain a portion of underemployment because some population cohorts—women, for example—may be prevented from commuting as a result of family or other ties. This is important when the local labor market does not provide sufficient opportunities for better-skilled workers, forcing them to be underemployed if they refuse to commute. Conversely, young workers are considered more willing to commute and hence to mitigate underemployment. Aside from their lower willingness to accept a long commute in order to avoid underemployment, women may be further prone to underemployment because of higher non-participation in the labor-market. This concept is rooted in the home-economy literature (Becker, 1991), according to which women's household and child-raising tasks encourage labor-market deactivation, especially in patriarchal societies.

Although underemployment rates vary across age, education, race, and ethnicity, there is a tendency for underemployment to be dominant among the most vulnerable or disenfranchised groups: young workers, old workers, high school dropouts, workers without college degrees, and some workers in service and blue-collar professions, for example (Sum & Khatiwada, 2010; Jensen & Slack, 2003). Youth are especially prone to underemployment. They are less experienced in job searching, less powerful in wage negotiations, less financially secure and more exposed to psychological distress (Reynolds, 2012) and, hence, are more likely to accept jobs that do not match their skills and earning potential, a driver of low job satisfaction. A number of writers have also considered local labor-market characteristics to be important in determining underemployment (Bonnal, Lira & Addy, 2009 and Wilkins, 2006, e.g.; Prause & Dooley, 2011 offered a review). Wilkins (2006) found that intermediate and elementary clerical jobs, trade jobs, and intermediate production and laborer jobs increased the probability of underemployment for employed men from 4-10 percentage points and from 4-16 percentage points for employed women. He also found that the probability of underemployment was higher for persons who worked in less skilled occupations (sales and

personal services, plant and machine operators, laborers, and related workers) and for those in the recreation and construction industries.

Görg and Strobl (2001) found that the underemployed were less likely to work in large firms, confirming that smaller firms tend to be part of the informal sector. The visibly underemployed and voluntary part-timers tend to be less educated, women, and urban dwellers. Sector has also been reported as a significant factor in underemployment. Workers in forestry/fishing and agriculture are twice as likely to be underemployed as are those in the service industry (Jensen & Slack, 2004). On the other hand, Nord (1989) found that the service sectors tended to lower labor-force participation and increase underemployment because secondary workers were pushed into the labor market in order to support their households and not because of a greater availability of service jobs. In turn, underemployment grew because of a 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 indicators of psychological, subjective, and physical well-being are abundant (Jensen and Slack, 2003; Grzywacz & Dooley, 2003; Feldman, Leana & Bolino, 2002; Angrave &Charlwood, 2015; Prause & Dooley, 2011), research on the effects of underemployment on financial welfare, such as wages, has been scarce.

Feldman, Leana, and Bolino (2002) noted that underemployment tended to be related to loss of wages. Those who find themselves underemployed may experience an initial wage penalty that persists over time, lowering their earning potential throughout their careers (McKee-Ryan & Harvey, 2011). Korpi and Tahlin (2009) analyzed the impact of educational mismatch on wages and reported that overeducated people, on average, received an early wage penalty from which they never recovered. Pecoraro (2014) noted that young graduates who were overeducated and mismatched in skills were most heavily penalized in their wages; this notion was valid when unobserved ability was accounted for but was not significant for graduates who were overeducated but matched in skills. This means that, to a certain extent, over-education reflected a lack of unobserved attributes.

Kleibrink (2016) rejected the notion that mismatched workers compensated for unobserved productivity differences, arguing that wage differentials were explained largely by poor matching in the labor market. Kleibrink argued that, while negative effects on wages were a fact, structural problems between education and the labor market might be the cause of such wage differences.

Nordin, Persson, and Rooth (2010) examined the consequences of education-occupation mismatches and found that the income penalty on highly educated individuals was large for both men and women. When comparing men and women with the same educational background (field of education, years of schooling, and degree/no degree), mismatched men and women suffered a 32% and 28% income penalty, respectively. The authors argued that the income penalty potentially decreased with work experience, especially for men, suggesting that work experience could close the gap by helping individuals transition from part-time or temporary employment to full-time and permanent work. Moreover, more highly educated men and women employed full-time and year-round received a significant and substantial income penalty for being mismatched.

Appendix 1 provides a thorough review of studies on the topic.

III. General Findings

3.1. Incidence of Underemployment in Macedonia, Serbia, and Montenegro

The labor markets in Macedonia, Montenegro, and Serbia face large and persistent overall unemployment rates that are particularly high among youth (Table 1). Compared to the EU-28 average, these rates are as high as double, but also reflect structural and not cyclical unemployment. In addition, the proportion of youth who are neither employed nor in educational or training programs (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 pressing issue for the working-age population overall, at least not in Macedonia and Montenegro and not compared to the EU-28 average. When these rates are calculated for youth, however, they become more concerning. According to the ILO definition, youth underemployment appears two to eight times higher than the overall rate in the working-age population, providing initial support for the claim that youth are more prone to underemployment. In addition, youth in Macedonia, Montenegro, and Serbia are twice as prone to underemployment compared to those in the EU-28. Moreover, the narrow ILO definition actually understates the issue of youth underemployment: it considers individuals underemployed only when they work less than thirty-five hours a week but want to work more. We need to consider that a young worker's negotiating power at the start of a career is very low. For most jobs, in fact, the conditions of the workplace are given/prescribed by the employer. Jobs that offer less than forty hours per week are very limited in the countries under investigation, which means that the narrow definition may hide the severity of the problem.

Table 2 - Underemployment Statistics

Proportion of 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

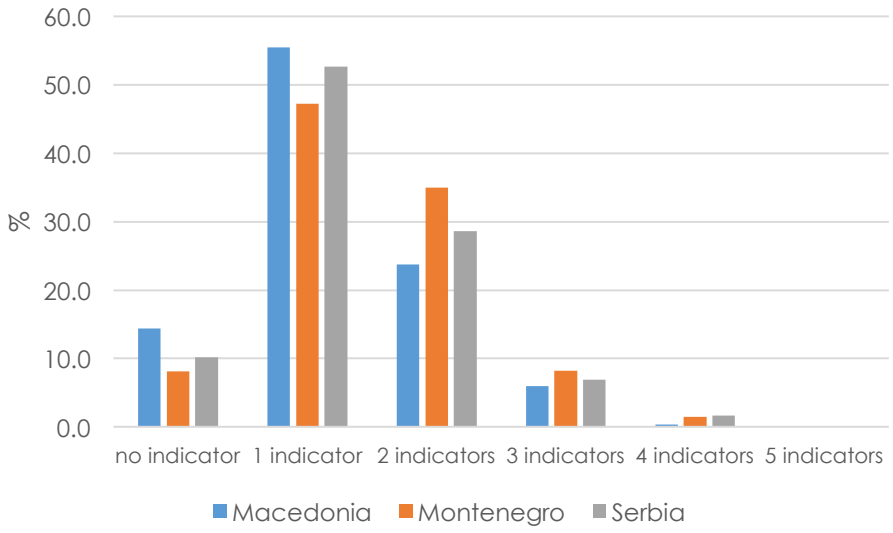
Source: ILO (first indicator); SWTS (the other three indicators); Eurostat (EU-28).
Note: Figures represent proportion of total employment. The broader definition covered youth who worked less than thirty-five hours but who wanted to work more (the ILO indicator), who were overqualified, who expressed insecurity in their jobs, whose salaries were below the reservation wage, and who worked in temporary positions or without written contracts.

Indeed, the issue becomes more severe when the broader definition of youth underemployment is considered. In line with Reynolds (2012), we operated with five

indicators in the broader definition: the individual worked less than thirty-five hours but wanted to work more (the ILO indicator), was overqualified, expressed insecurity in the job, earned a salary below the reservation wage, and worked in a temporary position or without a written contract. One could argue that the four indicators beyond the ILO definition have been more prevalent and persistent in the Western Balkans and have thus been a source of concern for youth. The broader definition enabled us to incorporate the relationship between labor productivity and underemployment: people become underemployed as they learn new skills. Additionally, the broader definition revealed the intensity of underemployment. For the sake of illustration, we arbitrarily took as underemployed those for whom at least two of the five broader conditions were true. The last row of Table 2 makes clear the striking nature of the results: Between half and two-thirds of employed youth in Macedonia, Montenegro, and Serbia met at least two of the five conditions.

Figure 1 presents underemployment intensity in more detail and corroborates our previous observations: only 8%-14.3%of youth in Macedonia, Montenegro, and Serbia had faced no form of underemployment, while half had experienced one underemployment condition. At the other end of the distribution, no respondent had experienced all five underemployment conditions.

Figure 1: Underemployment Intensity by Country

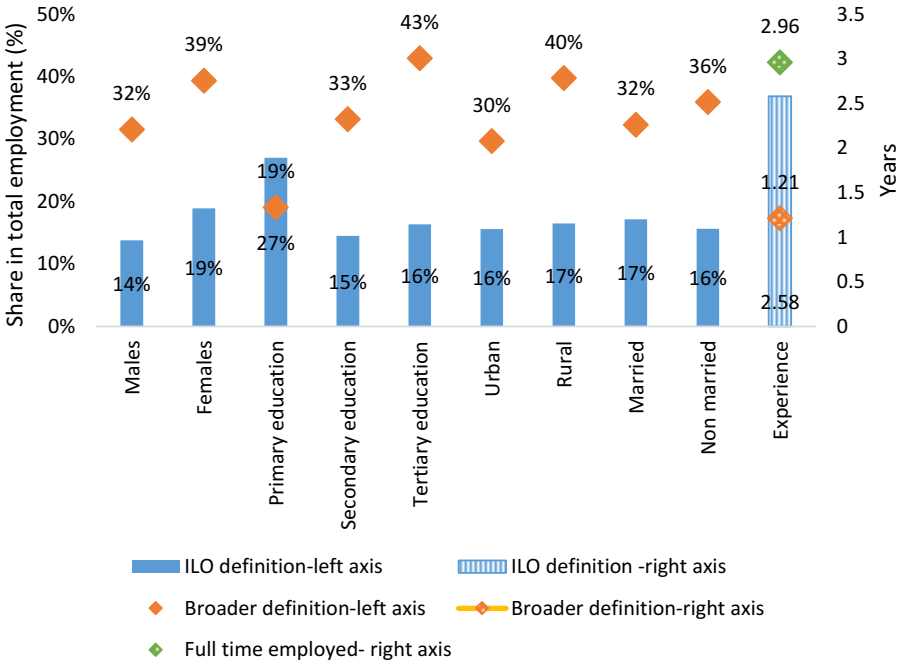


Source: ILO School-to-Work-Transition Surveys (SWTS), 2014-2015

3.2. Underemployment and Personal and Labor-Market Characteristics

Figure 2 presents the percentage of underemployed youth among total employed youth according to key individual and labor-market characteristics: gender, education, geographical location, and marital status. These figures suggest that underemployment was higher among women: on average, 19% (39% by the broader definition) of women were underemployed compared to 14% (32%) of men. Wider differences existed with regard to education: 27% of youth with only a primary education worked less than thirty-five hours and wanted to work more vs. about 15% of youth with a secondary or tertiary education. According to the broader definition, however, almost one out of every two young individuals with a tertiary education was underemployed, mainly driven by self-perceptions of over-qualification and by limited-duration contracts. Rural youth were also more likely to be underemployed, but no significant differences existed between married and unmarried individuals. As expected, youth employed full-time were more experienced than underemployed individuals who worked thirty-five hours but wished to work more; in the broader definition, they had more than twice as much experience.

Figure 2: Underemployment of Youth by Gender, Education, Location, and Marital Status*



Source: ILO School-to-Work-Transition Surveys (SWTS), 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, average underemployment in Macedonia, Montenegro, and Serbia was 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, the highest underemployment was registered in the services sector (on average, 41.8% of employees in this sector were underemployed). The services sector comprises trade, transportation, information and communication, and finance, while intellectual services include professional, scientific, education, arts, and recreation services. As expected, only 3% of those employed in the public sector were underemployed. In the agricultural sector, every third employed person worked thirty-five hours and wanted to work more, and the same fraction reported feeling overqualified for their jobs. In the services sector, the situation was the opposite: 85% and 87% of those employed in services and intellectual services, respectively, held limited-duration contracts. One in every three employees in the services sector reported being overqualified for her or his job, and one in four in intellectual services worked thirty-five hours but wanted to work more.

The general conclusion that underemployment is highest in the agricultural and services sectors holds true when underemployment is observed country-by-country. Notable differences exist among countries when the broader definition is taken into consideration, however. In Macedonia, more than 39.5% of those who work in the manufacturing sector and 35.2% of those in the services sector are underemployed—the two sectors with the highest underemployment. In Serbia, underemployment is generally highest in the services sector, including in other service activities and activities of households as employers. Between 36% and 44% of employed youth in the services sector in Serbia are underemployed. In Montenegro, underemployment is the highest among all three countries. Excluding the manufacturing sector, more than 40% of those employed in all other sectors are underemployed. Underemployment is highest in the construction sector, where 65% of the employed are underemployed according to the broader definition. Interestingly, however, only 4% of those employed in this sector are underemployed according to the ILO definition. This indicates, that despite a desire to work for more than thirty-five hours, the broader indicators that explain underemployment prevailed.

Table 3 - Job Characteristics (Sector and Occupation) and Underemployment

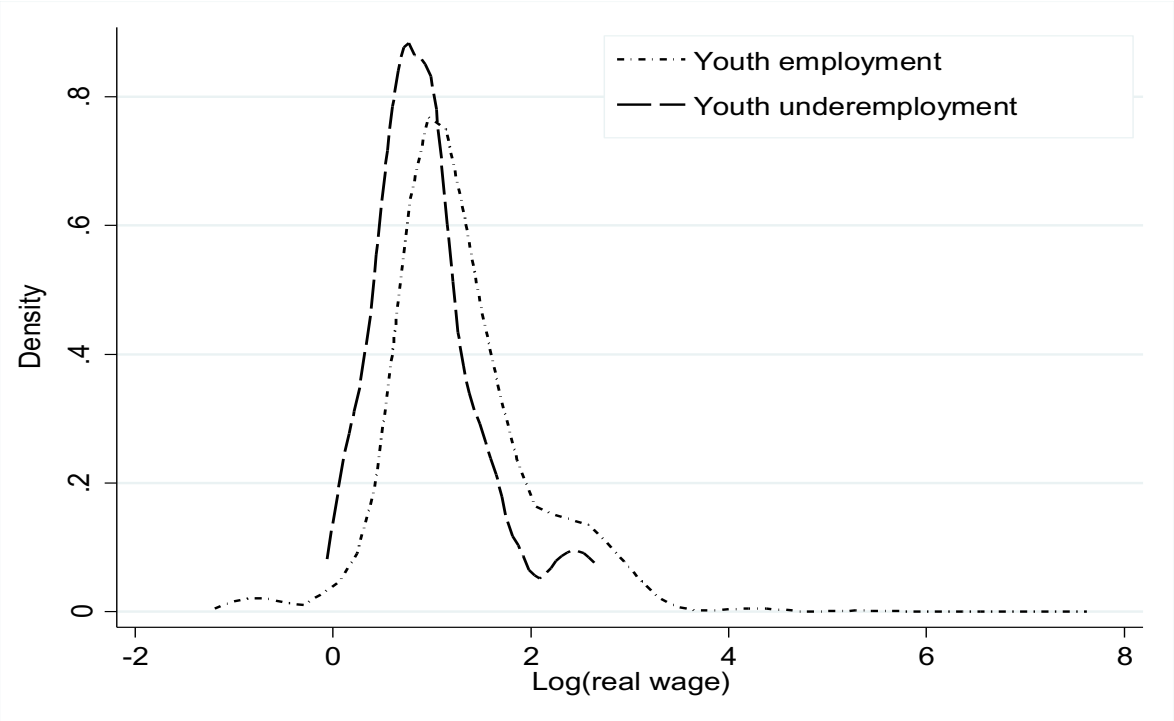
Share of total employment	All three countries		Macedonia		Montenegro		Serbia	
	ILO Definition	Broader Definition	ILO Definition	Broader Definition	ILO Definition	Broader Definition	ILO Definition	Broader Definition
Agriculture	**38.10**	21.58	**30.93**	25.37	omitted	omitted	**41.74**	19.66
Manufacturing	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 Surveys (SWTS), 2014/2015

No significant differences existed among Macedonia, Montenegro, and Serbia with regard to the distribution of underemployment by occupation. As expected, underemployment was highest in the elementary occupations and among agricultural workers and other workers (including clerical support services, sales, trade, and craft workers). Almost one of every two workers in agriculture and other services is underemployed in all three countries. Similarly, the underemployment of agricultural, forestry, and fishery workers is higher according to the ILO definition than it is when the broader definition is applied, indicating that underemployment in this sector is defined mainly by the basic indicator of working less than thirty-five hours and wishing to work more. As expected, those employed as managers and professionals have the lowest underemployment.

Figure 3 presents a kernel-density function of the hourly wages of youth in Macedonia, Montenegro, and Serbia by underemployment status. These results clearly suggest that the wages of underemployed individuals lie to the left of the wages of those who are non-underemployed along almost the entire wage distribution and that those who are underemployed may face systematically lower wages than do those in regular employment.

Figure 3: Wage Distribution by Underemployment Status



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

IV. Data and Empirical Methodology

4.1. Data

We used ILO's School to Work Transition Surveys (SWTS) gathered for about thirty countries, including three ex-Yugoslav transition economies: Macedonia, Montenegro, and Serbia (the only Western Balkan countries represented). The ILO surveyed individuals aged 15-29 and gathered data on demographic variables, education, household conditions, employment, inactivity status, and perceptions regarding paths to employment. Data were gathered for two years for each country and are freely available. We used data from the 2014 survey for Macedonia and the 2015 survey for Montenegro and Serbia. We dropped all youth who were still in educational programs to arrive at a sample of 4,227 combined respondents for all three countries. The exogenous instrument—the regional unemployment rate—was collected from regional statistics in Macedonia, Montenegro, and Serbia. The NUTS-3 level, the lowest available, was used.

4.2. Economic Model

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

$$P(underemployed_i) = \alpha_1 + \beta_{11}exper_i + \beta_{12}exper^2{}_i + \beta_{13}gender_i + \beta_{14}primary_i + \beta_{15}secondary_i + \beta_{16}married_i + \beta_{17}parent\_edu_i + \beta_{18}sector_i + \varepsilon_{19i} \quad (1)$$

$$logrealwage_i = \alpha_2 + \beta_{21}exper_i + \beta_{22}exper^2{}_i + \beta_{23}gender_i + \beta_{24}primary_i + \beta_{25}secondary_i + \beta_{26}married_i + \beta_{27}parent\_edu_i + \beta_{28}sector_i + \gamma_1 underemployed + \varepsilon_{29i} \quad (2)$$

where the condition of being underemployed of person *i* is a function of individual (personal) and labor-market characteristics. We defined underemployment through its intensity form (that is, through the broader definition that encompassed various forms of underemployment) and implemented a count-based approach in defining underemployment intensity. We used the broader definition because the two definitions—the narrow and the broad—are actually different measures. The former measures a specific condition (working less than thirty-five hours but wishing to work more) while the latter measures underemployment intensity.

This approach includes five elements and is, thus, an ordered variable [0, 5]. Note that zero meant that the person was employed but not underemployed (i.e., the job could be considered adequate or decent) while the value was missing for those who were non-employed. As argued before (Section 3), underemployment intensity is particularly strong in Western Balkan countries.

The personal characteristics we included came from Human Capital Theory: education, experience, age, marriage, and gender. Job characteristics included sector: industry, construction, market services, and the public sector. e_i was the error term which was assumed to be well-behaved. Well-being was defined through wages, measured by real earnings per hour in logarithm and adjusted by the purchasing-power-parity rate (PPP) in euros;

In the literature, probit or ordered-probit methods have usually been used for the first equation (Ruiz-Quintanilla & Claes, 1996; Jensen & Slack, 2003; Altonji & Paxson, 1988; Wilkins, 2006; Görg & Strobl, 2001), while probit, simple OLS (Feldman, Leana & Bolino, 2002; Koeber & Wright, 2001), panel-fixed effects (Angrave & Charlwood, 2015), or 3-Stage

Least Squares (Nord, 1989) are used for the second. Generally, however, the models presented in the literature do not take into consideration the econometric challenges discussed below.

4.3. Econometric Challenges

Two main econometric challenges were pertinent to estimating the equations in this study: selection into employment and endogeneity of underemployment and well-being.

First, underemployment was observed only for the employed sample. If the employed labor force had been systematically different from the non-employed, then selection might have affected estimates. Selection bias may result from such observable characteristics as education and experience and, by including these characteristics in the regression, we resolved the issue of selection bias. More importantly, selection bias may have resulted from unobservable characteristics (motivation, informal networks, negotiation skills, etc.). Persons with higher motivation and social capital might have been employed more easily and might have found jobs that more closely "matched" their skills.

To overcome such problems, the Heckman two-stage selection method (1979) is frequently employed (see Wooldridge, 2010: 670). In the first stage (selection equation), those in the active labor force establish identifying restrictions on whether individuals are employed or not. 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 local unemployment rate is used as an instrument to correct selection bias (Bonnal, Lira & Addy, 2009). The variable may be a valid exclusion restriction only in conditions in which actual unemployment is close to what is considered a "natural" rate, however. This is not the case in the countries we examined, where unemployment is persistently higher.

Second, underemployment may be endogenous with respect to well-being. Underemployment may have affected per-hour earnings; at the same time, individuals from poorer households—who faced a poverty risk and whose need for an immediate job was

higher—may have been more likely to accept inadequate jobs. If all facets of household wealth and personal characteristics were not observed, variables correlated with both underemployment and well-being would be omitted, and underemployment would tend to be correlated with the unobserved determinants of well-being. Endogeneity stemming from both simultaneity and omitted variables (unobserved variables) is a serious methodological concern.

To overcome the problem, the literature employs an instrumental-variables approach (Bonnal, Lira & Addy, 2009; Korpi & Tahlin, 2009). Hence, we added a third relationship whereby underemployment was a function of all observables in the first equation, plus a variable affecting only underemployment and not well-being (our instrument). The literature provides little guidance at this point, and variables that affect underemployment but not welfare are scarce. Some researchers (e.g., Gregg, 2001) have used historical conditions related to childhood circumstances and community opportunities that affect future education and business careers as variables. The number of siblings in the household, place of residence during childhood, whether the person grew up with one of the biological parents, and whether economic problems existed in the family during childhood are historical variables related to education (Korpi & Tahlin, 2009).

Number of siblings in the household and childhood conditions were not available in our survey, however. Instead, we used the average regional unemployment rate at the time the person finished schooling, an instrument originally used by Gregg (2001) and subsequently by Gregg and Tominey (2005); Schmillen and Umkehrer (2013); Ghirelli (2015); and Petreski, Mojsoska-Blazevski, and Bergolo (2017). All of these studies actually used regional unemployment rates because they generally analyzed a single country and relied on local labor-market conditions as an instrument. This is a historical condition reflecting the conditions that prevailed at the time the person finished education, so labor-market conditions would be expected to be correlated with 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 jobs).

On the other hand, the average regional unemployment rate at that point in time would not be expected to affect well-being today. Rather, well-being today depends upon today's unemployment rate and labor-market conditions, opportunities for promotion and change of jobs, and so on. We therefore assumed that any potential initial correlation between local labor-market conditions (unemployment rate) and personal well-being at one single point in time (when the person finished education), would fade over time (i.e., the linkage would break as local conditions changed, as the person matured in a professional sense, as she or he acquired new skills, and so on).

We must, however, exercise caution with the use of such an instrument, especially given that the conclusions depend critically upon how it is used. First, if youth migrated from one region to other (sometimes to regions with better job opportunity) in the period between the completion of schooling and employment, then the effect of unemployment on wage perspectives and general well-being would have been underestimated (Petreski, Mojsoska-Blazevski and Bergolo, 2017). This type of inter-regional migration is not uncommon in Macedonia, Serbia, and Montenegro. Another caution has to do with the regional unemployment rate at the time of graduation, which is related to unobservable characteristics of the parents. If some unobserved parental characteristics affected a child's later employment outcomes, this would reduce the power of the instrument. Nevertheless, "it does at least take the unobserved heterogeneity back a generation" (Gregg, 2001: 637). Because we have no mechanism to improve the instrument with regard to the second caution, these considerations should be included when interpreting the results.

Given the concerns pertinent to our proposed instrument, we also pursued an alternative approach, following Lewbel (2012), who proposed a new method that identified structural parameters in regression models with endogenous regressors. The method is used in cases in which exogeneous instruments or validation studies are missing. In the proposed method, the identification comes from observing a vector of variables that are uncorrelated with the product of heteroskedastic errors. Lewbel explained that this is a feature of many models in which error correlations are the result of 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—selection bias and endogeneity—our three estimating equations are the following:

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

$$P(underemployed_i) = \alpha_4 + \beta_{61}exper_i + \beta_{62}exper^2{}_i + \beta_{63}gender_i + \beta_{64}primary_i + \beta_{65}secondary_i + \beta_{66}married_i + \beta_{67}parent\_edu_i + \beta_{68}sector_i + \gamma_2 reg\_unemp_r + \sum \gamma_j internal\_inst_{ij} + \varepsilon_{69i} \quad (6)$$

$$logrealwage_{ij} = \alpha_5 + \beta_{71}exper_i + \beta_{72}exper^2{}_i + \beta_{73}gender_i + \beta_{74}primary_i + \beta_{75}secondary_i + \beta_{76}married_i + \beta_{77}parent\_edu_i + \beta_{78}sector_i + \gamma_4 underemployed + \varepsilon_{79i} \quad (7)$$

where all notations are as before. In addition, $fated_{ij}$ is the father's education specified as a [1,3] variable to reflect primary, secondary, or tertiary education; reg_unemp_r the regional unemployment rate at the time the individual finished schooling; and $internal\_inst_{ij}$, which stands for a set of internally-generated instruments in keeping with Lewbel (2012).

4.4. Estimator

The sequential system of three equations (5-7) can be estimated by using the Limited Information Maximum Likelihood (LIML) approach defined in Roodman's conditional mixed process (CMP) package (2011). LIML implies distributional assumptions that lead to efficient estimates. The standard IV approach, however, does not; there is an implicit trade-off between estimators. The CMP method is appropriate for two broad types of estimations: 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 parameters of the final stage (or stages) are structural while the rest are reduced-form. We could have constructed our CMP estimator to account for the binary/ordered construct of the dependent variables in Equations 5 and 6, as well for the ordered/continuous construct of the dependent

variables in Equation 7, depending upon the variable used to approximate well-being. Using ordered probit for Equation 6, however, would have made calculations cumbersome, and achieving convergence would have been more difficult. As a result, we simply treated ordered variables as continuous. Moreover, we believe that including those who were still studying but working should have helped resolve the issue of selection bias because this cohort was included among the unemployed.

V. Results

5.1. Baseline Results

We analyzed the results of underemployment determinants and its effect on real wages. Table 4 presents the results of the estimated system of Equations 5-7. Columns 1-3 report results obtained with the CMP method. These estimates are purged of selection bias, and we properly accounted for endogeneity of underemployment with respect to wages. Standard identification tests cannot be produced, however. The CMP-based results indicated no correlation between underemployment and wages, likely implying that selection was not a problem.

Columns 4-6 thus present the results of a standard IV approach: Column 4 uses the regional rate of unemployment as instrument, while Columns 5 and 6 use internally generated instruments (2SLS and GMM2S estimators, respectively), following 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 was our preferred method of estimation over 2SLS (Column 5).

The results of validity tests on the instruments are provided at the bottom of the table. The validity tests of the external instrument—regional unemployment at the time the person graduated—showed that the instrument was weak. The under-identification test was above 0, suggesting that the model was under-identified. Moreover, the Montiel-Pflueger robust weak instrument test, which allows analysis when errors are not conditionally homoscedastic

and serially uncorrelated, showed that the instruments developed coefficients with a maximum relative bias of less than 30%, additionally demonstrating that the instrument alone was weak. In the case of the Hansen test statistic, the results cannot be produced because we have just identified the equation. This usually occurs when using one instrument, making the Hansen test irrelevant in this case.

The validity of the instrumental variable and conditional-heteroscedasticity instruments change when we combine them (Columns 5 and 6). The under-identification test of 0.000 indicates that the combined usage of the instrumental variable and the data-generated instruments fully identified the model. The first stage F-test of excluded instruments (joint significance) showed that there was conditional heteroscedasticity, proving that the generated instruments explained the endogenous regressor. This is a condition that is necessary to Lewbel's (2012) approach. Moreover, the Montiel-Pflueger robust weak instrument test showed that the method was correct because the instruments developed coefficients with a maximum relative bias of less than or equal to 5%.

Comparing the results across the wage regression (Columns 3-6), we noted negligible differences in the estimated coefficients. This is a further confirmation that selectivity was not a problem in our data. Still, the effect of underemployment on the wages of young workers was not robustly significant. It was significant in our preferred estimation method (Column 6), suggesting that, as underemployment intensified in its various manifestations, wages declined by an average of 8.4%. Appendix 2 presents a sensitivity analysis for the condition in which the dependent variable was altered into a dummy variable. We provide estimates of how underemployment affected wages if the individual fulfilled one, two, or 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 provided the most robust evidence.

Other wage determinants suggest that persons with a primary education alone received lower wages (by 31.8%, on average) in comparison to individuals with a tertiary education. Married individuals experienced a wage dividend, while parental education brought returns for youth as well. There is no gender wage gap for youth, nor experience matters.

Table 4 could also serve in analyzing the determinants of underemployment, as Column 2 reveals. Most of the explanatory variables were significant for underemployment. The results suggest that the incidence of underemployment diminished with experience, though the effect was convex. Women had a 1.7% higher probability of greater underemployment intensity. Taking into consideration the fragile position of women in the labor markets in Macedonia, Serbia, and Montenegro (low participation in the labor force, high gender pay gaps, high unemployment, and the impact of traditional gender roles), such results were not surprising.

Youth with a primary or secondary education had a lower intensity of underemployment compared to youth with a tertiary education, a finding that is interesting for two reasons. First, one underemployment condition is skills mismatch, implying an obvious correlation between education and underemployment. This result suggests that mismatches in skills and in supply/demand on the labor markets in the countries in our research were more prevalent at higher levels of education. Second, however, the effect of education on underemployment is *a priori* ambiguous because low education may have diminished over-qualification rates but increased under-qualification. Underemployment differed among labor-market sectors; in comparison to industry, it was slightly lower in the public sector and higher in market services.

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

Note: Authors' calculations.

Note: *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. Standard errors are provided in parentheses. Estimates corrected for heteroscedasticity.

We further explored the issue of the determinants of underemployment, and Table 5 presents the results of an ordered probit regression; the coefficients and their significance corroborate the findings of Column 2 in Table 4, indicating that youth with a tertiary education were most prone to underemployment. This finding applies to all three countries, though the effect was strongest in Macedonia. Experience reduced the probability of a higher intensity of underemployment, but the effect was different in each country: it was very strong and convex in Macedonia, mild in Serbia, and nonexistent in Montenegro. The table provides evidence that employment in market services increased the probability of higher underemployment intensity, which tends to be in line with both previous literature and our descriptive statistics, which show that various service sectors had the highest incidence of underemployment; this effect was noted in Serbia. On the other hand, public-sector employment reduced the probability of higher underemployment intensity (though this effect was noted in Macedonia only).

Table 5 - Determinants of Underemployment Intensity

Underemployed as dependent variable	Macedonia	Montenegro	Serbia	Overall
	(1)	(2)	(3)	(4)
Experience (in years)	-0.153***		-0.063***	-0.029*
	(0.051)		(0.013)	(0.017)
Experience^2	0.016***	0.005*		
	(0.006)	(0.003)		
Primary education	-1.487***	-0.994***	-0.515***	-0.994***
	(0.224)	(0.294)	(0.153)	(0.303)
Secondary education	-0.363***	-0.483***		-0.273**
	(0.100)	(0.109)		(0.135)
Marital status (1=married)	-0.243**		0.167*	
	(0.101)		(0.090)	
Regional unemployment rate		0.008		-0.003*
		(0.005)		(0.002)
Labour market characteristics				
Construction sector				
Market services			0.269***	0.141***
			(0.078)	(0.045)
Public sector	-0.223**			-0.096*
	(0.105)			(0.054)
Constant	-1.906***	-1.625***	-1.454***	-1.657***
	(0.136)	(0.163)	(0.099)	(0.029)
Observations	606	494	817	1,917

Note: Authors' calculations.

Note: *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. Standard errors are provided in parentheses. Estimates corrected for heteroscedasticity. Ordered probit regression, estimates are removed based on 15% level of significance

5.2. Results by Country

Table 5 presents our results by country. Note that we present only the results from the use of internally-generated instruments with GMM2S estimators. In the country-by-country analysis, 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 maintained their strength. The bottom panel of Table 5 suggests that all instruments were valid and that the models were properly identified.

The results point to some differences among Macedonia, Montenegro, and Serbia. Underemployment intensity significantly and negatively influenced the wages of young workers in all three countries, though the significance varied. Underemployment in Macedonia had the largest negative effect on wages (14.3%) and was significant at the 1% level. In Montenegro, underemployment intensity decreased the wages of young workers by 11.8% and was significant at the 1% level. Serbia's underemployment intensity was significant at the 10% level and had a negative impact of 7.8% on wages earned by young workers.

The differences in effects may be related to factors such as the minimum-wage level, labor-market policy incentives for youth, and informal youth employment. In specific, the minimum wage in Macedonia was the lowest of all three countries, and youth were targeted in labor-market measures that went into effect only in 2014, the year of the survey. Similarly, the incidence of informal employment among youth was highest in Macedonia, suggesting that the share of youth with informal working contracts was high.

The sensitivity analysis by country presented in Appendix 2 corroborates our baseline results. Underemployment was found to influence wages negatively in all three countries: 2.6% in Macedonia with a 1% level of significance and around 11% in Montenegro and Serbia with a 10% level of significance.

The other coefficients are frequently similar across countries and in line with the overall results. Some differences were found, however, such as that experience was significant only in Macedonia. Education was generally significant in Macedonia, Montenegro, and Serbia, and negative wage returns were strongest in Montenegro. Family circumstances (marriage and parental education) seemed to matter in Serbia. In Macedonia and Serbia,

young public-sector employees were paid more than industry employees whereas, in Montenegro, this was true for the market services sector (perhaps because the tourism industry in Montenegro receives a large influx of summer workers).

Table 6 - Wage Effects of Underemployment by Country

	Macedonia	Montenegro	Serbia
Dependent variable wages	**(1)**	**(2)**	**(3)**
Underemployed	**-0.143*** **	**-0.118*** **	**-0.078***
	(0.041)	**(0.046)**	**(0.042)**
Individual characteristics			
Experience (in years)	0.060**	-0.049	0.012
	(0.026)	(0.033)	(0.036)
Experience^2	-0.006**	0.001	-0.003
	(0.003)	(0.003)	(0.003)
Gender (1=female)	0.085	-0.127	-0.039
	(0.057)	(0.086)	(0.069)
Primary education	-0.128	-0.513***	-0.355***
	(0.143)	(0.155)	(0.134)
Secondary education	-0.261***	-0.255***	-0.048
	(0.073)	(0.095)	(0.081)
Marital status (1=married)	0.004	0.620	0.187**
	(0.060)	(0.483)	(0.075)
Parents education	-0.033	-0.057	0.169***
	(0.047)	(0.110)	(0.056)
Labour market characteristics			
Construction sector	0.117	-0.157	-0.186**
	(0.112)	(0.159)	(0.091)
Market services	0.017	0.239**	-0.037
	(0.063)	(0.094)	(0.062)
Public sector	0.181*	0.026	0.340**
	(0.097)	(0.104)	(0.158)
Constant	1.396***	1.909***	1.203***
	(0.140)	(0.211)	(0.165)
Observations	304	240	520
Instruments' tests			
Under-identification 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

Note: Authors' calculations.

Note: *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. Standard errors are provided in parentheses. Estimates corrected for heteroscedasticity.

†—2 Step Generalized Method of Moments (GMM)

VI. Conclusion

In examining the effect of youth underemployment on wages in Macedonia, Montenegro, and Serbia, we implemented an instrumental variable approach that relied on a regional unemployment rate indicator and internally-generated instruments (Lewbel, 2012, 2018) to control for endogeneity between underemployment and real hourly wages (because both were likely to be explained by unobserved ability factors). We also tested for sample-selection bias by using the maximum likelihood approach (Conditional Mixed Process Estimator) introduced by Roodman (2011).

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

At the policy level, our results suggest that underemployment generated dissatisfaction and impairs financial welfare, and they support the need for more aggressive youth employment policies, including internship and traineeship programs, qualification, re-training, and profiling of the youth into sectors and occupations that need (or will need) more workers.

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Appendix 1

Review of the Empirical Literature

Papers	Model used	Indicators found significant	Aspects analyzed
Bonnal, Lira and 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 selection bias.	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 and Slack (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%)	Well-being and social aspects of underemployment
Jensen and Slack (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 and Dooley (2003) "Good Jobs" to "Bad Jobs": Replicated Evidence of an Employment	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**)	Inadequate and barley adequate employment and poor/fair physical health and depression

Continuum from Two Large Surveys		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***)	
Feldman, Leana, and Bolino (2002). Underemployment and Relative Deprivation Among Re-Employed Executives.	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 (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***)	Underemployment and well-being
Sum and Khatiwada (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 well-being
Altonji and Paxson (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 and Charlwood (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 well-being (men): life satisfaction and less than thirty-five hours underemployed (-0.10*), job satisfaction and thirty-five-40 hours underemployed (-0.18***), psychological well-being and thirty-five-40 hours underemployed (-0.11***), life satisfaction and thirty-five-40 hours underemployed (-0.09*). Association of underemployment and well-being (women): less than 21 hours underemployed and psychological well-being (-0.1**), less than 21 hours underemployed and life satisfaction (-0.13**), 21-34 hours underemployed and psychological well-being (-0.12*), 21-34 hours underemployed and life satisfaction (-0.16**), thirty-five-40 hours underemployed and job satisfaction (0.06**), 50+ hours underemployed and job satisfaction (-0.07*), 50+ hours underemployment and psychological well-being (-0.11***), 50+ hours underemployment and life satisfaction (-0.14***)	Effect of underemployment on working hours and subjective well-being

Friedland and Price. (2003). Underemployment: Consequences for the Health and Well-Being of Workers.	Multiple Regression of Psychological Well-Being on Employment Status Net of Psychological Well-Being	Life satisfaction as dependent: psychological well-being (0.351***), sex (-0.047), marital status (0.062*), hours worked (-0.77*). Depression symptoms as dependent: psychological well-being (0.454***), education (-0.056*), underemployment (income based) (0.079**). Positive self-concept as dependent: psychological well-being (0.53***), sex (-0.041), underemployment (hours based) (-0.043), underemployment (income based) (-0.046), underemployment (status based) (-0.049). Job satisfaction as dependent: psychological well-being (0.459***), hour worked/week (0.107**)	
Ruiz-Quintanilla and Claes (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***), labor market outlook (-0.15**). Unemployment as dependent: primary education (0.733**), disjunctive tactics (0.191**), previous temporary work (0.260*), labor 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***), labor 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
Görg and Srobl (2001). The Incidence of Visible	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**),	Factors influencing the incidence of

Underemployment: Evidence for Trinidad and Tobago.		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 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***)	visible underemployment
Nord (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 and Clain (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 and Stevens (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	Analysis of work transitions for older workers

		(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).	
Koeber. and Wright (2001) Wage Bias in Worker Displacement: How Industrial Structure Shapes the Job Loss and Earnings Decline of Older American Workers.	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 in older workers
Korp and Tahlin (2009). Educational Mismatch, Wages, and Wage Growth: Over-education 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 and Caceres (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.

Appendix 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	N/A	0.134	0.217*
	(0.188)	N/A	(0.124)	(0.112)
Individual characteristics				
Experience (in years)	0.052*	N/A	0.029	0.045
	(0.027)	N/A	(0.038)	(0.028)
Experience^2	-0.005*	N/A	-0.004	-0.005**
	(0.003)	N/A	(0.003)	(0.002)
Gender (1=female)	0.039	N/A	-0.051	-0.075
	(0.066)	N/A	(0.066)	(0.048)
Primary education	-0.208*	N/A	-0.386***	-0.309***
	(0.123)	N/A	(0.128)	(0.111)
Secondary education	-0.225***	N/A	-0.086	-0.085
	(0.080)	N/A	(0.079)	(0.064)
Marital status (1=married)	-0.020	N/A	0.205***	0.135**
	(0.065)	N/A	(0.076)	(0.060)
Parents education	-0.029	N/A	0.139**	0.102**
	(0.051)	N/A	(0.058)	(0.046)
Labour market characteristics				
Construction sector	0.215	N/A	-0.198**	-0.032
	(0.131)	N/A	(0.099)	(0.087)
Market services	0.060	N/A	-0.018	0.051
	(0.066)	N/A	(0.067)	(0.055)
Public sector	0.257**	N/A	0.360**	0.369***
	(0.100)	N/A	(0.158)	(0.107)
Constant	0.929***	N/A	0.980***	0.854***
	(0.226)	N/A	(0.186)	(0.159)
Observations	304	N/A	520	1,064
Test of instruments validity				
Under-identification 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 (τ=5%)	N/A	7,605.098 </ 21.58 (τ=5%)	4,287.825 </ 21.58 (τ=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

Note: Authors' calculations. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. Standard errors are provided in parentheses. Estimates corrected for heteroscedasticity. 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 wages	**(1)**	**(2)**	**(3)**	**(4)**
Underemployed	-0.264***	-0.111*	-0.115*	-0.164***
	(0.056)	(0.058)	(0.066)	(0.054)
Individual characteristics				
Experience (in years)	0.037	-0.051	0.006	0.036
	(0.025)	(0.033)	(0.037)	(0.027)
Experience²	-0.003	0.002	-0.002	-0.004*
	(0.002)	(0.003)	(0.003)	(0.002)
Gender (1=female)	0.081	-0.114	-0.026	-0.043
	(0.054)	(0.083)	(0.066)	(0.048)
Primary education	-0.144	-0.481***	-0.310**	-0.289***
	(0.136)	(0.152)	(0.130)	(0.110)
Secondary education	-0.293***	-0.279***	-0.048	-0.117*
	(0.071)	(0.082)	(0.080)	(0.063)
Marital status (1=married)	0.011	0.656	0.171**	0.092
	(0.054)	(0.573)	(0.072)	(0.057)
Parents education	-0.020	0.011	0.159***	0.096**
	(0.046)	(0.091)	(0.053)	(0.042)
Labour market characteristics				
Construction sector	0.145	-0.130	-0.212**	-0.108
	(0.125)	(0.167)	(0.087)	(0.075)
Market services	0.040	0.239**	-0.052	0.018
	(0.058)	(0.106)	(0.061)	(0.051)
Public sector	0.161*	0.005	0.323**	0.285***
	(0.093)	(0.116)	(0.155)	(0.104)
Constant	1.310***	1.663***	1.167***	1.198***
	(0.122)	(0.195)	(0.153)	(0.120)
Observations	304	240	520	1,064
Test of instruments validity				
Under-identification 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 (τ=5%)	563.008 </ 21.58 (τ=5%)	1,218.093 </ 21.58 (τ=5%)	4,287.825 </ 21.58 (τ=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

Note: Authors' calculations. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. Standard errors are provided in parentheses. Estimates corrected for heteroscedasticity. †—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	-0.095	-0.145*	-0.119
	(0.069)	(0.095)	(0.088)	(0.074)
Individual characteristics				
Experience (in years)	0.044*	-0.045	0.024	0.043
	(0.025)	(0.033)	(0.037)	(0.028)
Experience^2	-0.005*	-0.001	-0.003	-0.004*
	(0.003)	(0.003)	(0.003)	(0.002)
Gender (1=female)	0.052	-0.117	-0.014	-0.052
	(0.064)	(0.085)	(0.074)	(0.051)
Primary education	-0.198	-0.479***	-0.291**	-0.265**
	(0.126)	(0.148)	(0.145)	(0.123)
Secondary education	-0.234***	-0.141*	-0.063	-0.098
	(0.076)	(0.085)	(0.077)	(0.063)
Marital status (1=married)	0.061	0.664	0.166**	0.119*
	(0.058)	(0.438)	(0.077)	(0.061)
Parents education	-0.027	-0.127	0.145**	0.099**
	(0.050)	(0.099)	(0.059)	(0.046)
Labour market characteristics				
Construction sector	0.092	-0.165	-0.216**	-0.141*
	(0.102)	(0.161)	(0.104)	(0.081)
Market services	0.024	0.183*	-0.054	0.017
	(0.064)	(0.096)	(0.070)	(0.056)
Public sector	0.228**	0.082	0.353**	0.324***
	(0.103)	(0.102)	(0.161)	(0.108)
Constant	1.215***	1.789***	1.113***	1.104***
	(0.139)	(0.192)	(0.151)	(0.120)
Observations	304	240	520	1,064
Test of instruments validity				
Under-identification 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 (τ=5%)	175.867 </ 21.58 (τ=5%)	289.124 </ 21.58 (τ=5%)	393.140 </ 21.58 (τ=5%)
First stage test of excluded instruments (Prob > F)	0.0000	0.0000	0.000	0.000
Hansen J statistic (p-value)	0.009	0.359	0.475	0.524

Note: Authors' calculations. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. Standard errors are provided in parentheses. Estimates corrected for heteroskedasticity.

†—2 Step Generalized Method of Moments (GMM)