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Gorana Krstić and Peter Sanfey

Earnings Inequality and the Informal Economy:
Evidence from Serbia

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The wiiw Balkan Observatory

Global Development Network Southeast Europe

Earnings inequality and the informal economy: evidence from Serbia[1]

Gorana Krstić[2] and Peter Sanfey[3]

December 2008

Abstract

We analyse the extent and evolution of informality and inequality in the Serbian labour market between 2002 and 2007, using data from the Living Standard Measurement Surveys (LSMS). Two surprising results emerge. First, the level of informal employment has risen significantly over the period, despite strong economic growth and the introduction of a range of market-oriented reforms. Second, the level of inequality in earnings seems to have remained more or less constant over the period, in contrast to the experience of other countries at a similar stage of transition. We show that informal employees earn significantly less than those in the formal sector, controlling for a range of other variables, and informality plays an increasingly important role in explaining earnings inequality.

JEL classification: J3, J4, P2

Keywords: informal economy; inequality; Serbia

1. Introduction

The Serbian labour market has been in a state of great flux throughout the current decade, following the beginning of transition in late-2000 and early-2001. This paper examines two aspects of the labour market – informal employment and earnings inequality. Using nationally representative survey data from 2002 and 2007, we first document the degree of informality in the labour market and the amount of inequality in earnings, using different measures of inequality. We also see whether informality has declined over this period, at a time when important laws to encourage and simplify business registration have been introduced in Serbia. Using a regression-based methodology, we then test whether the degree of informality in the labour market influences or explains the level of, and change in, earnings inequality. We also investigate the role of other factors that explain this phenomenon. Finally, the paper draws the relevant policy conclusions for labour market reform.

Our results contain a number of interesting findings. Perhaps the most striking is that the level of informal employment has risen sharply in Serbia between 2002 and 2007. This is a counter-intuitive result, but can be explained by the specifics of the Serbian case, as discussed below. A second result of interest is that the level of inequality appears to have remained more or less constant over the period in question, both for formal earnings and in the informal sector, where inequality is particularly pronounced. Finally, the analysis identifies informality as an important determinant of inequality in 2007, but not in 2002. In addition, informal workers earn less (in monthly terms) than formal workers, even when we control for a range of other characteristics. These results all highlight the importance for the Serbian authorities of tackling informality and encouraging formalisation through the labour market.

The structure of the paper is follows. The next section contains some background material on Serbia's transition to date and on existing literature on informality and inequality in transition countries. The following section details a methodology that allows us to attribute the level and change in earnings inequality to its determining factors. Two subsequent sections respectively review the data used and report the main empirical results. A final section concludes the paper with some policy implications.

2. Background

Serbia was a latecomer to transition. Throughout the1990s Serbia's development was marked by armed conflicts, international isolation, and political and economic instability. The collapse of the common market due to the break-up of the Socialist Federal Republic of Yugoslavia and subsequent international sanctions seriously affected the Yugoslav traded sector and led to a massive contraction of industry. Industrial activity fell by 50 per cent during the first half of the 1990s and per capita GDP plummeted to the 1969 level. Since mid-1990s real output has been increasing each year, with the exception of 1999 when real GDP fell by an estimated 18 per cent due to the Kosovo conflict and the NATO air strikes. Prior to the 1990s, living standards were comparatively high relative to most socialist economies. The collapse of economic activities and the rise in both open unemployment and underemployment led to an impoverishment of the population. Socio-economic conditions were also

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exacerbated by the influx of nearly 700,000 displaced people. The reduction in income-generating opportunities in the formal economy and the poor enforcement of tax and labour regulations, coupled with mild penalties for violations, encouraged the growth of the informal economy, which became an important safety net for many.[4]

In January 2001, the new Serbian government, led by Zoran Djindjić, launched a sweeping reform programme aimed at accelerating the transition to a market economy. Since then, the economy has greatly expanded and living standards have improved markedly. The economic reforms centred on macroeconomic stabilisation, price and foreign exchange liberalisation, the restructuring of the banking system, the privatisation of state- and socially-owned enterprises and improvements in the business regulatory framework. These reforms have stimulated capital inflows and led to a shift in economic activity to the private sector. There has been a sharp reduction in annual inflation and steady real economic growth averaging about 6 percent per year over 2001-2006 (See, for example, EBRD, 2008). However, the ILO-defined unemployment rate has remained stubbornly high at about 20 percent over 2004-2007. In spite of significant progress on a number of fronts, the EBRD transition indicators of cumulative reform progress continue to show Serbia lagging behind many of its neighbours (See EBRD, 2008). In particular, the formal labour market in Serbia, despite the introduction of improved legislation on labour and employment, remained relatively rigid over the post-2000 period and functioned poorly in contrast to its considerably more flexible informal counterpart (for a discussion, see World Bank, 2004). As a result, informal activities are a key feature of economic life in Serbia, with important implications for the rest of the economy and for general welfare.

There is a huge literature both on the informal economy and on inequality, but a rather limited amount applied so far to transition economies, and very little to Serbia. With regard to the informal economy, two recent multi-country studies that include estimates for transition economies are Schneider (2004) and Christie and Holzner (2004). Schneider's paper provides estimates of (what the author terms) the "shadow" economy (relative to recorded GDP) for countries from around the world. The size of the shadow economy in Serbia and Montenegro (still one country at the time) is estimated at 39.1 per cent of measured GDP in 2002/03, up from 36.4 per cent in 1999/2000. As the unweighted average across 25 transition countries in 2002/03 is 40.1 per cent, Serbia and Montenegro is situated a little below the average size of this group. Christie and Holzner (2004) analyse a range of south-eastern Europe (SEE) and central eastern Europe and the Baltics (CEB) countries. They take a different approach from that of Schneider (2004) and focus instead on household tax compliance. They derive data on "true" household income (from final consumption data) and statutory tax rates and compare actual tax revenue with what it should be if everyone paid the right amount of tax. The gap gives an indication of the size of the shadow economy. A wider range of estimates compared to Schneider's results are found, with Serbia, perhaps surprisingly, estimated at just 19 per cent of GDP.

The above research on informal activity has focused on calibrating the size of the unmeasured sector relative to its measured counterpart. The analysis of informal

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[4] Over the 1990s, the ratio of the informal economy to registered GDP in the Federal Republic of Yugoslavia was approximately one-third (see Krstić, 2002).

activity at the level of the labour force participant has been even more limited. Recent estimates according to the Living Standards Measurement Survey (LSMS) data show that informal employment accounted for 30 per cent of total employment in 2002 and 35 per cent in 2003 (Krstić, 2004).[5]

Rising inequality is a common feature of the transition process. Some authors have argued that inequality has risen further in those countries that actively pursued reforms (see, for example, Milanović, 1998). In contrast, recent research for Serbia (Krstić *et al.*, 2007) suggests that, following a period of rising inequality in the late-1990s, the early years of post-Milosević reform (2001-03) were in fact characterised by falling inequality. Recently-released LSMS data for the middle years of the present decade will allow us to extend this analysis to see what the latest trends are in Serbia.

Most transition countries have seen a sharp rise in labour earnings inequality since the transition began (World Bank, 2000), driven by significant changes in the labour markets. Rising wage disparities had the largest impact on the increase of total income inequality (Milanović 1999; Mitra and Yemtsov, 2006). Factors usually cited as a major driving force of increased earnings inequality are increased returns to education, and sectoral and structural shifts in employment (towards services and less regulated forms of employment, e.g., temporary contracts), as well as changes in the institutional setting of wage bargaining (Leitner and Holzner, 2008). There is also empirical evidence of a significant and positive link between the level of income inequality and the share of the informal sector in the economy (see Rosser *et al.*, 2000). Rutkowski (1996) highlighted the fact that excluding the informal sector in transition countries where it accounts for a significant part of overall economic activity is likely to underestimate the actual level of earnings inequality. Recent research on Bosnia and Herzegovina has shown that earnings inequality is more pronounced in the informal economy relative to the formal economy (Krstić and Sanfey, 2007). This suggests that income inequality declines if informal employment falls as a percentage of total employment. We will test this proposition for Serbia, using the data and methodology described below.

The examination of inequality in Serbia has attracted only modest empirical research since the transition started, with Milanović (2003) and Krstić *et al.* (2007) being exceptions. Milanović (2003) explores inequality of consumption and income and the contribution of income sources to total income inequality, using the LSMS for 2002, while Krstić *et al.* (2007) focuses on inequality of labour market earnings, using data from the Labour Force Survey (LFS) over 1996-2003.

3. Methodology

In this paper we follow the approach of Krstić *et al.* (2007) in using an OLS regression-based approach suggested by Fields (2002) to identify the key determinants of the level of main job earnings inequality in Serbia for a given year, as well as the changes in inequality between 2002 and 2007. This approach allows the contribution of each regression factor to the level of earnings inequality to be

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[5] The definition of informal employment in this study covered: (1) workers employed with no social contributions paid; (2) people employed in a private unregistered firm; and (3) the employed who work at home, from door-to-door, in the flea market and in other places.

quantified and isolated.[6] It is relatively straightforward to implement even as the number of explanatory variables increases. In addition, the framework can be easily extended to allow the relative influence of a change in one factor on inequality between two points in time to be isolated.[7] There are drawbacks to the methodology, but its relative simplicity compared to other, more computationally burdensome methods, such as the one proposed by Wan (2004) makes it more suitable for our purposes.[8]

The methodology can be summarised as follows.[9] We start by assuming a wage determining function of the following form:

$$\ln(w_i) = \beta_0 + \sum_{j=1}^{k} \beta_j X_{ji} + u_i,$$ [1]

where $\ln(\cdot)$ denotes the natural logarithmic operator, X_{ji}, $j=1,\ldots k$ represents wage determining variables (e.g., labour force experience, education, marital status, private sector/informal sector, industry sector, settlement, region, hours worked). Equation [1] can be re-expressed as:

$$\ln(w_i) = \sum_{j=0}^{k+1} a_j Z_{ji} = \mathbf{aZ'},$$ [2]

where $\mathbf{a} = [\beta_0 \quad \beta_1 \quad \beta_2 \quad \beta_3 \ldots \ldots \beta_k \quad 1]$, and $\mathbf{Z} = [1 \quad \mathbf{X_{1i}} \quad \mathbf{X_{2i}} \quad \mathbf{X_{3i}} \ldots \ldots \mathbf{X_{ki}} \quad \mathbf{u}]$.

The standard inequality measures, defined on the vector of wage (w_i), are continuous and symmetric functions that equal zero when all workers receive the mean wage. Given the above wage determining function, we can thus define an inequality index on the vector of log wages as $I(\cdot) = I[\ln(w_1), \ln(w_2), \ln(w_3)\ldots\ldots\ln(w_N)]$. It can be shown (see Shorrocks (1982)), that the share for the jth factor in the inequality of the income measure used is given by:

$$S_j[\mathbf{w}] = \frac{\text{cov}[a_j Z_j, w]}{\sigma^2(\ln(w))} = \frac{a_j \times \sigma(Z_j) \times \text{cor}(Z_j\ w)}{\sigma(\ln(w))},$$ [3]

where $\sigma(\cdot)$ denotes the standard deviation, $\text{cor}(\cdot)$ the correlation coefficient, and where $\sum_{j=1}^{k+1} S_j[w] = 1.0$ holds for any inequality index that is continuous and symmetric. Fields (2002) verifies that once a log-linear model is specified, the results obtained, using this methodology, are not dependent on the inequality measure used.

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[6] Fields and Yoo (2000) and Ravallion and Chen (1999) provide applications of this methodology to Korea and rural China respectively.

[7] See Fields (2002) for a number of additional advantages the methodology possesses over the non-regression based procedures that attempt to isolate overall inequality into its within-group and between-group components.

[8] See Krstić *et al.* (2007) for further discussion. An important drawback of Wan's approach is that the software allows only a limited number of variables in the regression that could be used for decomposition. The software allows a decomposition for a maximum of 27 variables. However, our OLS regression model for monthly earnings has 29 variables (see Table 5 in section 5).

[9] This discussion draws on Krstić *et al.* (2007).

In order to account for differences in inequality between two time periods (0 and 1), we note:

$$[I(\cdot)]_1 - [I(\cdot)]_0 = \sum_{j=1}^{k+1} [S_{j,1} \times [I(\cdot)]_1 - S_{j,0} \times [I(\cdot)]_0] . \qquad [4]$$

The contribution of the jth factor to the change in equality over the two time periods is given by:

$$\Pi_j = \frac{[S_{j,1} \times [I(\cdot)]_1 - S_{j,0} \times [I(\cdot)]_0]}{[[I(\cdot)]_1 - [I(\cdot)]_0]} , \qquad [5]$$

where $\sum_{j=1}^{k+1} \Pi_j = 1.0.$

This expression [5] isolates the changing factors that drive the differences in earnings inequality between two years. In our research we will use the Gini, Theil entropy measure and the variance of log wages as the dispersion measures.

4. Data and labour market trends

The data for this study are drawn from two waves of the Living Standards Measurement Study (LSMS) conducted in Serbia (excluding Kosovo) in May-June 2002 and in May-June 2007. In line with standard LSMS methodology, the surveys collected information from households and individuals on their income and consumption level, economic activities, and other characteristics. The total number of interviewed households was 6,386 in 2002 corresponding to 17,357 individuals, and 5,557 households (19,725 individuals) in 2007. The data are representative at the national level, and by regions (6 regions) and type of settlement (urban/rural).[10]

The earnings measure available within the LSMS is based on monthly pay in the main job and excludes taxes, social security contributions and any welfare payments related to the earnings received. We distinguish between earnings received from the formal economy and those from informal activities. Recent research on male labour market earnings inequality in Serbia (Krstić *et al.*, 2007) based on the Labour Force Survey (LFS) data did not distinguish between formal and informal earnings, as the Serbian LFS was not designed to measure the scale of informal economy. Thus, in this study the LSMS data are used as it allows us to define the informal economy in a comparable way in 2002 and 2007, using the same definition in both cases (see Krstić, 2004). Thus, the definition of informal employment in this study covers:

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[10] For more details on sampling methodology, see Living Standard Measurement Study: Serbia 2002-2007, published by the Serbian Republican Statistical Office (RSO) in 2008.

(1) workers employed with no social contributions paid;
(2) people employed in a private unregistered firm; and
(3) the employed who work at home, from door-to-door, in the flea market and in other similar places.

There is also information available in the LSMS (but not in the LFS) on earnings arrears. We can determine whether the earnings measure reported reflects arrears in the reference month. This is an important variable because it is well known that arrears may have an impact on earnings dispersion over time, depending on whether its incidence is declining or increasing.

Table 1 contains the main labour market indicators in Serbia in 2002 and 2007. Despite the strong economic growth over this period, it is clear from Table 1 that all main labour indicators appear to be weaker in 2007 than five years ago. Both the participation and employment rates have declined by 3 and 4 percentage points respectively, while the unemployment rate has increased by nearly 2 percentage points. These data suggest that job creation in Serbia remains a challenge. The expansion of the private sector has failed to absorb the labour shed by the restructuring and privatisation processes.

The table also shows the significance of employment in the informal economy in Serbia. Nearly 28 per cent of total employment (aged 15-64) was in the informal sector in 2002, and this percentage increased to 35 per cent in 2007, or even to 37 per cent if those who worked with a verbal, or no contract with the employer are included (information on the latter is available only in 2007). Among employees only (i.e. excluding self-employed, farmers and unpaid family workers), the share of those working informally increased from 11 per cent to 20 per cent over the same period. This rise in informal employment has come about despite the improved business climate over the period in question.

Why has this happened? One possible reason for this unexpected result is the regressive character of the labour tax system that was introduced in 2001 and was in effect until January 2007. By imposing a high tax burden on low-income labour,[11] the incentives for employees to join the formal economy diminishes, as they have to give up a significant portion of what they can get by working at the same job informally. Employers also have an incentive to evade this tax, for the same reason (Arandarenko and Vukojević, 2008). The regressive labour tax system created disincentives for firms to hire low-cost labour and is likely to reduce labour demand, especially in the formal sector for many vulnerable groups of workers who experienced difficulties in finding employment (World Bank, 2006).

Informal employment was until recently also encouraged by the ease in gaining access to a range of social benefits by the simple act of registering as unemployed with the employment service. The fact that many registered unemployed were in fact working

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[11] The tax wedge for low wage earner receiving 33% of average wage was 47.1%; for a worker receiving average wage it was 42.2%, while it was down to 34.5% for a wage eight times higher than the average wage (even after accounting for annual personal income tax).

in the informal economy (33 per cent) and had easy access to health insurance and other social benefits represented a hidden subsidy to enterprises engaged in the informal economy (Krstić and Carbonese, 2009). Such occurrences are now ruled out; the employment service is no longer responsible for covering health insurance for jobseekers.

Table 1. Main labour market indicators for Serbia, 2002-2007

	2002	2007
Participation rate	67.2	64.2
Employment rate	59.3	55.3
Unemployment rate	11.7	13.9
Employment in informal economy (in % of total employment, 15-64)	27.6	34.9

Note: Participation and employment rates expressed in percent of working age population (15-64)
Source: LSMS 2002, 2007.

Table 2 contains a more detailed breakdown of the two categories – formal and informal. Several points of interest arise. First, it seems that males, young (aged 15-25), less educated, workers in non-wage employment, and in agriculture are more likely to be employed in informal than in formal activities in both years considered. Second, comparing the informal economy between 2002 and 2007, it appears that the share of older workers (aged 46-64) in the informal economy increased, as well as the share of better educated (having secondary education or more), self-employed and unpaid family workers, while the share of workers in services declined. Third, informal workers earn less than formal workers in both years considered, about 8 per cent and 43 per cent in 2002 and 2007 respectively; the gap has therefore increased significantly over 2002-2007. Earnings in the informal sector also tend to be more dispersed, as measured by the coefficient of variation for monthly earnings.

Table 2. Characteristics of employment in formal and informal economy, 2002-2007
(in %, population between 15-64)

	2002			2007		
	Informal	Formal	All	Informal	Formal	All
All	100.0	100.0	100.0	100.0	100.0	100.0
Gender						
Male	59.9	55.4	56.7	59.4	55.5	56.9
Female	40.1	44.6	43.3	40.6	44.5	43.1
Age categories						
15-25	15.1	7.9	9.9	10.7	7.3	8.5
26-45	45.8	53.0	51.0	44.3	53.0	50.0
46-64	39.1	39.1	39.1	45.0	39.7	41.5
Educational level						
No school or incomplete primary	12.9	4.3	6.6	9.3	1.1	4.0
Primary school	26.5	14.9	18.1	27.4	9.9	16.0
Vocational or three-year secondary	24.2	21.0	21.9	18.7	16.3	17.1
Secondary or high school	29.5	39.0	36.4	35.8	46.5	42.8
College	4.0	8.1	7.0	3.7	9.4	7.4
University	2.9	12.6	10.0	5.1	16.8	12.7
Employment type						

Wage-employment	60.7	91.1	85.0	49.2	88.9	75.0
Self-employment	9.9	3.9	5.1	14.2	1.9	6.2
Farmers	26.7	4.6	9.0	25.3	9.1	14.7
Unpaid family workers	2.8	0.5	0.9	11.4	0.2	4.1
Sector of economic activity						
Agriculture	40.8	15.5	22.6	44.5	5.8	19.3
Industry	12.7	30.4	25.5	21.9	32.9	29.1
Services	46.6	54.1	52.0	33.6	61.3	51.6
Average monthly net main job earnings (in dinars)*	8,634.3	9,425.2	9,272.8	16,246.5	24,707.0	22,495. 7
Coefficient. of variation for monthly net main job earnings	1.123	0.795	0.861	0.805	0.633	0.689

Notes: * For those who reported positive hours worked.
Source: LSMS 2002 and 2007.

5. Empirical results

This section now turns to a detailed analysis of some of the questions raised in the introduction. Specifically we focus on two issues: earnings inequality in the formal and informal economy and its change; and the role of different factors that explain both the level of, and change in, earnings inequality. The importance of the informal economy as one of these factors is highlighted in a special section.

5.1. Formal and informal earnings inequality

Has earnings inequality risen in recent years in line with the progress in transition-related reforms and how does earnings inequality differ between the formal and informal economy? Table 3 shows average monthly main job earnings in the formal and informal economy, along with the inequality of earnings in each sector and year, using a range of inequality measures. Three points stand out. First, we see that monthly earnings in the formal economy were higher than in the informal economy in 2007 but not in 2002 (the same pattern is observed for hourly earnings, as shown in Table A1 in the Annex). Second, the change in inequality in both sectors remains statistically insignificant according to almost all measures of inequality employed in our analysis (see values of *z*-scores). Third, earnings inequality is significantly higher in both years in the informal economy relative to the formal economy. Again, this result holds regardless of which measure of inequality is compared. One possible reason for this last result is the existence of the minimum wage (set out at about 40 per cent of the average wage), which is enforced in the formal sector but not in the informal sector. The other reason may be that informal economy attracts a higher share of poorly educated workers compared to the formal economy, as shown in Table 2.

Table 3. Monthly earnings inequality, 2002-2007

	2002	2007	z-score, 2007 vs 2002
Average monthly net main job earnings, in dinars	9,172.3	22,659.0	
Informal	9,370.6	16,647.5	
Formal	9,148.0	24,067.3	
Inequality measures for overall earnings			

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	0.1620	0.1720	0.533
Theil entropy measure			
st.errors	(0.0148)	(0.0115)	
Gini coefficient	0.2958	0.3147	1.500
st.errors	(0.0092)	(0.0087)	
Variance of logs	0.3301	0.3826	1.944
st.errors	(0.0155)	(0.0221)	
Inequality measures for informal earnings			
Theil entropy measure	0.2401	0.2295	-0.203
st.errors	(0.0397)	(0.0342)	
Gini coefficient	0.3585	0.3579	-0.020
st.errors	(0.0224)	(0.0213)	
Variance of logs	0.4554	0.5564	1.258
st.errors	(0.0463)	(0.0656)	
Inequality measures for formal earnings			
Theil entropy measure	0.1524	0.1524	0.000
st.errors	(0.0140)	(0.0116)	
Gini coefficient	0.2877	0.2966	0.688
st.errors	(0.0090)	(0.0094)	
Variance of logs	0.3147	0.3009	-0.542
st.errors	(0.0165)	(0.0194)	
Formal vs. informal earnings, z-score			
Theil entropy measure	-2.0863	-2.1362	
Gini coefficient	-2.9290	-2.6291	
Variance of logs	-2.8628	-3.7343	

Note: Sample relates to employees, aged 15-64 years, who reported non-zero earnings and positive hours worked.
Source: LSMS 2002, 2007.

Before turning to a detailed analysis of inequality using the regression-based approach outlined earlier, we turn to a brief examination of the nature of Serbian earnings inequality using the non-regression based procedure adopted by Jenkins (1995). This approach allows a decomposition of the inequality measures by factor (or group) components. Thus, the total wage inequality is decomposed into parts attributable to between-group and within-group inequality using the Theil entropy measure from Table 2. The analysis is undertaken for groups comprised of gender, labour force experience, educational level, marital status, industry sector, informal sector, settlement type, region and arrears. Table 4 shows the detailed results. The general finding is that most of the earnings inequality is explained by within group inequality. Regarding between-group inequality, the educational level is responsible for the greatest part of that inequality in both years followed by arrears and region in 2002 and region and settlement type in 2007. It should be noted that the role of education as the factor most responsible for between group inequality was also observed using the LFS sample of male employees over 1996-2003 (Krstić *et al*., 2007).

Table 4. Within group and between group monthly earnings inequality,
Theil entropy measure, 2002-2007

	2002	2007	2002	2007	2002	2007
	Within group inequality		Between group inequality		% between group in all ineq.	
Gender	0.1597	0.1712	0.0023	0.0009	1.42	0.52
Working experience	0.1612	0.1671	0.0009	0.0049	0.53	2.85
Education	0.1437	0.1158	0.0183	0.0563	11.32	32.71
Marital status	0.1613	0.1617	0.0007	0.0010	0.45	0.58

Industries	0.1600	0.1651	0.0020	0.0069	1.23	4.01
Informal sector	0.1620	0.1631	0.0000	0.0089	0.02	5.17
Settlement type	0.1598	0.1608	0.0022	0.0113	1.36	6.55
Region	0.1547	0.1578	0.0073	0.0143	4.52	8.30
Arrears	0.1518	0.1701	0.0102	0.0019	6.29	1.12

Source: LSMS 2002, 2007.

For all groups examined, except arrears and gender, the trend over time is upwards. There is very little between-group earnings inequality explained by the informal sector in 2002 but it considerably increased in 2007. In contrast, there is evidence of a potentially important role for arrears in 2002 but it declined considerably in 2007.

5.2. Factors that determine the level and change in earnings inequality

We now turn to identifying some key factors that determine the level of main job earnings in Serbia. Table 5 reports OLS estimates for the augmented Mincerian monthly earnings equation based on the sample of employees who reported non-zero earnings in their main job and are aged between 15 and 64 years. Besides the standard explanatory variables in the earnings regression, we also include an informal sector variable according to the definition of the informal economy adopted in this study (see section 3). The variable "wage arrears" is defined as a binary variable that takes the value one if received earnings are delayed by two months or more, and zero otherwise.

The fits of the equations are satisfactory and the included regressors explain 29 per cent and 40 per cent of the total variation in monthly earnings in 2002 and 2007 respectively. The estimated coefficients for the human capital measures (the educational qualifications and the labour force experience variables) are generally well determined in both years. The estimated wage returns appear to rise monotonically with labour force experience in 2007 and the returns to the higher educational qualifications are reasonable in both years by the standards of transition economies (see Newell and Reilly, 1999). There is an indication that the point estimates for higher education significantly increased between 2002 and 2007, as happened in many other countries in their early years of transition.

The informal sector effect is not statistically significant in 2002, but it appears highly significant in 2007 with informal employees earning 22 per cent less, *ceteris paribus,* relative to the formal employees. This is an important result, because it highlights the growing advantages of being employed formally relative to informally, and therefore suggests that Serbia is moving towards a more mature market economy.

With regard to the estimated industry effects, workers in agriculture earn less than in industry, and this disadvantage of agricultural workers appear to increase in 2007. The estimated arrears effects are highly significant in both years. Employees with wage arrears experience a wage disadvantage of 31 per cent in 2002 and 36 per cent in 2007, *ceteris paribus*.

Location and region effects are highly significant. Residing in urban areas provides a premium relative to residing in a town, while employees in Belgrade and Vojvodina enjoy significant wage premia relative to those living in Central Serbia.

Table 5. OLS regression estimates for monthly earnings, 2002-2007

| | 2002 | | 2007 | |
	Coef.	Std. Err.	Coef.	Std. Err.
Male	0.215	(0.017)***	0.190	(0.018)***
Work experience				
<= 5 years work experience	-0.039	(0.031)	-0.064	(0.030)**
5-10 years	f		f	
10-20 years	-0.050	(0.025)**	0.084	(0.028)***
20-30 years	-0.047	(0.025)*	0.106	(0.030)***
years>30	-0.006	(0.033)	0.123	(0.035)***
Educational level				
No formal education	-0.075	(0.072)	-0.105	(0.073)
Primary	f		f	
Vocational or three-year secondary school	0.093	(0.029)***	0.152	(0.030)***
Secondary	0.257	(0.027)***	0.290	(0.028)***
High school	0.388	(0.033)***	0.507	(0.040)***
University	0.638	(0.032)***	0.865	(0.038)***
Marital status				
Married	0.146	(0.027)***	0.055	(0.024)**
Single	f		f	
Divorced/widowed	0.140	(0.040)***	0.062	(0.042)
Industry sector				
Agriculture	-0.058	(0.034)*	-0.265	(0.044)***
Industry	f		f	
Services	0.010	(0.018)	-0.005	(0.019)
Informal sector	0.019	(0.031)	-0.250	(0.028)***
Urban	0.034	(0.018)*	0.064	(0.017)***
Region				
Belgrade	0.175	(0.024)***	0.244	(0.027)***
Vojvodina	0.091	(0.023)***	0.075	(0.024)***
Central Serbia	f		f	
West Serbia	-0.044	(0.031)	0.063	(0.027)**
East Serbia	0.038	(0.033)	0.007	(0.030)
South-East Serbia	-0.115	(0.027)***	-0.045	(0.030)
Arrears	-0.371	(0.022)***	-0.449	(0.056)***
Monthly hours (log)	0.181	(0.031)***	0.140	(0.021)***
Constant	7.591	(0.167)***	8.569	(0.115)***
R2 adjusted	0.288		0.402	
Sample size	4257		3795	

Notes: (a) Sample relates to employees, aged 15-64 years, who reported non-zero earnings. (b) The dependent variable is the log of monthly earnings. All explanatory variables with the exception of monthly hours (logged) are binary variables. (c) The estimation procedure is OLS and White (1980) estimated standard errors are reported in parentheses. (d) The critical value for the Breusch-Pagan test for heteroscedasticity at the 0.05 level is 22.5 in all cases. (e) f denotes category omitted in estimation. (f) ***, ** and * denote respectively statistical significance at the 0.01, 0.05 and 0.10 levels using two-tailed tests. *Source*: LSMS 2002, 2007.

We now turn attention to examining the more important factors that determine the level of labour market earnings inequality as reported in Table 6. The first point to

note is that although the fits of the estimated equations are respectable (table 5), a considerable amount of the total variation in log monthly earnings in both years is unexplained by the wage determining factors. The residual components, though declining, are sizeable and most of the inequality is thus unexplained.[12] There remains a great deal of noise in the wage determination process in Serbia and unobservable factors appear to dominate the process. In terms of the explained component, however, Table 6 identifies educational qualifications, as the most important factor, which accounts for 43 per cent and 50 per cent of the explained level of inequality in 2002 and 2007 respectively. The second important factor in 2002 is arrears, accounting for around a quarter of explained level of inequality, but its importance diminished in 2007. In 2007 however, the second most important factor in explaining the level of earnings inequality is the informal sector, while its role in 2002 was minimal. In addition to those factors, region plays an important role as well, in both years considered. Other factors, such as gender, labour force experience, marital status, settlement type and monthly hours worked played a negligible role in explaining the level of earnings inequality in Serbia.

Table 6. Factor inequality shares for monthly earnings, 2002 and 2007

Factors	2002	2007
Male	0.0205	0.0151
Work experience	0.0021	0.0138
Education	0.1151	0.1908
Marital status	0.0046	0.0018
Industry	0.0027	0.0320
Informal sector	-0.0006	0.0487
Urban	0.0041	0.0109
Region	0.0349	0.0327
Arrears	0.0686	0.0135
Hours (log)	0.0168	0.0253
Residual	0.7311	0.6153
Sample size	4257	3795

Notes: The calculations are based on expression [3] in the text.
Source: LSMS 2002, 2007.

Table 7 provides further insights into the change in inequality using expression [5], as it isolates the changing factors that drive the differences in earnings inequality between 2002 and 2007. In this exercise we use the Gini, the Theil entropy measure and the variance of log wages as the dispersion measures. Given the marginal increase in earnings inequality between 2002 and 2007, a positive (negative) sign indicates factors responsible for widening (narrowing) earnings inequality. It is comforting that there is a consensus across almost all measures regarding the directional effect the factors exert on inequality. Both education and the informal sector are found to exert a widening influence on inequality. (The role of the informal economy in changing inequality will be further analysed in the following sub-section.) An increase in wage premiums to education is also found to be one of the most important factors that were driving the rise in wage disparities in the Central European countries (World Bank, 2000). However, the relative importance of these factors appears to be sensitive to the inequality measure used. The one factor that acts to narrow earnings inequality is employee arrears, due to the reduction in arrears. The share of employees with arrears

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[12] This is not uncommon for transitional economies. See Newell and Reilly (1999) for wage equation fits for a selection of transitional economies.

declined from 18.4 percent in 2002 to 2.8 percent in 2007. A similar feature was observed in Russia and other CIS countries, where reduction in arrears explains the decline in inequality among wage earners (Alam *et al.*, 2005; Rutkowski *et al.*, 2005).

Table 7. Contribution of factors to changes in monthly earnings inequality, 2002-2007

Factors	Theil entropy measure	Gini	Variance of logs
Male	-0.0724	-0.0692	-0.0188
Work experience	0.2033	0.1965	0.0873
Education	1.4169	1.3732	0.6663
Marital status	-0.0436	-0.0419	-0.0158
Industry	0.5066	0.4897	0.2160
Informal sector	0.8472	0.8187	0.3584
Urban	0.1210	0.1171	0.0536
Region	-0.0029	-0.0017	0.0189
Arrears	-0.8790	-0.8471	-0.3326
Hours (log)	0.1630	0.1581	0.0787
Residual	-1.2603	-1.1934	-0.1121

Notes: The calculations are based on expression [5] in the text.
Source: LSMS 2002, 2007.

5.3. Informality as a factor that determines the level and change in earnings inequality

Although employment in the informal economy did not have any influence on earnings inequality in 2002, it was the second most important factor, after education, in explaining the level of earnings inequality in 2007. This is in line with the estimated earnings regression results which show that informal sector variable was not significant in 2002, but highly significant in 2007. Table 6 shows that informal sector contributed to around 13 percent of explained level of inequality in 2007. This widening influence on earnings inequality could be linked to the increased share of employees working informally between the two years in question. A similar feature is observed in many transition countries, where the increased share of temporary or short term contracts is seen as a factor contributing to rising earnings inequality (Alam *et al.*, 2005).

As noted earlier, the share of employees (i.e. in wage employment) working in the informal economy in Serbia increased considerably, from 11 per cent to 20 per cent over 2002-2007. This is mainly driven by the increased share of those who did not pay social security contributions. It appears that reforms on labour taxes and social security contributions, introduced at the beginning of 2007, did not bring a visible reduction in informal employment and an increase in formal employment, although the average fiscal burden of employees' net salaries decreased from 73 per cent to 62 per cent (Krstić and Corbanese, 2009).

There is no doubt that Serbia made significant progresses in the improvement of the business climate over the years considered, as numerous surveys indicate. However, the World Bank's *Doing Business 2009* (World Bank, 2008) indicators show that Serbia continues to score poorly in some of the areas studied, particularly in the area of paying taxes and starting a new business. Policy-makers therefore need to re-double efforts to simplify the tax system and ensure firms and workers have an

incentive to register and operate within formal structures. Formalization may be promoted by better enforcement of tax collection and more effective tax administration.

6. Conclusion and policy implications

This paper has attempted to identify the importance of informal economy in describing the level of main job earnings inequality within a given year and the change in that inequality between 2002 and 2007. The paper spans the period of significant transition-related reforms with substantial progress made in the improvement of the business climate. The availability of new, high-quality LSMS data and applied regression-based methodology have allowed us to draw a number of important conclusions regarding informality and inequality in the Serbian labour market.

Our analysis revealed that informal activities are highly significant in the Serbian labour market, and appear to have grown considerably over 2002-2007. Nearly 28 percent of total employment (aged 15-64) was in the informal sector in 2002, and this percentage increased to 35 percent in 2007. This is a counter-intuitive result, but can be explained by number of factors. One possible reason is the regressiveness of the wage taxation system that was present since 2001 until 1 January 2007. By imposing a high tax burden on low-income labour, the incentives for employees to join the formal economy diminishes, as they have to give up a significant portion of what they can get working at the same job informally. It appears that reforms on labour taxes and social security contributions introduced at the beginning of 2007, have not yet bring a visible reduction in informal employment although the average fiscal burden of employees' net salaries decreased significantly. Informal employment was until recently also encouraged by the ease in gaining access to a range of social benefits through the simple act of registering as unemployed with the employment service, while actually working in the informal economy.

A second result of interest is that the level of inequality appears to have remained broadly constant over the period in question, both for formal earnings and in the informal sector, where inequality is particularly pronounced, although some increase has occurred. This is a surprising result, especially in light of the rise in informal activities and the enhanced role of education. Relatively stable earnings inequality in Serbia appears in contrast to findings of Milanović (1998) for other selected transitional economies where a positive relationship between reform and inequality is detected. Other studies also show that most transition countries experienced large increase in earnings inequality since the transition began (World Bank, 2000). The sharp decline in arrears over the period in question has helped to counteract those forces pushing in the direction of greater inequality.

Finally, the analysis identifies informality as an important determinant of inequality in 2007, but not in 2002. Informal sector is found to exert a widening influence on earnings inequality, which could be linked to increased share of employees working informally between two years in question. However, the most important factor that explains both the level of explained inequality in 2002 and 2007, and contributed to slightly increased inequality over that period, appears to be educational qualification.

An increase in wage premiums to education is also found to be the most important factors that were driving the rise in wage disparities in the Central European countries (World Bank, 2000).

The results highlight two points that need to be addressed by policy makers. First, measures taken so far to reduce informality have been a failure. Even though the economy has grown strongly over the present decade, the level of informality has increased, implying both unfair competition to those in the formal sector who are subject to the usual taxes and regulation, and a loss of much-needed revenue to the government. The paper provides evidence that many still find it relatively easy to register as unemployed but continue to work in the informal sector. The recent changes (noted above) on access to health insurance and other benefits should help to improve the situation, but continued vigilance will be needed to ensure that social assistance is targeted at the most needy.

Second, the returns to education have increased over the period. This is an encouraging result in that it brings out the benefits of a greater focus on educational attainment and suggests that the benefits to expending greater resources on schools and universities may be higher than before. Recent research has once again highlighted the strong link between educational attainment and economic growth, particularly in transition countries (see EBRD, 2008), and points to the need for greater government spending in this area.

Annex:

Table A1. Average monthly and hourly main job earnings and hours worked, 2002-2007

	2002	2007
Average monthly net main job earnings, in dinars*	9,172.3	22,659.0
Informal	9,370.6	16,647.5
Formal	9,148.0	24,067.3
Average monthly hours worked**	168.3	169.7
Informal	167.2	157.6
Formal	168.4	172.5
Average hourly net main job earnings, in dinars	62.4	203.5
Informal	73.1	200.6
Formal	61.1	204.2

Notes: Sample relate to employees aged 15-64 years. * For those who reported positive hours worked.
**For those who reported positive monthly wages.
Source: LSMS 2002, 2007.

References

Alam, A., M. Murti, R. Yemtsov, E. Murrugarra, N. Dudwik, E. Hamilton and E. Tiongson (2005), Growth, Poverty, and Inequality: Eastern Europe and the Former Soviet Union, The World Bank, Washington, D.C.

Arandarenko M. and V. Vukojević, 2007. Labor Costs and Labor Taxes in the Western Balkans, World Bank, Washington DC.

Christie, E. and M. Holzner, 2004. Household tax compliance and the shadow economy in central and southeastern Europe, *mimeo*, Vienna Institute for International Economic Studies.

European Bank for Reconstruction and Development, 2008. Transition Report 2008: Growth in Transition, EBRD, London.

Fields, G.S and G. Yoo, 2000. Falling labor income inequality in Korea's economic growth: patterns and underlying causes, Review of Income and Wealth 46, 139–160.

Fields, G.S., 2002. Accounting for income inequality and its change: a new method with application to the distribution of earnings in the United States, Mimeo, School of Industrial Relations, Cornell University.

Jenkins, S., 1995. Accounting for inequality trends: decomposition analyses for the UK, 1971-86, Economica 62, 29-64.

Krstić, G., 2002. An empirical analysis of the formal and informal labour markets in the FR Yugoslavia (1995-2000), University of Sussex, Brighton.

Krstić, G., 2004. Labour markets in Serbia and Montenegro, background paper prepared for Agenda for Economic Growth and Employment, Report No. 29258-YU, The World Bank, Washington, DC.

Krstić, G. and P. Sanfey, 2007. Mobility, poverty and well-being among the informally employed in Bosnia and Herzegovina, Economic Systems, 31, 311-335.

Krstić, G., J. Litchfield and B. Reilly, 2007. An Anatomy of Male Labour Market Earnings Inequality in Serbia – 1996 to 2003, Economic Systems 31, 97-114.

Krstić, G. and V. Corbanese, 2009. In search of more and better jobs for young people of Serbia, ILO Employment Papers, ILO Budapest (forthcoming).

Leitner, S and M. Holzner, 2008. Economic inequality in Central, East and Southeast Europe, *Intervention: European Journal of Economics and Economic Policies*, 5(1), 155-188.

Milanović, B., 1998. Income, Inequality, and Poverty during the Transition from Planned to Market Economy, World Bank Regional and Sectoral Studies, World Bank, Washington DC.

Milanović, B., 1999. Explaining the increase in inequality during transition, Economics of Transition 7, 299-341.

Milanović, B., 2003. Incidence of Social Transfers; Inequality, p.43-66 in Bogićević et al., Poverty and Reform of Financial Support to the Poor, Republic of Serbia Ministry of Social Affairs and Center for Liberal Democratic Studies, Belgrade.

Mitra, P. and R. Yemtsov, 2006. Increasing Inequality in Transition Economies: Is There More to Come?, World Bank Policy Research Working Paper No. 4007.

Newell, A.T. and B. Reilly, 1999. Rates of return to educational qualifications in the transitional economies, Education Economics 7, 67–84.

Rosser, J.B., Rosser, M.V., Ahmed, E., 2000. Income inequality and the informal economy in transition economies, Journal of Comparative Economics, 28, 156-171.

Rutkowski, J., 1996. Changes in the wage structure during economic transition in Central and Eastern Europe, World Bank Technical Paper No. 340 – Social Challenges Series.

Rutkowski, J., S. Scarpetta, A. Banerji, P. O'Keefe, G. Pierre and M.Vodopivec, 2005. Enhancing Job Opportunities: Eastern Europe and the Former Soviet Union, World Bank, The World Bank, Washington DC.

Schneider, F., 2004, The size of the shadow economies of 145 countries all over the world: first results over the period 1999 to 2003, IZA Discussion Paper No. 1431.

Shorrocks, A. F., 1982, Inequality decomposition by factor components, Econometrica 50, 193–211.

Wan, G., 2004, Accounting for income inequality in rural China: a regression-based approach, Journal of Comparative Economics 32, 348-363.

World Bank, 2000. Making Transition Work for Everyone: Poverty and Inequality in Europe and Central Asia, The World Bank, Washington D.C.

World Bank, 2004. Serbia and Montenegro: Republic of Serbia, An Agenda for Economic Growth and Employment, Report No. 29258-YU, The World Bank, Washington, DC.

World Bank, 2006. Serbia: Labor market assessment, The World Bank, Washington D.C.

World Bank, 2008. Doing Business 2009. The World Bank, Washington DC.