Ekonomika preduzeća

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he last edition of *Ekonomika preduzeća* was introduced with the paper written by *M. Arandarenko* and *D. Aleksić* discussing the reliability of the Labor Force Survey and the official unemployment rate in Serbia. The article was essentially inspired by the criticism expressed in the article presented at the last Kopaonik Business Forum written by *P. Petrović*, Chairman of the Fiscal Council. Since we genuinely strive to promote a fruitful debate between experts and constructive scientific critique, this edition of *Ekonomika preduzeća* offers the response to the introductory paper of the previous edition. In addition to this, the present edition represents an interesting amalgam of papers with focus on Serbia exclusively and of those focusing on the region around it. The selected papers are a sort of puzzle pieces which depict a complex economic situation in Serbia and its relative position vis-à-vis pear countries.

As we had previously pointed out, in the *Introductory Paper, P. Petrović, D. Brčerević*, and *S. Minić* respond with counterarguments to the abovementioned article. The authors claim that *M. Arandarenko* and *D. Aleksić* did not provide adequate empirical evidence for their hypothesis, and offer proof that are not in the line with conclusions made by A*randarenko* and *Aleksić*. With every intention not to be biased towards any of the contributors to the debate, we truly believe that both articles will deepen the discussion and accelerate the search for better understanding of the issue of unemployment.

In the first paper in the *Finance* section, a group of authors led by *D. Lončar* tests the fundamental premise of the structure-conduct-performance paradigm. The authors explore the existence and intensity of the linear interplay between the variation of the degree of concentration and the degree of competition within the banking sectors in Serbia, Croatia, Romania and the Czech Republic, respectively. The results were conducive to interesting conclusions. Namely, in the six-year period from 2009 to 2014, the degree of concentration was the lowest in Serbia and the highest in Croatia. On the other hand, the analysis of the degree of competition and its relation to profitability indicated that the banking sector in the Czech Republic was the least profitable in the entire sample.

In the same section, *L. Barjaktarović*, *R. Pindžo* and *D. Barjaktarović* examine the validity of the SMEs model of investment loan approval employed by local banks when considering whether to financially support the investment needs of the SMEs clients. The authors introduce views on how to resolve the flaws in the analyzed model based on an ameliorated decision-making process. Another trio of authors, *I. Simeunović*, *I. Domazet* and *J. Zubović*, examine the viability of applying a bonus-malus system in establishing automobile liability premium rates. The authors have developed an optimal tariff system which reflects the equivalence principle between the amounts of the premiums and the reported losses of individual policyholders.

In the last paper in the same section, *J. Kočović*, *M. Paunović* and *M. Jovović* present theoretical and methodological aspects of the analysis of the cost of capital calculation and demonstrate the procedure on the case of the Serbian Oil Company. Technical as it is, the debate takes into consideration all the problems and obstacles an evaluator in Serbia faces, as well as the distortions and contradictions caused by the thin capital market and bank-centric financial system.

In the *Transition and Restructuring* section, a duo of authors, *O. Gavrić* and Đ. *Kaličanin* deal with the omnipresent issue of long-term sustainable growth. Energy-efficient operations, green clusters and circular economy are at the center of the suggested approach.

The last paper pertains to the *Business Cases* section, where *N. Mrđa* discusses opinion-makers influencing the successful restructuring, along with privatization of a well-known Serbian company from the pre-transition period, Sintelon. The author argues that a company in the privatization process also needs other components of restructuring strategy, such as organizational change, new business model implementation, information system redesign, etc. Sintelon remains one of the most successful examples of privatization in Serbia and its story deserves to be told to the academics and business professionals. We hope that this paper will encourage other authors to continue with this type of analysis.

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FISH THAT FLY DO EXIST, BUT ARE RARE: ARE THE OFFICIAL LABOUR MARKET DATA MISREAD OR UNRELIABLE?

Postoje ribe koje lete, ali su retke – da li je zvanična statistika tržišta rada pogrešno protumačena ili nepouzdana?

Abstract

In our previous paper, Petrović et al. [7], we showed that large swings in employment since 2008, reported by the Labour Force Survey, were highly improbable and most likely had not happened. Our main arguments were that the official employment data were completely disconnected from other macroeconomic trends, such as economic activity, private consumption or social contribution revenues, as well as that nothing even remotely similar had occurred in any comparable economy. Our conclusions were fiercely challenged in Arandarenko et al. [1], albeit based on (in their words) 'relatively rare' hypothetical cases and on alleged methodological errors, without the authors supplying any empirical evidence for their claims whatsoever. Although the burden of empirical proof was on Arandarenko et al., this time we did their job showing that their hypothesizing is entirely empirically unfounded and that our main conclusions for Serbia still hold. However, what is more important than arguing with hypothesizers, is that the suspicious trends in official employment statistics have continued in 2016, indicating that the disturbing reliability issue has not yet been resolved. Thus, it is a pressing issue for the Statistical Office of the Republic of Serbia (SORS) to come out with revised, correct and credible employment series from 2008 onwards.

Keywords: *employment, economic activity, labour market, Labour Force Survey, Serbia*

Sažetak

U prethodnom radu Petrović et al. [7], pokazali smo da su izuzetno snažne promene zaposlenosti nakon 2008. godine merene Anketom o radnoj snazi teško moguće i da se, po svemu sudeći, nisu desile. Ovu tvrdnju argumentovali smo potpunim odudaranjem zvaničnih podataka o zaposlenosti od drugih makroekonomskih trendova (privredna aktivnost, lična potrošnja i doprinosi za obavezno socijalno osiguranje), kao i činjenicom da se ništa slično, ni u približnoj meri, nije dešavalo u drugim uporedivim zemljama. To je, međutim, pretenciozno osporeno u radu Arandarenko et al. [1], u kom su, umesto empirijskih dokaza, ponuđeni (kako i sami autori kažu) „relativno retki" hipotetički slučajevi kada je kretanje zaposlenosti kao u Srbiji moguće, uz navodne metodološke greške u korišćenim procedurama Petrović et al. Premda je empirijsko dokazivanje trebalo da bude obavezan deo kritika Arandarenko et al, ali je izostalo, mi smo umesto njih taj posao obavili u ovom radu i tako pokazali da su ponuđene „retke" hipoteze potpuno neutemeljene, tj. da nalazi naše prethodne studije nesporno važe. Daleko važnije od polemisanja sa tvorcima imaginarnih hipoteza je to da zvanična statistika i u 2016. godini prikazuje sumnjive trendove na tržištu rada, što ukazuje na to da problemi koji dovode do nepouzdanosti tih podataka najverovatnije još uvek nisu otklonjeni. Smatramo veoma važnim da RZS revidira postojeće serije podataka od 2008. godine, kako bi one bile tačne i kredibilne.

Ključne reči: *zaposlenost, ekonomska aktivnost, tržište rada, Anketa o radnoj snazi, Srbija*

Introduction

Official employment records in Serbia measured by the Labour Force Survey (LFS) show two episodes of unusually large swings in the number of employed persons accompanied by relatively minor GDP fluctuations. First, in the period 2008-2012, there was an enormous drop in the number of employed persons, by about 600,000 (from 2.8 million to 2.2 million, approximately 20%), with an increase in the unemployment rate of over 10 pp (from about 14% to about 25%). Second, in the period 2012-2015, a strong growth in the number of employed persons followed, reaching (depending on the series used) between 210,000 and 340,000 (10-15%) with a fall in the unemployment rate of about 6 pp (to about 18%). In Petrović et al. [7], we analyzed these developments and concluded that such major changes in the labour market, in times of economic stagnation, were unlikely and that it was almost certain that they had not taken place, i.e. that the LFS provided insufficiently reliable data on employment trends in Serbia. The main argument for this claim is the convincingly demonstrated fact that the official records on labour trends were completely disconnected from other relevant macroeconomic trends (GDP, private consumption, collection of contributions and income taxes) in both of these episodes. Moreover, the credibility of these official data on labour market trends in Serbia is further challenged by the fact that there is no comparable country in Central and Eastern Europe (CEE) in which an employment decline of approximate magnitude (except perhaps Latvia) was observed in the years that followed the financial crisis of 2008 (although many have gone through a much deeper recession). Similarly, there is no CEE country that has seen such an intense employment growth since the end of 2012 (even though the majority have achieved significantly higher GDP growth). Most importantly, we have not observed the very unusual phenomenon of a complete disconnect between the employment data contained in the LFS and the abovementioned macroeconomic indicators in other comparable CEE countries.

In a critique of our work, Arandarenko et al. [1] argue that there truly is such a complete disconnect in Serbia. In other words, the critics claim that "either the episode of intensive employment decline in the 2008-2012 period, or the following episode of strong employment recovery" are indisputable, i.e. that they do not stem from unreliable employment measurements in the LFS. They anchor their arguments in a handful of hypothetical examples (admitting themselves, for a few of those to be "unusual and relatively rare"), in which such unlikely labour market trends like the ones recorded in Serbia would be possible, with several objections to the methodology and terminology used by Petrović et al. However, in an attempt to disprove our results, Arandarenko et al.– as a rule – go no further than putting forward these unusual and hypothetical (as well as stylized) examples, never offering any empirical evidence that these hypothetical possibilities have actually occurred in Serbia. Furthermore, they do not quantify the impact of their methodological objections, which makes it impossible, from an academic point of view, to assess whether those objections could potentially affect our main findings and to what extent. Thus, they do not offer anything beyond pure hypothesizing.

In sections 2 through 5, we examine Arandarenko et al.'s critique and provide empirically founded answers for their hypothetical examples. In Section 6, we show that the latest LFS data (i.e. through the first half of 2016) remain suspicious. What follows is a short summary of our arguments which are given at length in the rest of the paper.

Arandarenko et al. open their critique by stating that we are using a "mistaken employment series", which allegedly led us to faulty conclusions. However, we show (see Section 2 below, Table 2) that the very same "incorrect series" is widely used by IMF, European Commission and World Bank when analyzing employment trends in Serbia. Would that mean that Arandarenko et al. suggest that their analyses are also flawed? Furthermore, these "incorrect series" are extensively used in domestic public arena, and especially in the political circles, to demonstrate "intensive employment decline in the 2008-2012 period" and subsequent "strong employment recovery from 2013 onwards". It was the very aim of our analysis to show that these developments were highly improbable and the employment series unreliable, or if you wish incorrect. Thus, there is a broader, more significant issue than arguing with

Arandarenko et al., and that is that SORS should produce revised, comparable and correct employment series from 2008 onwards, which is essential both for international organizations and domestic policy makers, but also for the public at large.

Coming back to Arandarenko et al., they carry on their critique by reporting what they believe to be the correct series ("the right panel of Table 1 illustrates the correct employment series" cf. p. 213). But then, their right panel reports two different numbers for employment in 2014: 2,421,270 and 2,544,188 and, unless Arandarenko et al. come out with a persuasive hypothetical example, both numbers cannot be correct. Therefore, at least one of the respective series that the observations belong to (see Table 1 [1, p. 213]) must be, contrary to Arandarenko et al.'s claims, wrong. It is, perhaps, not the best way for Arandarenko et al. to demonstrate their command over data, particularly as this is the only time they refer to data in the paper.

More importantly, a repeated analysis using the data Arandarenko et al. claim to be correct yields exactly the same solution: there is an intrinsic problem in labour market monitoring in Serbia. As shown in Figure 1 (Section 3 below), regardless of employment series used, a record high employment growth in Serbia in the period 2012-2014 that is completely disconnected from GDP growth (indicating high employment elasticity to GDP) was indeed a strange and unique case in CEE. However, Arandarenko et al. believe that this disconnection reflected in employment elasticity of 12.5 (or 20, depending on the series used) is nothing unusual, since in theory this indicator could take any value between minus infinity and plus infinity. To support their belief, they use a hypothetical example of a country experiencing an unusual and relatively rare (as they say) phenomenon of a strong employment increase which is not related to GDP growth. By doing so, Arandarenko et al. incorrectly apply the argument of Kapsos [6] who warns that, for countries with GDP growth close to zero, the employment elasticity may exhibit large swings arising from relatively small changes in the underlying variables, notably employment. Nevertheless, this is not the case in Serbia: however measured, the employment increase by 8.7% or 14.2% could hardly be described as a "relatively

small change", nor is the GDP growth of 0.7% over the 2012-2014 period close enough to zero to significantly distort the result. Not to mention that Arandarenko et al. do not provide any empirical evidence that such hypothetical example is possible at all, e.g. by showing that it ever happened in a country comparable to Serbia. In fact, the reference that Arandarenko et al. heavily rely on [6] also contradicts them, showing that employment elasticity, apart from some freak cases, remains in the range between 0 and 1 or close to it, just as we have suggested. Strangely enough, in their earlier paper, Arandarenko et al. [2] do state that the "broadest theoretical expected range" for employment elasticity is between zero and one (see p. 154), which leaves us puzzled as to who we should argue with.

Another indication of unreliability of the official labour market data based on the LFS is an even less convincing episode of enormous decrease in the number of employed persons in the period 2008-2012, which amounted to about 600,000 (21%) (see Section 3 below). Again, Serbia clearly stands out as an outlier among all other countries in CEE – although many of them experienced a much deeper recession. The only country which experienced an employment drop of similar proportions was Latvia (15.6%). However, as opposed to Serbia, there is a clear explanation for the steep employment slump in Latvia. It had undergone the deepest recession in Europe during the crisis (in 2009, GDP plunged by 17.7%), while at the same time sharply cutting the public sector employment (from about 8% in the health sector to about 29% in the state administration). Nothing of the kind occurred in Serbia, where 600,000 jobs (as reported by the LFS) disappeared in just four years, while GDP decreased by only 2.2%. Even more awkward is that this alleged employment dive supposedly had to have occurred entirely in the private and informal sector, thus shaving it by almost one-third, as hard data indicate pretty much stagnant (around 750,000) employment in the public sector.

In an attempt to explain how these extreme swings in the Serbian labour market were possible while the economy was stagnating, Arandarenko et al. recourse to yet another empirically unfounded and rather hypothetical example. In their belief, such an enormous drop in employment in the 2008-2012 period could be

seen as a "departure from the mean", while the recent episode of strong employment recovery could represent a "regression towards the mean". But again, they do not back up their belief with any empirical evidence. Without a proper econometric test showing that the corresponding time series is oscillating around that mean, i.e. that the series is mean reverting – this statement boils down to an empty and indeed trivial claim: employment decreases in recessions and increases during the periods of economic recovery. Moreover, Arandarenko et al. use this empirically unfounded belief not only to "prove" that the previous episodes of large employment swings were possible, but also to conclude that there was very likely still room for employment to grow faster than GDP. However, without due econometric testing, on which both Arandarenko et al. [1] and [2] remained silent although well-equipped, the argument above is just another hypothetical belief they so often recourse to.

In the following sections, we revisited the issue of the observed disconnection between employment trends and GDP (Section 4), and employment and private consumption and social contribution proceeds respectively (Section 5). These glaring disconnections are just further stark indications of the official employment statistics unreliability. But not for Arandarenko et al.

The relation between employment and output is widely studied and used in economics (e.g. theory of production and growth) and empirically estimated and proven (e.g. production functions), not least by estimating employment elasticity as in the reference Arandarenko et al. extensively use [6]. Still, they dispute this relation in Serbia, claiming that it is conceivable for the employment to grow far above GDP growth over several years in a row. Technically, this implies that employment elasticities are in the double digits over a period spanning several years, even though this is far outside the theoretically and empirically expected range. However, they do not even attempt to provide empirical evidence for such bold claims. They choose to "prove" them by constructing an uncommon example to explain employment growth not accompanied by GDP increase. This alone would probably suffice in discarding the arguments of the hypothesizers as hollow, but we took a step further in Section 4, and

inspected the data for Serbia. Even a rough examination of these data, which Arandarenko et al. were well-equipped to but chose not to perform, convincingly refutes the hypothetical model they have advanced.

Specifically, Arandarenko et al. attempt to explain the high growth of employment with GDP stagnation – allegedly taking place in Serbia, as implied by the LFS data – by a general position and a well-known fact that not all jobs are created equal. No one disputes that not all jobs are created equal, but for employment to grow by 10% while GDP remains almost stagnant, significant and adverse changes should have occurred in the labour market in Serbia after 2012. Particularly, a steep drop in the average work hours and/or productivity would have been needed to offset the impact of a significant employment increase on GDP growth, and such claim should be supported by data. Arandarenko et al. take a step in this direction by constructing a hypothetical example implying the structural changes needed for an employment increase concurrent with GDP stagnation (the diagram with workers in neckties). However, the authors did not attempt, at least indicatively, to test their hypothetical example using the published and readily available data for Serbia.

Had they tried, they would have seen for themselves that there were no indications that such changes in the labour market had actually occurred in Serbia. So we analyzed the data from the LFS in 2012 and 2014 at the lowest level of disaggregation, instead of Arandarenko et al. The data showed that, in the observed period, the number of employees had grown in practically all existing categories monitored – both for above-average and below-average productivity levels (different age groups, lowest and highest education groups, formal and informal jobs, full-time and part-time, paid and unpaid, almost in all activities, etc.). While all these jobs are different, with some affecting GDP growth more, some less, as long as they are all growing – which is what the LFS data indicate – GDP can hardly be stagnating.

In the following Section 5, we addressed the attempt of Arandarenko et al. to refute the discrepancy between the employment trends (as reported by the LFS) and the trends of private consumption and social contribution

revenues respectively by invoking methodological issues. In Petrović et al., we demonstrated these discrepancies and used them as an additional argument (together with the argument on GDP) that the labour market trends, as depicted by the LFS, were unlikely.

We now show, one more time, that the divergence between the official employment data and social contribution revenues is so large that they could be reconciled only if the real salary in the formal sector had dropped from 10% to 20% over the 2012-2015 period. As nothing even remotely similar had occurred, this proves beyond any doubt that these two trends are divergent. Namely, social contribution collection from 2012 to 2015 decreased by over 5% in the real terms, while at the same time, according to the LFS, there was an increase in the number of the formally employed by 11.5% (or about 5%, corrected for the amended SORS methodology). So, in order for these two trends to be reconciled, there would have had to have been a steep drop in real average salary in the formal economy from 2012 to 2015, which is exactly what Arandarenko et al.'s critique implies.

However, by inspecting data on average salary from the RAD survey, which encompasses over 80% of the formally employed, we showed that the steep drop in real average salary had not occurred. Furthermore, by scrutinizing the remaining 20% of the formally employed not covered by the RAD survey, we also demonstrated that the plunge in real average salary could not have happened.

But even a glance at macroeconomic developments in Serbia over the 2012-2015 period would suffice to show that a real salary dive in the formal sector of more than 10% is extremely unlikely. But not for hypothesizers Arandarenko et al., who seem not to grasp that working with data in economics very often implies approximations, and that approximations can be used to prove a point as we did above. Therefore, they should provide numbers showing that the approximation we used did not get the job done, and not just state that "procedure is completely incorrect".

Similarly, in the same Section 5 (and once again, using data), we showed a disconnection between the large increase in the number of persons employed (as reported by the LFS) and the private consumption that saw a real drop of about 2.5% in the 2012-2015 period. Having in mind that

labour income is by far the single most important source driving private spending, it is highly improbable that such a drop in private consumption could happen despite strong employment growth, as indicated by the LFS. The explanation offered by Arandarenko et al. is that the described bizarre trends are possible due to the amendments to the Labour Law in 2014 that reduced job security, producing "negative impact on private consumption". This is an impressive piece of economic analysis, except that Arandarenko et al. do not show that it bears an even distant relevance for Serbia. The affected average wage earner in the private sector in Serbia is a typical 'hand to mouth' case, hardly saving anything. Thus, it takes Arandarenko et al. quite a stretch of imagination to advance that this earner had abruptly decreased its consumption and increased savings, so much so that the total private consumption has decreased considerably in Serbia. Or maybe it is not the pure imagination on behalf of Arandarenko et al., but then it should have been demonstrated by offering even the crudest empirical evidence for Serbia, which – needless to say – is missing again.

In the last Section 6, we pointed out that the substantial employment growth, observed in the latest 2016 LFS data, was highly unlikely. First, this growth is driven by a vast increase in the number of persons employed in agriculture which, as per data in the LFS for Q2, has increased by as many as 106,000 people (y-o-y). The reported increase in employment in the non-agricultural sector also raises doubts as it grows at the annual rate (3.3%) twice as high as the rate of non-agricultural output (1.7%). Nevertheless, as quarterly data tend to be unstable, the assessment should be postponed until additional observations for 2016 are obtained. Still, all conducted examinations, including the explorations of the last available data for 2016, unambiguously show that there are significant and, most likely systemic issues with the validity of data collected and published in the LFS.

Concluding this summary, let us stress that we admire the ability of Arandarenko et al. to come out with a colourful hypothetical construct. Nonetheless, if they, going forward, still fail to offer empirical evidence showing that their hypothetical examples can explain employment

developments in Serbia over the period 2008-2015, any further discussion is useless.

Section 2: One way or another – strong employment growth in a stagnating economy is an illusion, after all

In Petrović et al. [7], we analyzed the official data of the Statistical Office of the Republic of Serbia (SORS) on labour market trends in Serbia from 2008 onwards (shown in Table 1), and they point to two clearly distinct sub-periods. In the first period of 2008-2012, an enormous drop in total employment of about 600,000 (21%) was reported, with the unemployment rate sharply increasing from 14.4% to 24.6%, while in the second, a strong recovery of employment, increasing nearly by 330,000 through 2015 was recorded, accompanied by a sharp drop in the unemployment rate to 18.5%. In Petrović et al., we analyzed employment series through 2014, i.e. the latest available annual data at the time, focusing on the 2012-2014 period with reported employment increase of 315,000 or 14.2%. We showed that this strong employment growth was completely disconnected from other relevant macroeconomic trends over the same period, and hence was most likely just a statistical illusion.

However, Arandarenko et al. [1] claim that our analysis was based on "erroneous rationale" and that we used a "mistaken series", as it encompasses the originally released annual employment data for 2012 and 2013 and the upwardly revised data for 2014, which have been produced by SORS to ensure forward comparability with the 2015 and later data, not the backward comparability. Moreover, they go one step further, claiming that the "mistaken series"

unfortunately spread from our paper to some of the media and hence wider public. Although we are flattered by the latter statement, Arandarenko et al. are still somewhat exaggerating as to the impact of our paper. Anyhow, as we have reiterated several times, in our analysis we used the current official data on labour market trends for the period 2008-2015, released by SORS and based on the LFS. As such, these data are extensively used in public, whether by the international institutions in their assessments of labour market developments in Serbia (IMF, European Commission and World Bank) or by broader audiences at home – including government officials.

For example, in the first column of Table 2, we present data on unemployment rate from the IMF's September report (2016) on the fourth and fifth review under the stand-by arrangement that Serbia has with this institution [5, p. 25]. The second column of the same Table gives the employment annual growth rates in Serbia stated in the latest European Commission's report (2016) about EU candidates and potential candidates' economies [3, p. 23]. Just a brief overview of numbers shown in Table 2 is enough to convince the reader that the IMF's unemployment rate series and the European Commission's employment annual growth rates are identical to those in our allegedly mistaken series in Table 1. Having this in mind, one could say that Arandarenko et al. indirectly imply that the IMF and European Commission used some unofficial labour market statistics in their reports, perhaps from our paper or the media? Furthermore, in its recent report on economic trends in South-East Europe, the World Bank also used the above "mistaken series" while analyzing the labour market developments in Serbia [8, p. 6]. Finally, in the public arena at home, and especially in the political

Table 1: Serbia: Total employment and unemployment rate, 2008-2015

	Employment	Employment (annual % change)	Unemployment rate (15-64)
2008	2,821,724	-	14.4
2009	2,616,437	-7.3	16.9
2010	2,396,244	-8.4	20.0
2011	2,253,209	-6.0	23.6
2012	2,228,343	-1.1	24.6
2013	2,310,718	3.7	23.0
2014	2,544,188	10.1	20.1
2015	2,558,426	0.6	18.5

Source: Statistical Office of the Republic of Serbia, LFS.
Note: The 2015 data are the average for the first three quarters. SORS has, in the meantime, released data for the entire 2015 and then revised its numbers for 2014 and 2015, but to ensure the comparability with our previous analysis, the data available at the time is shown.

circles, the strong decline in unemployment rate in the last several years reported by SORS is most often compared with its record high of 26% in the second half of 2012, meant to show enormous success. However, Arandarenko et al. have remained silent on these cases of "comparing the incomparable".

More importantly, it could be said that Arandarenko et al. claim that the aforementioned examples (IMF, European Commission, World Bank), apart from our paper, are also based on "erroneous rationale" and therefore flawed. Namely, all these assessments of recent labour market trends in Serbia combine the originally released annual employment data until 2013 with the upwardly revised data for 2014, as we did. According to Arandarenko et al., such an employment series is incorrect because it is constructed by "comparing the incomparable". In their paper, they argue that there are two correct comparable employment series in Serbia for the period 2008-2015, with the break point in 2014 (as shown in their Table 1 [1, p. 213]): one for the period 2008-2014, and the other starting from 2014 onwards. But there is an intrinsic contradiction in the argument they are trying to make. The contradiction is that Arandarenko et al. claim that both employment data series are correct even though they contain two different numbers of employed persons in 2014, differing by almost 120,000 persons employed. In other words, out of two different numbers of (equally defined) employed persons in 2014, it is impossible that both are correct – one must be "more correct". Bearing in mind that the latest methodological changes in the LFS introduced in 2015 should have brought about some improvements in measuring employment and unemployment in Serbia, it is reasonable to assume that the upwardly revised value

for 2014 (which is produced to ensure comparability with the data in 2015 and onwards) should be more accurate. This is another reason why we used the revised number, in addition to the fact that the analyzed data set is widely used in public discourse. By showing that these repeatedly used official labour market statistics for the period 2008-2015 are packed with inconsistencies, we wanted to point out that SORS should carefully re-examine existing labour market statistics and revise historical series according to its findings.

Section 3: Comparative evidence: Revisited and confirmed yet again

Although the objection on the employment data set we used, put forward by Arandarenko et al. [1], is highly questionable (if not completely irrelevant), we extended our analysis to encompass the employment series for which they claim to be correct, to check if that would undermine any of our previous findings. In this case, the employment growth rate in Serbia in the period 2012-2014 would amount to 8.7% (instead of 14.2%), while employment elasticity to GDP would amount to 12.5 (instead of about 20).[1]

We demonstrate, first, that the use of the "corrected" series has no impact on any of the main conclusions from our previous analysis, i.e. that there is an intrinsic problem in monitoring labour market in Serbia. Namely, in the observed period, whatever the data set, Serbia was the absolute record holder regarding employment growth when compared to other countries of Central and Eastern Europe (CEE). At the same time, this employment growth was completely disconnected from GDP trends, which is an unusual and indeed unique case in CEE.

Table 2: Serbia: Selected labour market indicators, 2011-2015

	IMF (2016)	European Commission (2016)
	Unemployment rate (in percent, 15-64)	Employment (annual percent change)
2011	23.6	-6.0
2012	24.6	-1.1
2013	23.0	3.7
2014	20.1	10.1
2015	18.5	0.6

Source: IMF (2016), [5, p. 25] and European Commission (2016) [3, p. 23]

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1   Employment elasticity with regards to GDP shows the change (in percent) in employment with 1% change in GDP.

We show, then, that employment elasticity to GDP is a valid indicator both in Serbia and in CEE economies, and, despite the claims of Arandarenko et al., they should be comparable. In order to show the opposite to be true, Arandarenko et al. come out with a hypothetical example which, in their own words, is "unusual and relatively rare", but do not offer any empirical evidence that their hypothetical construct is applicable to Serbia. Doing their job, we showed that it is not, and that the employment elasticity in Serbia roughly 30 times higher than the average in CEE economies clearly indicates that something is wrong with the reported employment series in Serbia.

Moreover, as additional indication casting doubts on reliability of the official employment data based on the LFS throughout the whole after-crisis period, we briefly explore perhaps an even less convincing episode of enormous employment drop in the period 2008-2012, which amounted to about 600,000 people (21%). Finally, we demonstrate that Arandarenko et al.'s use of the statistical concept "regression towards the mean" in an attempt to justify reported extreme swings in the Serbian labour market over the period 2008-2015 is nothing more than another empirically unfounded belief.

As can clearly be seen from Figure 1, regardless of which employment data series is used (official or "corrected"), in the period 2012-2014 Serbia was an absolute record holder in employment growth compared to all CEE countries. At the same time, the recent strong employment recovery was completely disconnected from GDP growth (a mere 0.7% over the considered period), which was truly a unique case in CEE. Namely, if we observe the entire group of countries (excluding Serbia), overall employment in CEE increased by 1.9% in the period of 2012-2014, with GDP simultaneously growing by about 4.5%. This means that employment elasticity with regards to GDP amounted to 0.42 in CEE, which is completely in line with theoretical expectations for employment elasticity (ranging from 0 to 1). By individual countries, employment elasticity shows certain discrepancies from the calculated average. Thus, the lowest elasticity was observed in Slovenia, amounting to -0.8 (employment drop of 1.5% with 2% GDP growth) and the highest elasticity of 1.2 was recorded in Hungary (employment growth of 7.3% with a GDP increase of 6.3%). Recognizing that the link between economic growth and employment is obviously not a deterministic one,

Figure 1: Central and Eastern Europe: employment and GDP growth, 2012-2014

■ Employment (2014/2012)　■ GDP (2014/2012)
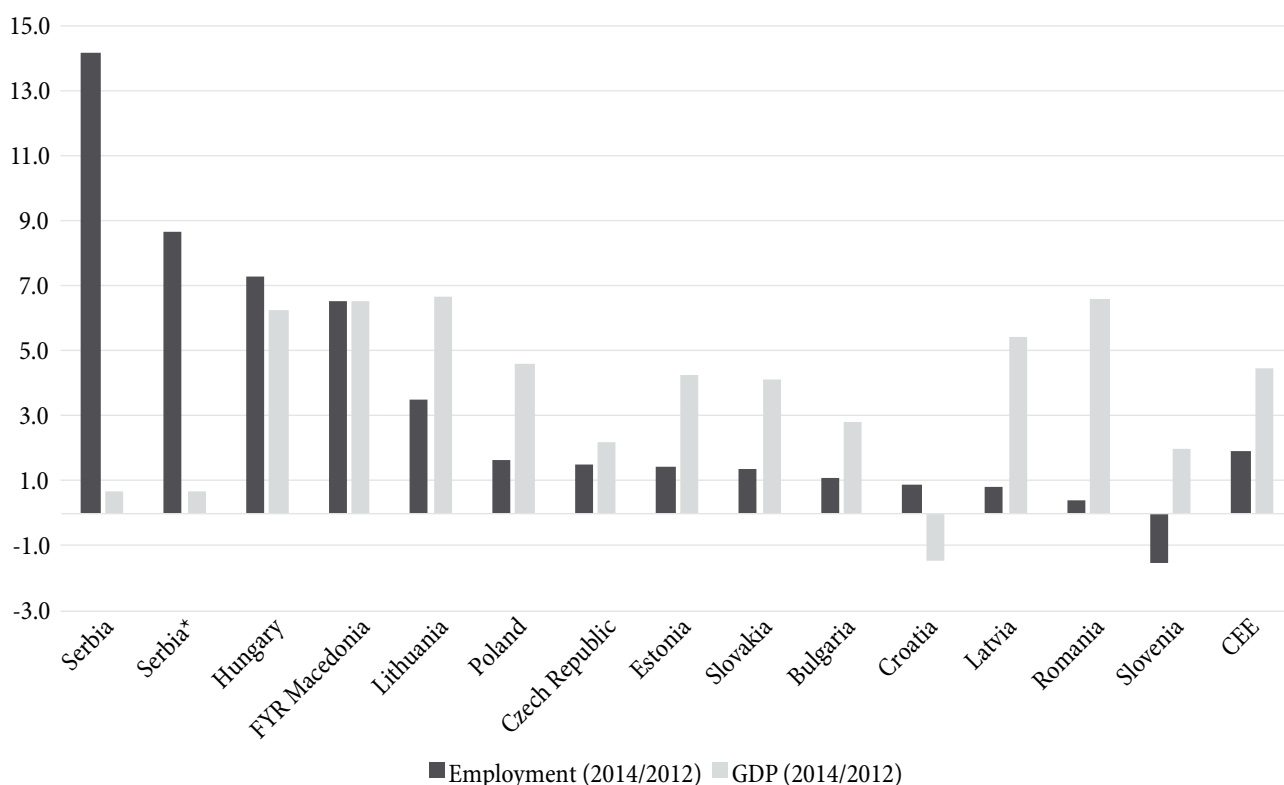
Source: Eurostat, SORS
Note: Serbia* represents the employment growth as suggested by Arandarenko et al. No data available for Montenegro, Bosnia and Herzegovina and Albania.

reasonable discrepancies from the theoretical range for employment elasticity are possible in a relatively short term, so obtained results for individual countries could be seen as being in line with expectations. However, regardless of the data used to calculate employment elasticity in Serbia – whether it amounts to 12.5 or to 20, it is obviously far beyond theoretically expected and empirically reasonable values, as well as from values calculated for the comparable countries in the observed period.

However, Arandarenko et al. believe that such a high value of employment elasticity (either 12.5 or 20) is not strange at all because, as they claim, possible boundaries for this indicator are between minus and plus infinity. In deriving this theoretical range of possible values for employment elasticity, Arandarenko et al. rely on findings of Kapsos [6], stating that countries with GDP growth close to zero may exhibit large swings in employment elasticities arising from relatively small changes in the underlying variables. Following this line of logic, Arandarenko et al. conclude that, in this case, even a relatively modest change in employment (in either direction) can push the absolute value of employment elasticity into double or even triple-digit territory. To confirm their belief that employment elasticity could take any value, they present a hypothetical example in which they assumed that GDP growth rate in country A was 1%, and 0.1% in country B, while the employment growth rate in both countries was 5%. In this example, employment elasticity would be 5 in country A, while in country B it is 50. Finally, Arandarenko et al. easily transpose this hypothetical example into reality, concluding that both cases are possible as both countries face unusual (relatively rare) but quite possible phenomenon of similar proportions – a strong increase in employment which is not related to GDP fluctuations. However, looking carefully at Kapsos's argument, one can easily show that the above hypothetical example does not apply to Serbia, and hence that elasticity obtained for Serbia is truly well above the expected range, raising doubts about the reported employment series.

It is clear at first glance that the arguments used by Arandarenko et al. are factually unfounded, as their conclusions are built up (in their own words) on unusual and relatively rare hypothetical cases, while they fail to offer any empirical evidence that such cases are even possible. First, they use a stylized example in an attempt to demonstrate that employment elasticity with regards to GDP is an unstable and thus unreliable indicator of the link between the two variables over time – instead of demonstrating this claim with empirical episodes in which such extreme employment elasticity values were observed in multi-year periods in other comparable countries. Without this, the described hypothetical example is nothing more but an exercise demonstrating a simple and well-known arithmetical fact – any number divided by a value close to zero yields a very large number.

Second, the hypothetical example presented by Arandarenko et al. is empirically irrelevant for explaining a strong employment growth in Serbia in the period 2012-2014 implied by the official data. It can easily be shown that the methodological remark discussed in Kapsos [6] and used by Arandarenko et al. does not apply in this concrete case, i.e. the remark that countries with GDP growth close to zero may exhibit large swings in employment elasticities arising from relatively small changes in the underlying variables, notably employment. Firstly, regardless of how we measure employment growth in the period 2012-2014 (whether it amounts to 8.7% or 14.2%), this cannot be considered a "relatively small change" by any means. Secondly, even though GDP growth rate was relatively low, 0.7%, it is not so close to zero as to artificially distort the result completely and make it useless. Therefore, it is obvious that the major discrepancy of employment elasticity in Serbia over the 2012-2014 period from either the expected theoretical values or actual values in comparable countries, strongly suggests that the reported market trends are highly suspicious.

It is worth noticing in Figure 1 that Croatia also exhibited a disconnection between employment and GDP trends during the period 2012-2014, although not as prominent. Namely, in the aforementioned period, there was a relatively small employment growth of around 0.9%, despite the fact that Croatian economy was in recession and that the cumulative drop of GDP equalled to 1.4%. If we were to include the following year (2015), when employment grew by 1.4% and GDP by 1.6%, Croatia would become such a "freak case" for which employment elasticity would

have to be cautiously interpreted according to Kapsos, because the denominator of this indicator is close to zero. Despite relatively small (and quite possible) changes in employment and GDP in the period 2012-2015 (2.2% and 0.2% respectively), in this case the value of employment elasticity would be well beyond the expected range.

Summarizing arguments on employment elasticity, it seems that even Arandarenko et al. agree that their empirical estimates vary mostly between zero and one, since they extensively cite Kapsos [6], who reports these estimates. Moreover, in their previous paper, Arandarenko et al. [2] state that the "broadest theoretical expected range" for employment elasticity is between zero and one (see p. 154), and we could not agree more. But then they suddenly forget all this, and start coming out with freak examples that are empirically irrelevant for Serbia, as we have just shown.

Another indication casting doubts on reliability of the official employment data based on the LFS throughout the whole after-crisis period is an even less convincing episode of enormous employment drop in the period 2008-2012, which amounted to about 600,000 people (21%). Again, Serbia clearly stands out as an outlier regarding the intensity of employment drop among all other countries in CEE – although many of them experienced a much deeper recession. Perhaps the only country that faced the employment decline of similar proportions was Latvia (15.6%). However, Latvia, as opposed to Serbia, experienced the deepest recession in Europe during the crisis (in 2009, GDP decreased by 17.7%), hence the observed significant employment drop is expected. In addition, Latvia carried out one of the most ambitious fiscal consolidations in Europe, sharply cutting employment in its public sector: in the health sector by about 8%, in the education sector 14% and in the state administration about 29%. Thus, there is a convincing explanation for the large dive in employment in Latvia. However, for Serbia, there is no such obvious or rational explanation on how 600,000 jobs could have disappeared in just four years (as reported by the LFS), while GDP decreased by only 2.2%. What makes this Serbian episode even more unusual and highly improbable is the fact that this steep employment drop must have happened almost entirely in the private and informal

sector. Namely, there are reliable data on employment in the public sector showing that the number of employed persons in this part of the economy in the period 2008-2012 was pretty much stagnant (around 750,000).[2] This means that the reported employment drop of about 600,000 had to have happened in the much smaller sample of about 2 million employed persons and not in the total number of employed persons of 2.8 million, which includes the public sector. In other words, employment in private (and informal) sector dropped by almost one-third, which would almost certainly mean that the Serbian economy was plummeting – but it was not the case, since in the observed period GDP declined by only 2.2%.

Again, Arandarenko et al. are not impressed with absolute numbers, claiming that the described extreme movements in the labour market in a stagnating economy from 2008 onwards are in no way strange. In their opinion, such an enormous drop in employment in the 2008-2012 period could be seen as a "departure from the mean", while the recent episode of strong employment recovery could represent "regression towards the mean". As usual, Arandarenko et al. are just hypothesizing without supplying any empirical evidence to support their beliefs whatsoever. Needless to say, without proper econometric testing that would confirm that corresponding time series is oscillating around that mean, i.e. that series is mean-reverting – this statement boils down to an empty and indeed trivial one: employment decreases in recessions and increases during the periods of economic recovery. But it is not something we disagree about. As a reminder, the issue is whether the episode of intensive employment decline in the 2008-2012 period (while unemployment rate grew from about 14% to about 25%) and the following episode of strong employment recovery (while unemployment rate sharply dropped to about 15%, according to the latest data) actually happened in Serbia. Furthermore, Arandarenko et al. use their empirically unfounded belief not only to "prove" that the previous episodes of large swings in employment are possible, but also to predict the future developments in the labour market. Since cumulative employment drop in the

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2   This is a conclusion we reached by analyzing expenses for general government employees, financial reports of SOEs, including the companies from the portfolio of the Privatization Agency.

period 2008-2014 exceeded the cumulative drop in GDP, despite the recent increase in the number of employed persons, they conclude that it is very likely that there is still room left over for "regression towards the mean". In other words, they expect a continuation of strong employment expansion that is completely disconnected from GDP growth and, perhaps, other relevant macroeconomic trends. Thus, even projections Arandarenko et al. make are based on empirically unfounded relations, and in that respect, no doubt they are consistent.

Section 4: Why can't the blanket statement "Not all jobs are created equal" explain the complete disconnect between employment trends and GDP?

In an attempt to explain the complete disconnection between labour market trends and GDP, which they see no problem with, Arandarenko et al. [1] offer the well-known quip that "not all jobs are created equal". The explanation, however, is hollow if not supported by empirical evidence that would show why Serbia is the only country in which there have been extreme changes in employment not accompanied by corresponding GDP trends (Figure 1). Instead of empirical evidence, time and again Arandarenko et al. offer rare hypothetical examples to demonstrate how it is possible for employment to grow without affecting GDP. However, not only it is very unlikely that these rare hypothetical examples have been occurring in Serbia year in, year out, but a mere scratch at the surface of these explanations reveals that they are not even supported by the official data.

Perhaps the best illustration of the methods used by Arandarenko et al. to disprove the findings of our previous paper is "impute, then refute". For example, they state that Petrović et al. said or implied that: "...the employment increase of 10% automatically translates into 10% increase in output…".[3] On the contrary, we considered a relatively wide range of employment elasticities that are different from one.

What we are actually claiming is that there has to be a relation between employment and GDP, and even if such a relation is disrupted in some cases, it is unlikely that this would keep reoccurring several years in a row. The relation between employment and output is widely studied and used in economics (e.g. theory of production and growth) and empirically estimated and proven (e.g. production functions), not least by estimating employment elasticity as in Kapsos [6], the reference Arandarenko et al. extensively used. However, according to the LFS results, the relation has practically been inexistent in Serbia since 2008, as the employment and GDP exhibited divergent trends.

As an explanation of how it would be possible for GDP in Serbia to remain stagnant with an employment growth of 10%, Arandarenko et al. construct a hypothetical example and illustrate it with stylized images of workers in neckties, without bothering to show that the construct is empirically relevant for the analyzed Serbian episode. In their hypothetical construct, as a new employee is hired, the remaining employees have to, at the same time, reduce their hours worked in order to compensate for the output of the newly hired employee. In this manner, the employment growth does not lead to an increase in the overall number of working hours or output. Even though the example is purely hypothetical and unlikely, particularly over a period spanning several years, it actually does a pretty good job defining the conditions under which a significant increase in employment would be neutral in terms of GDP growth (which is what the Serbian LFS shows). Namely, workers would have to considerably decrease their average working hours and/or productivity, which would then neutralize the impact of a significant employment increase on GDP. This hypothesis, if it were true, would also point to significant and very adverse structural changes in the labour market from 2012 onwards, lending itself to empirical testing. As expected by now, Arandarenko et al. do not bother offering even a crude empirical indication that their hypothesis holds in Serbia.

So, let us do their job for them, and look at the actual data for Serbia. We took the example that Arandarenko et al. also mention in their paper (although for other purposes), which is relevant to the aforementioned

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hypothetical example. From 2012, according to the LFS, the number of persons in part-time employment increased above average, reducing the average work hours in the economy. The information does roughly follow the line of the hypothesis set by Arandarenko et al., but can still not serve as a sufficient argument for the Serbian GDP stagnating while the employment grows significantly. This is because persons employed on a part-time basis still contribute to GDP growth. Thus, even with an increase in the number of employees with part-time employment only, ceteris paribus, GDP would still have to grow. Therefore, accelerated increase of part-time jobs could only be an argument supporting a somewhat slower growth of GDP compared to employment growth, which could be accepted, within a reasonable range. To explain an almost stagnating GDP while employment swiftly grows, as has happened in Serbia, it would have to be empirically shown not only that the number of part-time employees increased intensively, but also that relatively significant negative structural changes have occurred in the labour market, over several years, in a wider population – e.g. a decrease of the number of persons in full-time employment.

This, in turn, means that a good test that would show whether a swift growth in employment in Serbia has indeed been accompanied by almost stagnant GDP would be to see, for example, if the number of full-time employees had significantly dropped in the period from 2012 to 2014. If so, that would serve as a good foundation for an argument-supported claim that the expected GDP increase due to newly hired employees was compensated by having all the employed persons work shorter hours, leading to a stagnation in the number of man-hours with an increase in employment (like in the hypothetical example of "workers in neckties"). Of course, absolute precision is not required, only a clear indication that such changes in employment structure have occurred and that these changes support the hypothesis presented as a possible explanation for the complete disconnect between the employment trend and GDP. However, the actual data for Serbia do not even remotely support this; on the contrary, full-time employment has actually grown by quite a bit and certainly significantly faster than GDP.

Going down to the lowest level of disaggregated data from the LFS in 2012 and 2014, it can be seen that it is unlikely that there has been any negative structural change in the number of man-hours and/or productivity that would explain why GDP was almost stagnating hand in hand with a strong growth in employment. Namely, in the period 2012-2014, detailed data from the LFS show that employment grew in practically all existing categories monitored – men and women, different age groups, lowest and highest education groups, formal and informal jobs, full-time and part-time, paid and unpaid, almost in all activities, etc. Therefore, all these jobs are indeed different and have a different impact on GDP, but as long as they are all increasing – which is what the LFS data imply – it is unlikely that GDP in Serbia would be stagnating. This unambiguously shows that the claim made by Arandarenko et al. that the GDP has stagnated with a large increase in employment in the period 2012-2014 because "not all jobs are created equal", is absolutely empirically unfounded.

Section 5: Are divergent trends between the reported employment and related macroeconomic aggregates "alleged" or real?

As an additional argument used in our previous paper [7] to demonstrate unreliability of the official employment data from the LFS, we showed that that these employment data were completely inconsistent with the trends in private consumption and social contribution revenues. Namely, with a steep employment growth, it is highly unlikely that private consumption would be declining, as labour income presents by far the largest individual source propelling personal consumption. Similarly, it is unlikely that there would have been a real drop in social contribution collection when formal employment and wages were on the rise. Nevertheless, the LFS data allege that these unlikely events have occurred in the period 2012-2015, and Arandarenko et al.[1] claim that these trends are not inconsistent, or at least that they cannot be proven so. Their main argument is that the data from the LFS cannot be put in line with personal consumption and contribution collection trends for methodological reasons. We will show this to be incorrect, i.e. that the

approximations we used for these comparisons are reliable enough and that the complete disconnect of the LFS data from the aforementioned macroeconomic aggregates is indisputable, which is another strong argument supporting the thesis that the LFS data are invalid.[4]

Discussing the divergence of contribution revenue trends and formal employment trends as reported in the LFS, Arandarenko et al. state that these indicators cannot be cross-referenced, as there are no data available on average salaries in formal employment from the LFS. Namely, the contribution collection should follow the wage bill trend for the formally employed, i.e. the number of employees multiplied by their average salary. However, we used data on average salaries in the registered employment measured by the RAD survey (until 2015) as a good approximation on the average salary trend for the formally employed. The difference between formal and registered employment is the following: formal employment in the LFS, unlike in the RAD, also encompasses those formally employed in agriculture (farmers with registered agricultural households and their family members with paid social security contributions); formal jobs in the army and the police; persons formally employed on the basis of temporary and service contracts. In addition, LFS counts the employees performing several jobs once, while RAD registers each job separately. Formal and registered employment (LFS and RAD) overlap by over 80%. Despite the fact that, even at first glance, the difference between the two seems too small to completely overturn our main findings, Arandarenko et al. label our procedure "completely incorrect" – since, in their opinion, ignoring the differences between the two can lead to poor results. However, Arandarenko et al., as usual, do not quantify their hypothesis using data, even though they should have, if they earnestly wanted to

prove that their methodological objections alter the main findings of our analysis.

Had they done so, they would have seen immediately that the discrepancy between the contribution revenue trend and the calculated wage bill trend for formal employment was simply too large (about 13 pp) to be explained by the difference in collection scope lower than 20%. Namely, for Arandarenko et al.'s critique to hold, the average salaries in the formal employment segments excluded by the RAD survey would have to have more than halved from 2012 to 2015, or there would have to have been a substantial employment growth (over 100%) in low-paid jobs (e.g. formal agriculture employment). The simplest way to show that the former had not occurred is to refer to the salaries in the army and the police, which were increasing as prescribed by legal indexation, while the number of employees had not changed dramatically. For the formally employed in agriculture, we do not have direct data at our disposal, but based on detailed tax data on contribution collections from persons working in agriculture,[5] we can see that there are no unusual trends from 2012 to 2015 that would have affected our approximations.

Formal employment in agriculture, army and police represents by far the largest groups of employees comprising the difference between the LFS and RAD scopes. The remaining difference between the scopes of the two is so low that there is no need to further test the erroneous hypothesis of Arandarenko et al. that the average salary from the RAD research was inapplicable to the calculation of the wage bill for formal employment from the LFS in the period 2012-2015. Not only was the procedure used by Petrović et al. not "completely incorrect", but, as we demonstrate, it was very precise for the observed period, and the contribution revenue trend was, beyond any doubt, completely disconnected from formal employment trends reported in the LFS.

To avoid repetition (see Sections 2 and 3), we shall skip detailed discussion of the objections by Arandarenko et al. that we had failed to take into consideration the alterations in the LFS methodology in 2014. The objection is unfounded due to several reasons. First, we used the

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4   One of the objections of Arandarenko et al. was that we were backing up our suspicions of the reliability of the LFS data by comparing them with other sources, without questioning the reliability of the said other sources. However, this is not correct. The data on the contributions collected were taken from the budget and are completely precise and valid, while the data on the personal consumption trends were taken from the statistics of the national accounts for which there are no concerns (unlike the LFS) of significant distortion of real trends. The data from the national accounts are consistent with all other macroeconomic aggregates (except the LFS data).

5   Contributions for the persons employed in agriculture have grown nominally by 13.5% from 2012 to 2015.

only official employment data for 2015 and 2012, used by all relevant international institutions as well as in the relevant public discourse. Second, it is undisputable that when we correct the number of the formally employed for the difference introduced by the new methodology, we still get divergent trends for formal employment as reported in the LFS and the contribution revenue trend, with only a decrease in its discrepancy.[6] We have discussed this objection by Arandarenko et al. in greater detail in Sections 2 and 3.

Arandarenko et al. make completely irrelevant methodological objections to the procedure we used to demonstrate that the LFS data were inconsistent with the personal consumption trend, most likely stemming from their failure to understand this procedure correctly (even though we think the explanation was sufficiently clear). Instead of responding to the said methodological objection, we shall demonstrate one more time, in somewhat greater detail, how we arrived at the conclusion that the employment growth presented in the LFS implied a nominal growth of labour income per household of at least 20% in the period 2012-2015.

Let us classify all persons employed in Serbia into three categories: 1) formally employed, 2) informally employed with labour income and 3) unpaid family workers. Of all the groups, the number of employees in the first category (formally employed) was by far the greatest (about 2 million out of 2.5 million) and according to the LFS, it showed the slowest growth in the period 2012-2015 (11.5%). The second category (informally employed with some labour income) is significantly smaller than the category of the formally employed (about 300,000) and it showed, as indicated by the LFS, a remarkably quick growth in the period of 2012-2015 by about 30%. Unpaid jobs, i.e. the third category, do not affect household labour income by definition, neither for 2012 nor for 2015, and are thus irrelevant for our analysis. Being that employment in the first and largest category (the formally employed) showed the slowest growth from 2012 to 2015 (11.5% compared to

over 30% in the second category), we concluded that the employment trends from the LFS implied that household labour income had grown at least in line with the growth of income from formal employment. Taking into consideration the growth of salaries, the growth of income from formal employment nominally amounts to about 20%.[7]

As labour income comprises (according to the Household Consumption Survey) almost half of the disposable income used by households to fund their consumption, the nominal labour income growth of at least 20% (and real growth of around 10%) implied by the LFS was completely disconnected from the real decrease of personal consumption of about 2.5% from 2012 to 2015. Of course, we have also considered the trends of other sources of household income from 2012 to 2015, which are individually much smaller than labour income and for which there are reliable data – a real decrease in pension income (about 7%), but also a real increase in income from remittances, social security, etc. – which Arandarenko et al. state as a possible reason for the decrease in personal consumption regardless of the high employment growth. With a labour income growth over 20% (10% real growth), all other sources fuelling consumption would have to have decreased from 2012 to 2015 by 10% in real terms for the results to be consistent with a drop of 2.5% in personal consumption; the data show nothing even remotely like this.

We shall now go back to the methodological objections of Arandarenko et al. to our conclusions. The objections pertain to our supposedly erroneous calculation of an average "hypothetical" salary in the economy "...if for no other reason, then because of almost 10% of unpaid family workers within the LFS employment".[8] In the previous paragraphs we have, however, shown that we had not calculated the "hypothetical" salary in the economy at all, nor did we need to use data on the number of unpaid family workers within the LFS employment. Instead, we chose to estimate the labour income growth implied by the LFS using the most conservative method available,

6 Trends remain divergent even with the correction of data for the modifications in the SORS methodology, because the contributions have seen a real drop in the period from 2012-2015, and the wage bill has seen an increase. The correction only reduces the difference between the two from about 13 pp to about 6 pp.

7 We have already shown that the average salary from the RAD serves as a fairly good approximation of the trends in average salaries for the formally employed. If we were to take into consideration the change in methodology, the number would be decreased to under 15%, which has no impact on any of the conclusions reached by this analysis.

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based on the available data (and even so, obtained a complete discrepancy between the employment and private consumption trends).

Setting hypotheses not tested by the data is a standard part of the argumentation by Arandarenko et al. With all other explanations on pension cuts and decreases in other sources funding consumption (which we also considered in our analysis), which could hypothetically explain how it would be possible to see a substantial growth in overall employment and a significant drop in private consumption at the same time, Arandarenko et al. note the adoption of the Labour Law in 2014 as an additional reason for the drop in personal consumption. The authors, among other things, claim: "...there must have been an indirect negative impact on private consumption as a consequence of reduction in job security – or at least because of the widespread perception of increased job insecurity." This actually implies that the adoption of the new Labour Law increased [the perception of] job insecurity, leading to lower consumption (i.e. higher savings), which affected private consumption. We feel that, prior to postulating such a claim, the authors ought to have explored which category of employees in Serbia had become more endangered due to the amendments to the Labour Law. This, for example, could easily be the employees with below-average salaries, spending all they earn and having no room for savings. In addition, it would be good to check if there has been an increase in savings among the population that would be consistent with this hypothesis. It is also interesting to note that construction of such hypotheses actually shows that Arandarenko et al. are nevertheless aware (even with all the criticism of our approximations) that the strong growth of employment since 2012, as portrayed by the LFS, is inconsistent with the drop in personal consumption and that an explanation for these disconnected trends must be provided.

To conclude this part, we still feel that this, as well as other numerous untested and unlikely hypotheses offered by Arandarenko et al. in an attempt to explain why the employment trends in Serbia were completely disconnected from macroeconomic aggregates, are still somewhat less likely than the hypothesis that the LFS fails to measure employment trends with sufficient reliability.

Section 6: The latest employment data for 2016 still raise doubts on reliability of the LFS

The latest LFS data for 2016 suggest that the disconnect between the employment trends and GDP continues. According to the data for the second quarter of 2016, the overall number of persons employed has increased by about 174,000 compared to the same period in the previous year, i.e. by 6.7%. At the same time, GDP growth was three times smaller, amounting to 2%. Additional argument that raises suspicion about reliability of the published data is the fact that the growth of social contribution revenue by 4.1% can be completely explained by the increase of the average salary (that has risen by 4.2%) and not by the growth of formal employment (as indicated by the LFS). Bearing in mind that there could be some volatility in the quarterly data (although smaller than this), we emphasize that this should be treated as our preliminary assessment. However, if similar trends were to continue in the upcoming quarters, this would undoubtedly reinforce our findings and indicate that the data series from the LFS are still seriously flawed.

Within the overall Q2 employment data presented, those showing a high increase in employment in agriculture are least convincing, while the growth of employment in non-agriculture is unusually high, but still within some realm of possibility. Of the overall employment increase by about 174,000 persons, the LFS data show that over 60%, i.e. 106,000 have been employed in agriculture. Increase in the number of the employed in agriculture of over 100,000 persons (over 20%) in only a year is very unlikely and will be further discussed below. The growth of employment in sectors other than agriculture (68,000 persons) is somewhat lower, but still out of the ordinary. Namely, employment growth (net of agriculture) rose twice as fast as the non-agricultural output (GVA), 3.3% compared to 1.7% (y-o-y). Furthermore, the analysis of trends in formal (non-agricultural) employment from the LFS shows that it has increased significantly faster than the relevant (non-agricultural) contribution revenues.[9]

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9   Taking into consideration the change in average salary as well.

Table 3: Employment trends (overall and in agriculture) and other related indicators, 2015-2016

	2015 Q1	2015 Q2	2016 Q1	2016 Q2	2016 Q2 / 2015 Q2
Employed persons	in 000				in %
Overall	2504	2588	2571	2762	6.7
Excluding agriculture	1978	2046	2001	2113	3.3
In agriculture	526	542	570	648	19.6
Informally in agriculture	317	320	351	403	26
Formally in agriculture	209	222	219	246	10.5
Average gross salary	in dinars				
Overall	57,447	61,440	60,024	64,001	4.2
Social contributions	in millions of dinars				
Overall	115,618	125,902	120,522	131,011	4.1
GDP					2.0
GVA in agriculture					4.3
GVA (non-agriculture)					1.7

Source: SORS and the Ministry of Finance

Data on agricultural production indicate that it will achieve a gross value added growth of about 5-10% in 2016, predominantly as a result of more favourable weather than in the previous year (2015 drought). If it were to be assumed that there has truly been an increase of the number of employees in the agricultural sector of about 20%, which is what the LFS shows, this would further imply that there has been a large drop in agricultural productivity or an enormous change in its structure (increase of the share of labour-intensive activities), which is not very likely. Due to mechanisation in agriculture, the agricultural production growth no longer requires a multi-fold increase in employment, as shown by the LFS. In other words, more favourable weather conditions have afforded a larger yield in agricultural crops and the increase in value added in agriculture, but higher yields do not even lead to a proportional increase in the number of employees in agriculture, let alone to a 20% increase.

As an additional indicator showing that measurement of the number of employed persons in agriculture in Q2 is unreliable, we observed social contributions paid in by formally employed farmers. These contributions show a nominal growth of only 2.5%, which is not even remotely close to the high growth of (formal) employment in agriculture, of over 10% (Table 3). Therefore, the most likely explanation for an extremely high growth of employment in agriculture, leading to a relatively high growth in employment overall in Q2, is to be found in the unreliability of the LFS measurements – indicating that most probably there are significant and, by all means, systemic issues with the validity of data, collected and published by this survey.

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INTERPLAY BETWEEN MARKET CONCENTRATION AND COMPETITIVE DYNAMICS IN THE BANKING SECTOR: EVIDENCE FROM SERBIA, CROATIA, ROMANIA AND THE CZECH REPUBLIC

Interakcija između tržišne koncentracije i stepena konkurencije u bankarskom sektoru – slučaj Srbije, Hrvatske, Rumunije i Češke

Abstract

The paper tests the fundamental premise of the SCP paradigm – whether there is a linear interplay between the variation of the degree of concentration and the degree of competition within the banking sectors in Serbia, Croatia, Romania and the Czech Republic, and how intense this interplay is, if it does exist. The analysis uses panel data for selected concentration indicators (the Herfindahl-Hirschman Index and the concentration ratio for the five largest banks) and concentration indicators analyzed on the basis of profitability indicators (the interest rate spread) for the 2009-2014 period. An isolated analysis of the degree of concentration indicators of the selected banking sectors indicates that Serbia displayed the lowest degree of concentration, while the highest one was recorded in Croatia. The results of testing the degree of quantitative agreement between the analyzed indicators of concentration and profitability show that the SCP paradigm was successfully proven in cases where it was not expected, considering the values of concentration and profitability indicators, which may primarily be explained by the specifics of the banking sectors in the analyzed European countries.

Keywords: *market concentration, competition, profitability, banking sector, the SCP paradigm*

Sažetak

U radu je testirano osnovno stanovište SCP paradigme – da li između varijacije stepena koncentracije i stepena konkurencije u okviru bankarskih tržišta Srbije, Hrvatske, Rumunije i Češke postoji linearna veza, kao i koji je smer i intenzitet ove veze ukoliko ona postoji. U analizi su korišćeni panel podaci za odabrane pokazatelje koncentracije (Herfindal-Hiršmanov indeks i racio koncentracije pet najvećih preduzeća) i pokazatelji konkurencije (kamatni spred, ROA, ROE) za period 2009-2014. godine. Izolovana analiza pokazatelja stepena koncentracije odabranih bankarskih tržišta ukazuje da je stepen koncentracije najniži u Srbiji, a najviši u Hrvatskoj. Rezultati ispitivanja stepena i smera kvantitativnog slaganja između analiziranih pokazatelja koncentracije i profitabilnosti ukazuju da je SCP paradigma uspešno dokazana u slučajevima u kojima to nije bilo očekivano, uzimajući u obzir vrednosti pokazatelja koncentracije i profitabilnosti. Navedeno se, pre svega, objašnjava specifičnostima bankarskih tržišta analiziranih evropskih zemalja.

Ključne reči: *tržišna koncentracija, konkurencija, bankarski sektor, SCP paradigma*

Introduction

The importance of banks for the functioning of the contemporary economic systems is remarkable. As financial intermediaries, banks mobilize free funds while, on the other hand, through allocations and investments, they distribute these funds in order to maximize their objective or profit. Because of its contribution to the optimal allocation of capital, the banking sector is the main pillar of the financial system in most countries. With regard to this, the ECB study of the banking sectors in the European Union member states [23] shows that, in terms of financial structure, the new Member States rely more heavily on bank finance than on direct market finance, as is the case in most EU-15 countries. Furthermore, the structure of the banking systems is dominated by commercial banks, holding approximately 90% share of total banking sector assets.

However, in the past few decades, significant changes have been analyzed in the banking sector that have occurred as a result of technological innovation, the processes of liberalization and privatization, but also of the problems caused by financial crises in the form of contraction in demand and narrowing of the credit market. Taking into account these factors, the present paper outlines basic trends typical of the banking sector since the beginning of the 21st century [27, pp. 1-44].

The analysis of the banking sector in the European Union indicates a declining trend in the number of credit institutions. In the ten-year period, from 2003 to 2013, the number of credit institutions decreased by 15%, from 9,054 in 2003 to 7,726 in 2013 [25], [24], which clearly shows a trend towards concentration of capital in banks, namely the consolidation of the banking sector. Although the report states that the process of consolidation largely occurs through mergers and acquisitions, it is interesting to note a decline in the activity of mergers and acquisitions as a global trend, both in terms of the number of transactions, as well as in terms of their values. The largest volume of mergers and acquisitions activity, measured by the number of transactions, was recorded in 2001, whereas the value of transactions peaked in 2007, due to the acquisition of the ABN Amro by the consortium of the Royal Bank of Scotland, Fortis and Santander, as well as the merger of Sanpaolo IMI and Banca Intesa, based on which the value recorded in 2007 amounted to over EUR 180 billion. After the outbreak of the global economic and financial crisis in 2008, the value of mergers and acquisitions exhibited a continuous decline, from EUR 39 billion in 2008 to merely EUR 8 billion in 2013 [24]. These trends suggest that the consolidation of capital in the banks actually occurred due to the consolidation of banks operating within the same group, rather than due to the activities of mergers and acquisitions.

In addition to the impact on the value of the consolidation transactions in the banking sector, the global crisis of 2008 also affected the value of total assets of banks in the European Union. By 2008, there was a trend of increase in total assets, while in the post-2008 period there was a change in the trend or a decrease in the value of assets of banks [25], [24].

Another one of the current trends in the banking industry is the transnationalization or transfer of banking activities abroad. The first forms of movement of capital to the banking sectors in other countries, in the form of the establishment of branches, appeared in the 1970s in the developed countries. However, the processes of transition, liberalization and privatization in the early 1990s intensified the transnationalization processes in the countries of South Eastern Europe, which increased the share of foreign capital in the banking sector of the countries in the region.

As a result of such trends, and particularly due to consolidation and transnationalization, there was an increase in the degree of concentration of the banking market. The analysis of the market of the European Union shows that the degree of concentration increased in the 2005-2013 period, with peak values in 2011, followed by a dip in 2012 and a recovery in 2013, resulting in a significant increase in concentration compared to the level before the crisis [24].

The global trend of increasing the level of concentration of the financial sector drew the focus of attention of scientists and experts towards the question of economic consequences thereof [43]. Accordingly, the subject of this paper is quantitative analysis of the interplay between the

variation of the degree of concentration and the degree of competition within the banking sectors in Serbia, Croatia, Romania and the Czech Republic, for a six-year period from 2009 to 2014, with the aim of testing the basic postulates of the SCP paradigm. As the indicators of concentration, the paper uses the Herfindahl-Hirschman Index (HHI) and concentration ratio of the five largest companies in the industry (CR_5). Since, based on literature review, it was concluded that the degree of competition in the banking sector is predominantly analyzed according to their profitability, the authors have agreed to approximate the level of competition by the interest rate spread, as an indicator that best illustrates basic functions of banks – as intermediaries. The level of the interest rate spread, as a difference between the average lending interest rates and the average deposit interest rates, reflects the degree of monopoly power that the bank possesses and is, consequently, a function of the degree of concentration of the banking sector as a whole [22]. Higher values of the interest rate spread are associated with the growth of the market power of banks, while lower values are characteristic for developed banks that operate effectively in a highly competitive marketplace [17, pp. 96-122], [52].

The paper consists of six sections. The introductory considerations are followed by the second section with a review of the literature pertaining to measuring the degree of concentration and a study of the links between the level of concentration and other economic indicators. The third section exhibits the methodological framework for measuring the concentration – defines the relevant market and describes concentration ratios used in the paper. The fourth section refers to an empirical analysis of the degree of concentration and competition in banking markets in the selected European countries. The fifth and sixth sections analyze the results and provide concluding observations and recommendations for further research in this field.

Literature review and research design

The development of technological and financial innovations and strong deregulation of the financial sector resulted in an increase of concentration and, consequently, the creation of large financial conglomerates in the banking sector [9, pp. 2191-2214]. The issue of the impacts of market concentration on social welfare has captured the attention of scientific circles since the mid-20th century.

In his study, Kraft [29] systematically analyzed basic directions of development of the theories that examined this effect. Pioneering analyses of the effects of concentration were carried out in the 1930s and 1940s. The traditional theory of industrial organization associated the increase of concentration directly to the growth of the market power of the participants. The authors whose studies were used as bases for the oligopoly theory stated that competitors, through various forms of strategic behavior, influence both the increase in their own profitability, and a reduction in overall social welfare. In his study, Bain [2, pp. 293-324] concluded that, as a rule, activities with a higher degree of concentration generate higher profits.

The development of economic thought in the coming period resulted in a change of the public view of exclusively negative consequences that the increase of market power may have on social welfare. Thus, an increase in the size of a company increases its potential for innovation [48], but also for a more effective operation [16, pp. 356-390], [14, pp. 134-137], [53, pp. 818-833]. In addition, the development of the theory of unrestricted competition [5] introduced the entry of potential competitors in the market into the analysis. The proponents of this theory believed that the mere possibility of entry of a new competitor into the market significantly increases the level of competition between the existing market participants. The existence of threats of penetration of new participants into the market, if the existing ones raise their prices, may lead to outcomes which are very similar to those in markets with perfect competition. The study showed that even in activities with a relatively small number of participants, fierce competition may exist.

Due to the specific nature of banking activities, the experts do not share a uniform opinion on the need for a greater or lesser degree of concentration in the sector. Some authors [34, pp. 169-176] present arguments in favor of the increased level of market concentration (pro-concentration theories). Others [15, pp. 38-48] note that the level of concentration in the banking sector is undesirable

from a social point of view (cons-concentration theories). Guided by the authors Sharma and Bal [49, pp. 95-107] and Tushaj [52], the following part of the paper shall state the most significant views of the two schools of thought.

Advocates of increased concentration of the banking sector believe that capital consolidation in banks occurs as a result of the efforts to achieve economy of scale and increase business efficiency. A less concentrated banking market, with a large number of small banks, is more prone to banking crises than the banking market dominated by a few large banks. The above is explained by the fact that big banks have the potential to diversify their portfolio more effectively. In addition, proponents of this idea consider that it is easier to supervise a few large banks than a large number of small banks, which results in the reduction of risks stemming from inadequate prudential supervision of the banking sector.

On the other hand, numerous empirical studies link the concentration of the banking market with a reduction in credit supply, an increase in lending and a reduction in deposit rates. This results in a growth in profitability of the banking operations and a decrease in economic welfare of society. Furthermore, opponents of increased concentration in the banking sector have noted the falsity of the hypothesis which argues in favor of an easier supervision over a small number of large banks. They point out that if the size of a bank is positively correlated with the growing complexity of banking operations, supervision of large banks can become very complicated.

However, one of the basic questions related to the issue of growth of market power is how the increase in the degree of concentration of a particular market affects the level of competition. This issue has been relevant for numerous authors; thus, over time, two basic approaches were established in literature – the structural and the non-structural approach.

The structural approach relies on the SCP paradigm (structure-conduct-performance paradigm) and the hypothesis on the efficiency of structures, originally developed by the authors Mason [33, pp. 61-74] and Bain [3]. The proponents of the application of this approach determine the degree of competition between the banks based on the research of market structures and the degree of market concentration

(in terms of selected concentration ratios). In essence, this approach is based on the interplay between concentration and competition, with the assumption that the degree of market concentration is inversely related to the level of competition [1, pp. 566-579]. In other words, in a highly concentrated market, the degree of competition between the participants is lower (structure-conduct), which leaves room for the banks to claim more profits (performance). In contrast, the structure-conduct-performance hypothesis assumes a different direction of the interplay between market structure and business performance. According to this hypothesis, the superior performances are due to more efficient operation of large banks in comparison to small banks, and the growth of market power (increased level of concentration) is a direct consequence of conducting operations in a more efficient manner.

On the other hand, non-structural approach is based on researching competitiveness and bank behavior without the use of structural variables and ignoring the degree of market concentration. Within this approach, authors often use the Lerner Index [30, pp. 157-175], Panzar-Rosse [44, pp. 443-456], Iwata [28, pp. 947-966] and Bresnahan [12, pp. 87-92] model.

Recent studies that have examined the effects of market concentration showed that the growth of the market power of banks may result from the diversification of the banking sector [4, pp. 340-362]. These authors state that the banks which, in addition to the standard products, also offer other financial services (brokerage, insurance, etc.) as a rule have greater market power than the banks which only offer traditional banking services. In addition, numerous studies [31, pp. 31-77] revealed that there is a relation between the structure of the banking sector and economic growth.

On the other hand, in certain studies [19, pp. 563-583], [18] the authors consider that the degree of competition in the banking system and stability thereof depend on entry barriers, including on foreign ownership and the severity of activity restrictions, as well as the importance of other financial institutions (finance companies, merchant banks, insurance companies, capital markets). Furthermore, in their studies these authors find no evidence that banking system concentration negatively relates to competitiveness.

Based on a detailed review of the literature, it may be noted that in many cases the interplay between concentration and competition really is tantamount to reviewing the interplay between concentration and profitability, which stems also from the premises of the SCP paradigm. In this sense, the theoretical literature has developed two theories that explain the interplay between concentration and profitability in two different ways:

1. The market-power theories that promote a positive correlation between concentration and profitability, within which we distinguish between two aspects:

    1.1. The SCP (structure-conduct-performance hypothesis) – although the SCP paradigm has already been discussed, in terms of the interplay between concentration and profitability the SCP paradigm argues that the market that is more concentrated has higher prices as a result of competition imperfections in such market, i.e. the degree of concentration and profitability are positively correlated.

    1.2. The RMP (relative-market-power hypothesis) assumes that only companies with a large market share and differentiated products can charge higher prices and earn "supernormal" profits.

2. The theories that belong to the second group hold that the interplay between concentration and profitability is based on efficiency, the so-called efficient-structure hypothesis. Such theories are contrary to the previous ones that negate the effects of concentration on profitability.

    2.1. The X-efficient version – Companies with superior management or superior production technology achieve lower costs and thus higher profits. These companies also achieve greater market shares, which may result in higher levels of concentration. Within this variant – the efficient-structure hypothesis, the profit-structure interplay is irrelevant because it encourages efficiency and greater profitability and market shares.

    2.2. The scale-efficiency version – Companies essentially dispose of equally good management and technology, but some companies simply produce on a more effective scale and consequently have lower costs and higher profits. These companies achieve greater market shares, which increases concentration.

Bearing in mind the fact that "The research usually specified bank prices and measures of profitability as the endogenous indicators of bank conduct and performance, respectively." [8, p. 1], as well as a great amount of research by other authors [51, pp. 69-83], [7, pp. 404-431], [13, pp. 115-134], the authors have decided that the focus of this study should be a review of the basic assumption of the SCP paradigm on an inverse correlation between concentration and competition based on testing the strength of connections between concentration and profitability, which, according to the SCP paradigm, is positive.

In this sense, one of the fundamental questions is which indicator of profitability to choose, so that it can adequately reflect the level of competition in the market. Searching for the answer to this question, the authors noted that the interest rate spread contains information on the efficiency of the process of financial intermediation, the profitability of the banking sector and the impact of monetary policy on banking activities [54, pp. 73-82], and that the amount of interest rate spread reflects the degree of monopoly power that the bank possesses [22], which makes this indicator an adequate indicator of profitability or competition in the banking market.

Empirical research suggests that the relatively strong correlation between the size of banks and the height of interest rate spread is characteristic for banking markets dominated by several large banks [54, pp. 73-82]. In support, the author Belaisch [6] tested in his study the hypothesis that the anti-competitive banking market is characterized by high values of interest rate spread which reduces the volume of deposits and loans. This is also confirmed in the SCP paradigm which implies that market concentration is positively correlated with the amount of interest rate spread [47, pp. 1-10].

Accordingly, the authors have decided to use the interest rate spread as an indicator of profitability of the banking sector and, therefore, of the degree of competition in the market. This is corroborated by the report of the

IMF, a part of which states that the interest rate spread can be used for assessment of profitability and price behavior of banks [11]. Taking into account the tendency of central banks to increase transparency of the banking sector, commercial banks are forced to provide more detailed information both on the level of interest rates and interest rate spread, so that there are no hidden costs. Therefore, the interest rate spread is a more relevant indicator of profitability of the banking sector compared to traditional indicators of profitability – the ROA and ROE, which are subject to accounting manipulations.

Taking into account the aim and purpose of this paper, the *research question* is: Is there a linear correlation between concentration and competition (measured by profitability), as well as what is its intensity, if any? The basic hypothesis is set as follows.

The hypothesis. A greater degree of concentration of the banking sector is associated with higher profitability of banks operating in this market, which is negatively reflected on competition.

The above hypothesis shall be tested in the banking sectors of the four selected European countries based on the data downloaded from the websites of the central banks in these countries, for a six-year period between 2009 and 2014.

Methodological framework for measuring concentration

Despite the fact that the Panzar-Rosse model is the most widely used tool for testing the degree of market concentration and the level of competition in the banking sector [32, pp. 371-384 according to 50, pp. 41-50] this model entails several limitations for which reason it cannot be used for calculating the degree of concentration of the banking sector. Authors Lončar and Rajić [32, pp. 371-384 according to 10] suggest the following. The model assumes that each bank offers one product only. In addition, the model assumes that all banks have the same cost function. Finally, it was empirically confirmed that the model often erroneously assessed the level of competition depending on the degree of market concentration.

Accordingly, when analyzing the degree of concentration of the banking sector in Serbia and the selected European countries, this paper shall apply the structural approach, in which concentration ratios play a central role in explaining the structure of the market. The starting point in determining the degree of market concentration within the structural approach, and consequently the conditions of competition prevailing in it, shall be a clear definition of the relevant market.

Defining the relevant market is the basis for calculating market concentration indicators, competition analysis and application of competition rules. In practice, it is extremely important to determine precise boundaries of the relevant market. Within the EU legislation [56], the European Commission defined the relevant market as follows: The relevant market is the market comprising relevant product market and the relevant geographic market, from which we conclude that the determination of the relevant market involves establishing two dimensions of this market – the relevant product market and the relevant geographic market. Relevant product market is a set of goods or services that consumers consider interchangeable in terms of their properties, the usual purpose and price, while the relevant geographic market is the territory in which market players offer products and services, and is subject to the same or similar conditions of competition.

When defining relevant product market for the banking sector, in order to simplify the calculations, the most frequently used approach is the one that takes into consideration the criterion of holding the banking license. In other words, it means that, when calculating concentration indicators, all banks that hold the license are considered, regardless of the fact that some of them have expanded their activities portfolio into other segments of financial activities. On the other hand, certain financial institutions (e.g. insurance companies in the segment of life insurance) offer products that may be considered as substitutes for certain banking products. By applying the criterion of holding the banking license, however, these institutions shall not be considered in this study. Furthermore, the relevant geographic market shall be the entire territories of the analyzed countries.

Analysis of the banking sectors in Serbia, Croatia, Romania, and the Czech Republic

The early 1990s, with the onset of the transition process in Central and Eastern Europe (CEE), marked the beginning of the reform mechanism of their respective banking sectors, which included the creation of new regulatory systems and privatization of state-owned banks, paving the way for the arrival of foreign banks in the market of these countries. As a result, significant changes occurred in the structure and characteristics of the banking sectors in these countries, which may be reflected in the level of their concentration, as well as the competition therein. As noted above, in order to provide answers to the research question and test the hypothesis, we are going to analyze the banking sectors in the four selected countries in the six-year period between 2009 and 2014.

In the early 2000s, the banking market in Serbia was characterized by a large number of banks, real insolvency of the largest banks, high illiquidity, lack of an adequate system or presence of an inadequate system of internal supervision of bank operations, inadequate risk management system, as well as improper operations [38]. As of 2001, significant changes occurred in the banking sector in the form of closure of a number of banks that lost their banking license, capital consolidation (through mergers and acquisitions), entry

of foreign banks due the active policy of liberalization and other activities which improved the structure of the banking sector in Serbia. As a result of these trends, in the period from 2001 to 2004, the number of banks in the Serbian market halved and this trend continued in the coming years. The downward trend in the number of banks[1] was observed in the rest of the analyzed countries, as well, which makes testing the degree of concentration of the banking market a topical and important issue.

Along with the process of reducing the number of banks, changes also occurred in the ownership structure of the banks in the analyzed countries, in terms of increasing the share of foreign-owned banks. The dominant role of foreign banks is also evidenced by the data from a Raiffeisen Bank study [46]. If we observe the data for 2014, they show that the share of foreign banks in the total assets of banks varied from 75% (in Serbia) to 90% (in Romania). Among the analyzed countries, the share of state-owned banks in the total assets was the largest in Serbia (19.2%), followed by Romania where the share of state-owned banks was lower than in Serbia by up to more than ten percentage points and amounted to 8.8%, while in the Czech Republic it amounted to merely 2.3%.

An important indicator of the state of the banking sector is the value of total assets, loans and deposits. The values of these balance sheet items (see Figure 1) indicate

Figure 1: Value of total assets, loans and deposits in the period from 2009 to 2014 (in million EUR)
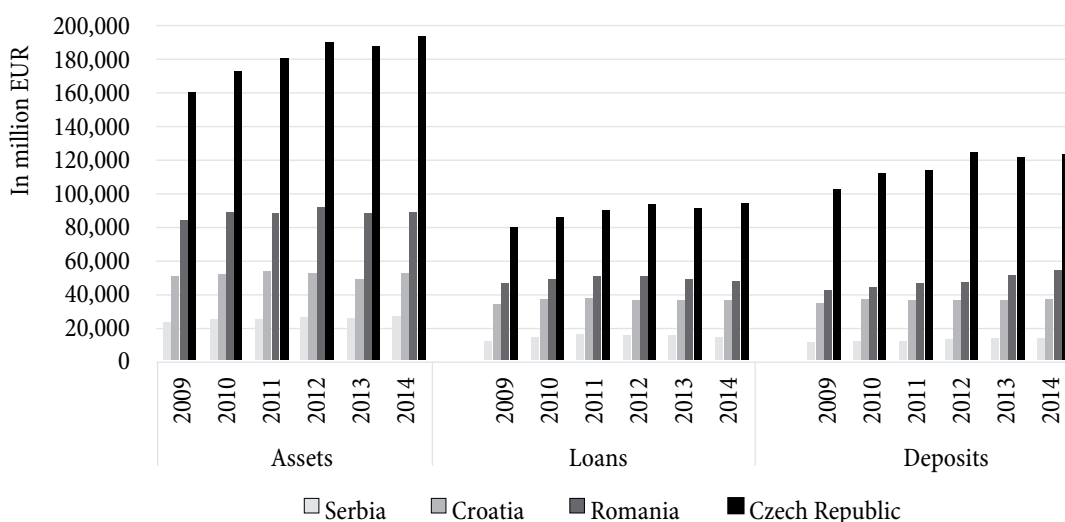
Source: The authors' calculations based on data obtained from the study: Raiffeisen Research (2014) CEE Banking Sector Report [45] and Raiffeisen Research (2015) CEE Banking Sector Report [46].

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1   According to the data for 2014, 29 banks were operating in Serbia, 28 in Croatia, 39 in Romania, and 45 in the Czech Republic.

Figure 2: Value of the CR$_5$ for assets in the period from 2009 to 2014 (in %)
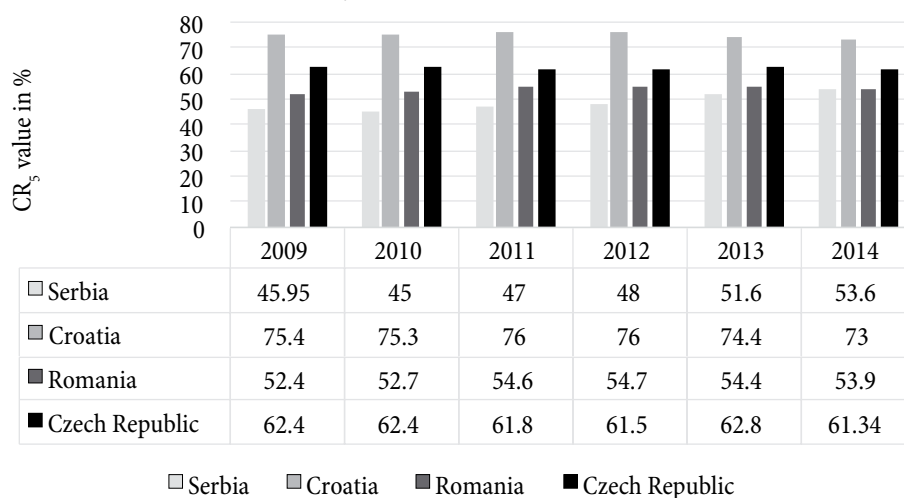
	2009	2010	2011	2012	2013	2014
☐ Serbia	45.95	45	47	48	51.6	53.6
☐ Croatia	75.4	75.3	76	76	74.4	73
◼ Romania	52.4	52.7	54.6	54.7	54.4	53.9
◼ Czech Republic	62.4	62.4	61.8	61.5	62.8	61.34

☐ Serbia ☐ Croatia ◼ Romania ◼ Czech Republic

Note: The data for Croatia for 2014 represent an estimated value; the data for Romania for 2014 refer to the first two quarters.
Source: The authors' calculations based on the data downloaded from the central banks' websites [20], [21], [36], [37], [39], [40], [41], [42], except for the Czech Republic for 2014, which was retrieved from the website of the European Central Bank [26].

the presence of large differences in the characteristics of the banking sectors of the analyzed countries. In the overall analyzed six-year period, Serbia recorded the lowest values of assets, loans and deposits, while the value of these accounting items was highest in the Czech Republic. By observing Figure 1, it can be undoubtedly concluded that, based on the criteria of the value of total assets, loans and deposits, the banking sector of the Czech Republic was the most developed one of all the countries in the analyzed group.

Taking into account the abovementioned features of banking sectors in the analyzed countries, the relevant question is the degree of concentration of these markets. As already stated, with regard to the availability of data, the authors decided to analyze concentration using two indicators, the CR and the HHI, whereby the concentration ratio refers to the five major banks (CR$_5$).
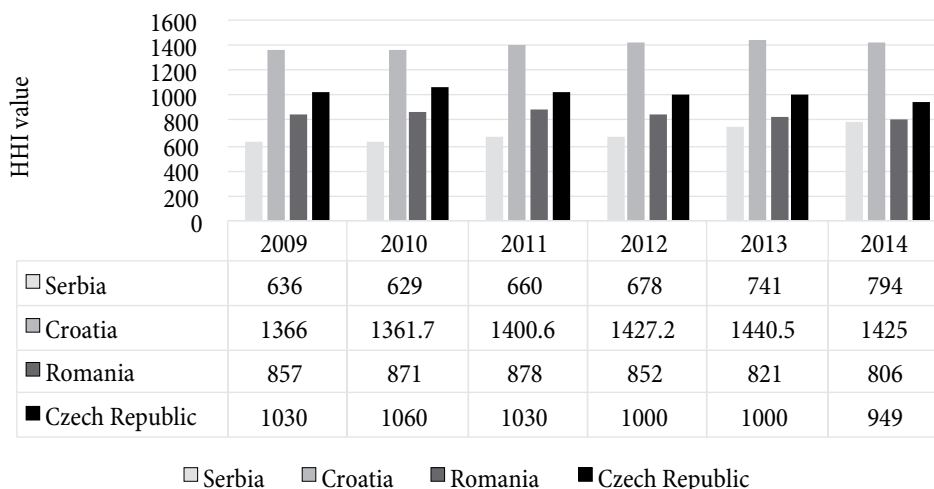
For the period from 2009 to 2014, average concentration ratio of assets of the five leading banks in the analyzed group of countries was 60.04%, which was almost identical to the median value in the European Union in the same period. The value of the CR$_5$ for the analyzed countries in the analyzed period (see Figure 2) indicates that, in the period from 2009 to 2014, Serbia achieved the lowest concentration ratio values for the five leading banks, which leads to the conclusion that, according to this indicator, the degree of concentration of the banking market in Serbia was the lowest. However, taking into account the

shortcomings of this indicator, a more realistic picture of the degree of concentration of the banking sector in the analyzed countries is obtained by comparing the values of the HHI (see Figure 3). It is evident that, in the period from 2009 to 2014, Serbia recorded the lowest values of the HHI, which confirms the previous conclusion that, in the analyzed group of countries, Serbia displayed the lowest degree of concentration. If we take into consideration both the CR$_5$ and the HHI, the degree of concentration was the highest in Croatia. It is interesting to note that the average value of the HHI for assets in Serbia, from 2009 to 2014, was lower than the average value of this indicator for the European Union in the same period (690 in Serbia, compared to 1,100[2] in the European Union).

Although the awareness of the level of market concentration was very important, testing the impact that concentration had on the entire banking sector was even more significant. Considering that the aim of this paper was to investigate the existence of a negative correlation between concentration and competition, based on a review of the (positive) connection between concentration and profitability, the authors have decided to approximate the level of competition by the interest spread in this paper. The relevance of using the interest rate spread as an indicator that reflects the level of profitability and

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2 Based on the authors' calculations derived from data downloaded from the website of the European Central Bank.

Figure 3: Value of the HHI for assets for the period from 2009 to 2014

	2009	2010	2011	2012	2013	2014
☐ Serbia	636	629	660	678	741	794
☐ Croatia	1366	1361.7	1400.6	1427.2	1440.5	1425
■ Romania	857	871	878	852	821	806
■ Czech Republic	1030	1060	1030	1000	1000	949

☐ Serbia   ☐ Croatia   ■ Romania   ■ Czech Republic

Note: The data for Croatia for 2014 represent an estimated value; the data for Romania for 2014 refer to the first two quarters.
Source: The authors' calculations based on the data downloaded from the central banks' websites [20], [21], [36], [37], [39], [40], [41], [42], except for the Czech Republic for 2014, which was retrieved from the website of the European Central Bank [26].

the degree of competition in the banking markets was previously discussed in Section 2 of the present paper.

Observing the value of the interest spread for all four analyzed countries in the period from 2009 to 2014 (see Table 1), it can be concluded that, from 2009 to 2012, the highest difference between average lending and the average deposit interest rate was recorded in Croatia. Bearing in mind the previously stated conclusion that Croatia displayed the highest level of concentration in the analyzed group of countries, it may be established intuitively that high concentration was related to a lower level of competition. However, in 2012, the value of interest rate spread was the same for Serbia and Croatia, while in the two following years, Serbia recorded the highest value of this indicator. It should also be noted that, in this period, the degree of concentration in Serbia revealed a tendency to increase, as well. On the other hand, the Czech Republic recorded the lowest value of the interest rate spread, unlike the indicators of concentration, which might have been expected according to the SCP paradigm.

Taking into account the abovementioned characteristics of the banking sector in the analyzed countries in Central and Eastern Europe, it is clear that the question of the impact of concentration on competition deserves special attention, and it is further analyzed in Section 5, where a link between concentration and competition is empirically tested based on the data referred to in the present section.

Testing correlation between concentration indicators and competition indicators

Based on the data presented in Section 4 of this study, we have conducted a correlation analysis, the results of which are presented in Table 2.

Most studies have indicated that there was a negative correlation between concentration and profitability, which suggests that the SCP paradigm is not valid. What may be true is that certain profitability indicators (the interest rate being the most often used one) are higher in a more concentrated market. It is safe to say that this theoretical

Table 1: Interest rate spread (in %)

		2009	2010	2011	2012	2013	2014
Interest rate spread	Serbia	6.70	6.00	7.40	7.60	9.20	8.00
	Croatia	8.40	8.60	8.00	7.60	7.70	7.40
	Romania	5.30	6.80	5.80	5.80	6.00	5.40
	The Czech Republic	4.70	4.80	4.70	4.40	4.10	3.90

Source: The data has been downloaded from the website of the World Bank [55], with the exception of the data for Croatia for the year 2014, which was retrieved from the website of the Croatian National Bank [35].

Table 2: Correlation matrix

Serbia

	Interest rate spread	HHI	CR_5	HHI*CR_5
Interest rate spread	1			
HHI	0.7703	1		
CR_5	0.8202	0.9958	1	
HHI*CR_5	0.7783	0.9997	0.9973	1

Croatia

	Interest rate spread	HHI	CR_5	HHI*CR_5
Interest rate spread	1			
HHI	-0.4854	1		
CR_5	0.8426	-0.3756	1	
HHI*CR_5	0.0657	0.7806	0.2861	1

Romania

	Interest rate spread	HHI	CR_5	HHI*CR_5
Interest rate spread	1			
HHI	0.3958	1		
CR_5	-0.1177	-0.2172	1	
HHI*CR_5	0.3132	0.8484	0.3324	1

The Czech Republic

	Interest rate spread	HHI	CR_5	HHI*CR_5
Interest rate spread	1			
HHI	0.9359	1		
CR_5	0.2843	0.5541	1	
HHI*CR_5	0.8711	0.9841	0.6929	1

Source: Authors' calculation

statement adequately describes the situation in the Croatian banking market. Specifically, in the case of Croatia, which exhibited the highest degree of concentration among the analyzed countries, there was a strong positive correlation between the interest rate spread and the CR_5 but the value of the correlation coefficient between the HHI x CR_5, as a comprehensive indicator of concentration, on one hand and the interest rate spread on the other was very close to zero, which indicates a negligible correlation between concentration and profitability indicators, and suggests that changes in the value of concentration indicators were not associated with changes in the value of profitability indicators. Given that the interest rate spread is highly positively correlated with the CR_5 but negatively correlated with the HHI as an overarching indicator of concentration, we came to the conclusion that the leading five banks achieved high profits, which may lead to the conclusion that the Croatian market was characterized by oligopolization.

The Czech Republic recorded the lowest value of the interest spread throughout the analyzed period, which,

combined with a large number of banks operating in the market, may lead to the conclusion that intense competition in the banking market reduced profitability. If we observe the correlation coefficient values obtained, we may conclude that there was a strong positive correlation between the HHI x CR_5 and the interest rate spread, which supports the SCP paradigm. This result may be unexpected, given that the concentration indicators revealed that the degree of concentration in the Czech market was not the lowest among the analyzed countries, which might have been expected in accordance with the SCP paradigm. The explanation lies in the fact that the concentration in the Czech market was more intense than in Serbia and Romania, but not intense enough to result in a conclusion on the rejection of the SCP paradigm. It is interesting to note that the correlation between the interest rate spread with the HHI was significantly higher than with the CR_5 (0.94 versus 0.28), which indicates that the largest players in the market did not dictate the rules of the game by appropriating high profits for themselves, but rather by

a price war which reduced the difference between the lending and deposit interest rates.

Practically during the entire analyzed period (except for 2010), following the Czech Republic, Romania was the country that recorded the second lowest values of the interest rate spread, which, on average, was 5.85 (compared to 4.43 in the Czech Republic), suggesting that Romania's competition was more intense than the ones in Serbia and Croatia. The analysis has shown that the correlation between the interest rate spread and concentration of individual indicators, as well as the correlation between the interest rate spread and the HHI x CR_5 within the limits was negligible and very weak, suggesting the irrelevance of interplay between concentration and profitability, as emphasized by numerous authors.

If we observe the market in Serbia, it is noticeable that its banking sector recorded the lowest values of concentration indicators which, according to the SCP paradigm, should be associated with lower levels of profitability. However, the value of the interest rate spread indicated that the profitability of the banking sector in Serbia was very high, and that in 2013 and 2014, it was the highest among the analyzed countries, which intuitively might lead to the conclusion that the SCP paradigm would be refuted. However, the correlation analysis showed that the interest rate spread correlated both with the HHI and the CR_5 and the HHI x CR_5 highly positively, leading to a conclusion that there actually was a positive interplay between concentration and profitability, namely that the SCP paradigm was successfully demonstrated. Such result is explained by the characteristics of the banking market in Serbia which, despite dispersed market participation, displayed slow competitive dynamics in the industry, indicating possible existence of indirect oligopolization and market cartelization. This brings us to the conclusion that the interplay between concentration and profitability does not necessarily depend on the number of players in the market and their respective market shares, but rather on the way in which market participants are organized. If there is a greater degree of cooperation among the players, in terms of maintaining a common pricing policy, then the profitability of the given banking market will

be higher even though the concentration ratios suggest a lower level of concentration.

Bearing in mind the presented research results, it may be concluded that the SCP paradigm, and hence the hypothesis, as described in Section 2 of this paper, was successfully demonstrated in the case of the Czech Republic and Serbia, while the Romanian market exhibited low, almost negligible interplay between concentration and competition and profitability, and this situation was even more pronounced in the case of Croatia. These results, although in certain instances unexpected, are explained by market specifics in the analyzed countries, especially price policy and the effects of the mutual cooperation of the banks that operate in these markets.

Conclusion

Under the influence of the process of globalization, liberalization and transition, the banking sectors of countries around the world have undergone paramount changes which have triggered a number of issues, one of the most topical ones being testing the degree of concentration and its impact on the level of competition and social prosperity. Research of the concentration of the banking sector is particularly important for countries in transition that initiated the process of liberalization of the banking market in the 1990s by allowing foreign banks to enter the markets, with possible significant implications for the level of competition. Accordingly, the study included an analysis of the banking sectors of three countries from the region of South Eastern Europe – Serbia, Croatia, and Romania, and one country from Central European region – the Czech Republic.

A dynamic analysis of the degree of concentration conducted by examining trends in the HHI and the CR_5 indicators in the six-year period from 2009 to 2014 for the selected European countries revealed that the degree of concentration measured by the indicators listed was the lowest in Serbia and the highest in Croatia. On the other hand, the analysis of the degree of competition, based on the analysis of the trends in the difference between the lending and deposit interest rates, indicated that the Czech banking market was the least profitable one. The highest

values of this indicator in the period from 2009 to 2011 were recorded in Croatia, while in 2012, the value of the interest rate spread was the same for Serbia and Croatia, and in subsequent years, the highest recorded values for this indicator in the analyzed group of countries were those for Serbia.

This statement is confirmed by the results obtained by examining the degree of correlation between the level of concentration and the degree of competition, measured by a profitability indicator of the banking sectors in the analyzed countries. The results are not unambiguous, and in most cases, they deviate from what might have initially been expected. Thus, in the case of Serbia, the SCP paradigm was successfully demonstrated even though the Serbian banking market was characterized by the lowest level of concentration, while the value of the interest rate spread was very high, which is explained by the cooperation between market participants and their agreeing on the price policies they adhered to. On the other hand, the lowest interest rate spread in the Czech Republic was not accompanied by very low concentration indicators; nevertheless, the SCP paradigm was demonstrated, which was explained by the fact that concentration was intense but not intense enough for the SCP paradigm to be rejected, as well as the fact that there was a possibility that participants were involved in market price war which lowered profitability. In contrast to these results, in Croatia, a demonstration of the SCP paradigm could have intuitively been expected since the Croatian banking sector exhibited the highest degree of concentration among the analyzed countries, while the value of the interest rate spread was high. However, the results of the correlation analysis showed a negligible correlation between the concentration and profitability indices, which was explained by the fact that high value of the interest rate spread did not affect the profit sufficiently so as to result in a positive conclusion regarding concentration and profitability. The analysis of the banking sector in Romania also showed that the interplay between concentration and profitability, i.e. competition, was almost negligible, as many authors were trying to prove.

This indicates that the conclusions about the interplay between concentration and competition cannot be made solely on the basis of the results of a quantitative analysis, and that the way in which the market participants are organized represents an important factor, as well.

The paper may serve as a basis for further research into this area. It would be interesting to examine how the introduction of new banking services and financial innovations arising from such services (brokerage, the sale of insurance and the like) would influence the level of concentration in the banking sector. In addition, future research might be focused on the development of the model which examines the interplay between concentration and profitability. In this sense, it would be possible to observe a wider time frame and more countries, but also to test the interdependence of these categories by using the panel model. The panel model would allow separate consideration of individual and time effects of concentration on profitability in the banking sector.

Since further consolidation of the banking sectors in the region is expected, the issue of concentration of the banking sector will be topical in the future, as well.

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VALIDITY OF INVESTMENT LOAN APPROVAL MODEL FOR SMEs IN SERBIA*

Validnost modela odobrenja investicionog kredita malim i srednjim preduzećima u Srbiji

Abstract

Small and medium enterprises (SMEs) are the main drivers of economic development. The SMEs invest funds in new products, new technologies, as well as in new markets. Finally, their aim is to increase the overall value of the company, i.e. to obtain profit for the shareholder. The subject of this research paper is an objective analysis of the validity of the investment loan approval model for the SMEs (ILASME) used by the commercial banks when considering whether to support financially an investment need of an SME client. The aim of this paper is to indicate the possibilities of improving the validity of the ILASME from the standpoint of validity for decision-making in this domain. The basic hypothesis of the research is that there is an objective doubt regarding the validity of the ILASME applied by the commercial banks in Serbia. By applying the Pearson correlation coefficient, the effect of the applied ILASME on the commercial banks' performance shall be quantified, i.e. the impact of non-performing loans (NPLs) on the financial result and the equity of the bank shall be determined. Furthermore, it can be concluded that final success of the implemented ILASME depends on the adopted and accepted risk management procedures, which are the subject of permanent monitoring and improvement, as well as on the qualitative factors on the borrower and lender side. Moreover, permanent monitoring of market trends and improvement of credit risk management procedures are relevant.

Keywords: *SMEs, investment, customer analysis, transaction analysis, cash flow, risk management*

Sažetak

Mala i srednja preduzeća (MSP) su glavni nosioci ekonomskog razvoja. MSP investiraju sredstva u nove proizvode, nove tehnologije i osvajanje novih tržišta. Njihov krajnji cilj je da povećaju vrednost kompanije, odnosno, da obezbede profit za vlasnika. Predmet ovog istraživanja jeste objektivna analiza validnosti modela za odobrenje investicionog kredita malim i srednjim preduzećima (ILASME) koji najčešće koriste poslovne banke kada razmatraju da li će finansijski da podrže investicionu potrebu MSP klijenta. Cilj ovog rada je da ukaže na mogućnosti za unapređenje ILASME u domenu objektivnog donošenja odluke. Osnovna hipoteza istraživanja je da postoji sumnja u validnost/pouzdanost ILASME koji koriste poslovne banke u Srbiji. Primenom Pirsonovog koeficijenta korelacije će biti kvantifikovan stepen međusobne povezanosti ILASME i poslovnih performansi banke, odnosno indikatora kvaliteta aktive, poslovnog rezultata i kapitala. To će dalje uputiti na zaključak da uspešnost primene ILASME zavisi od usvojenih i primenjenih risk menadžment procedura, koje su predmet stalnog praćenja i unapređenja, uvažavajući kvalitativne karakteristike kreditora i korisnika kredita. I na kraju, proaktivno praćenje tržišnih trendova i fleksibilno unapređenje kreditnih procedura za upravljanje rizikom od presudnog je značaja.

Ključne reči: *MSP, investicije, analiza klijenata, analiza transakcija, novčani tokovi, risk menadžment*

Introduction

Small and medium enterprises (SMEs) are the main drivers of economic development. Furthermore, they play a key role in the expected future growth of an economy (according to the European Commission data, they represent 99% of all businesses in the European Union [19]). Moreover, they contribute to the reduction of unemployment rate, i.e. they make up 66.7% of share of employment in the non-financial sector [27]. Finally, their activities are supported by the public sector through favorable or subsidized lines of credit.

There are different definitions of the SMEs in modern literature and practice all over the world. The European Commission defines them as the entities having less than 250 persons employed, annual turnover of up to EUR 50 million, or a balance sheet total which does not exceed EUR 43 million [20]. In accordance with the Serbian Law on Accounting and Auditing [26], the SMEs are classified in the following categories: small (10 ≤ annual average number of employees ≤ 50; RSD 84,671,000 ≤ annual sales ≤ RSD 1,064,433,000; RSD 42,335,000 ≤ annual average asset value ≤ RSD 532,217,000) and medium (50 ≤ annual average number of employees ≤ 250; RSD 1,064,433,000 ≤ annual sales ≤ RSD 4, 233,541,000; RSD 532,217, 000 ≤ annual average asset value ≤ RSD 2,116,770,000).

In order to be aligned with market competition and the customers' needs, the SMEs invest funds in new products, new technologies, as well as in new markets. Finally, their aim is to increase the overall value of the company, i.e. to obtain profit for shareholders. "Investments, in the broadest sense, are a necessary condition to achieve progress and the realization of man's continuous efforts to master the forces of nature and efficiently use them for his own needs. Without investments, there is no technological progress, i.e. progress on the continent." [22, p. 52]. Basic elements of investments [3] are: an entity that invests (investor), the object in which it is invested, the price of renouncing the expenditure (interest rate) and the discount rate. Accordingly, an investment is interpreted as current investment in assets which will obtain profit in the long run for the company. This definition is in line with Brealey et al. [12] and Bodie et al. [11], who claimed that today's investments bring benefits in the future. Moreover, Palepu et al. [29] pointed out that expected earnings, in spite of accepted risks and the ROE, are crucial for investments. Finally, the said interpretation relates to Đuričin and Lončar [15], who claim that future (forecasted) earnings capability is important for investment decisions.

The SMEs need appropriate financing for their investment decisions, both from its own, as well as from borrowed (external) sources. The banks are the main creditors in Serbia (i.e. external source of financing), due to the fact that the financial market in Serbia is bank-centric. Final SMEs decision with regard to the source of financing shall largely depend on the level of the return on investment (ROI). The focus is on the income earned from the basic business operations of the company, which represents the primary source of loan/owners' investment repayment [4].

The subject of this research paper is an objective analysis of the validity of the investment loan approval model for the SMEs (ILASME) applied by the local banks when considering whether to financially support the investment needs of the SME clients. In other words, the aim of this paper is to reveal the possibilities of improving the validity of the ILASME from the standpoint of validity for decision-making in this domain. The basic hypothesis (H0) is: There is an objective doubt about the validity of the ILASME used by the commercial banks in Serbia.

The bases for proving the hypothesis are: a) official annual reports of Erste Bank a.d. Novi Sad, (whose main customers, according to the Bank's mission, are predominantly the SMEs, and because one of the authors of this paper worked at Erste Bank for 5 years in the SMEs sector): indicators such as loans in use, asset quality expressed through the level of non-performing loans (NPL), amount (level) of equity, capital adequacy ratio (CAR), return on equity (ROE) and return on assets (ROA); b) primary survey results, which included 30 Chief Financial Officers (CFOs) of the SMEs which conducted business in Serbia in the second half of 2015 and the first half of 2016, in order to examine current practices in investment decision-making process. The Pearson correlation coefficient shall be subsequently applied in order to quantify and determine the effect of the applied

ILASME on the commercial banks' performances, i.e. the impact of the NPLs on the financial result and the equity of the bank. Those results shall then be compared with the Serbian banking sector data presented in the research conducted by Barjaktarović et al. [4]. The analysis period was from 2007 to 2015. The obtained results were compared with the respective answers and evaluations provided by the bankers and auditors who participated in the survey.

Accordingly, the paper is organized in four parts. In the introductory part, the subject, aim and hypothesis shall be defined. Literature review shall be presented in the second chapter. The third chapter shall render the methodology used. The research results shall be introduced in the fourth part. In the last chapter, concluding remarks shall be presented.

Literature review

According to the data provided by the Ministry of Economy, 324,272 SMEs conducted their business in the Republic of Serbia in 2014, which represents 99.8% of the total number of legal entities in Serbia (324,766) [27]. The SMEs and micro clients generated 64.8% of the total employment in the non-financial sector (i.e. 761,539 employees), 65.4% of total turnover and 32% of total GDP. However, the SMEs independent credit ranking is still not an officially available information.

In the following paragraphs, the authors shall present the research results: 1) quantitative factors in the client analysis (theoretical and empirical results); 2) qualitative factors in the client analysis (empirical results); and 3) loan transaction analysis (empirical results).

Hopwood et al. [21] and, in our region, Belak [10] are the authors who have worked extensively on the credibility of the financial statements as a basis for determining the creditworthiness of the clients, i.e. on forensic accounting and auditing, in theoretical terms. Their specialty involves investigative actions regarding the conducted frauds. Having in mind the globalization and the need for additional profit of different stakeholders, money and its instruments are subject of various fraudulent acts which are the subject of prevention and detection in their early phase. It is a current and interesting issue for the wider scientific and

professional public, as well as for future research. There are many studies and articles on this subject and officially published data by various relevant state institutions, which shall be presented below.

Surveys conducted by professors in the field of business economy and law and experts from Central and Eastern Europe (conducted in the period from 2009 to 2016, with a special focus on the market of the Republic of Serbia), indicate that there are certain doubts about the validity of the proposed ILASME, i.e. regarding the basic determinants of creditworthiness of the SMEs, such as the objectivity of the financial statements and the financial analysis instruments. The third category of fraud, according to the ACFE [1], is false financial reporting (9% of the total number, but causes the greatest financial effects, on average a loss of 1 million dollars). According to the data provided by this association, scheme frauds in financial statements may relate to: (1) overvalue of assets and income (premature revenue recognition, notional incomes, hidden liabilities and costs, inadequate property valuation – overvalue, inadequate disclosure); or (2) underestimation of assets and income (disposal of revenue recognition, underestimated income, overvalue of liabilities and costs, inadequate valuation of property – underestimation).

Furthermore, many studies conducted in the same period in Serbia indicated that there are reasons for doubt in the quality of the submitted financial statements. The motives for such acts are mainly related to tax reasons (tax evasion) or to disbursement of bonuses to managers [28]. Furthermore, research conducted among accountants (2014) revealed that there is no clear boundary between the creative use of accounting techniques and their misuse ("creative accounting"). In addition to this, by applying the Benford's law on a sample of 847 large companies which operated in the Republic of Serbia in 2012, Barjaktarović et al. [5] indicate that there are grounds for doubt regarding the stated financial results due to the regularity of the appearance of numbers 1 and 9. In the following experiment conducted on a sample of 4,029 large and medium-sized enterprises operating in the Republic of Serbia in the period from 2009 to 2013, by applying the Benford test, Čerović et al. [14] indicate that there are reasonable grounds to

question the reported amounts of net cash flow from operating activities, due to the incidence of numbers 1 and 3, and lower occurrence of number 4. The authors suggest that the reasons might be manipulative, but do not exclude the ignorance of persons who composed the cash flow statement. Moreover, Bugarčić [13] points out to the mistrust in the case of tax evasion and money laundering in the Republic of Serbia on the basis of cash payment transactions (loan granted by owners) and withdrawals from the account on the basis of forgery of business/financial documentation. Furthermore, Jovin [23] revealed that actual and officially reported results are quite different, i.e. that many companies perform business in the gray area, paying in cash without disbursing appropriate taxes to the state (the sample covered 129 SMEs and 80 credit risk managers in 15 banks in Serbia in 2015). Based on the survey conducted among accountants in major cities of Serbia (2015), it has been found that a small number of enterprises: (1) correctly calculate depreciation of fixed assets (which represent 60.36% of total assets of all legal entities that have submitted data for statistical purposes for 2014) [31], (2) use the prescribed regulations for the assessment of trade receivables depreciation while relying on no real analysis of the performed calculation to improve their performance in the upcoming reporting periods [35].

According to the analysis provided by Knežević et al. [24], many limitations of the financial analysis application are identified, and the most significant are the following: identification of categories of industrial companies and intercompany relationships (group of associated companies), seasonal influences on the obtained values of indicators, published averages for industries have an approximate character and in many cases represent the target of companies, the financial statements have been prepared using the historical cost basis without considering the impact of inflation, the relevant data on the balance sheet, etc. Moreover, Jovin [23] confirmed that projections of future business of the SMEs are not reliable and that many business plans are prepared according to the "copy-paste" principle applied by external consultants in order to produce the paper requested by the bank (not in order to prescribe a proper business model for future development). Finally, Vasilski

[34] and Sikimić [31] confirmed by examining two different SMEs credit portfolios that the most relevant factors for successful performance of a company are management and appropriate organizational structure and qualification of the employees.

On the other hand, contemporary regulations in the field of risk management in the banking sector (i.e. the Basel Accords), are in line with expert opinions (risk managers of the banks, especially) in the final assessment of the creditworthiness of the client, which means that the appropriate mix of qualitative and quantitative components (primarily, the quality of financial statements) of the company and of the risk managers' ability are key issues to be considered while making investment decisions. In addition to this, data which are published on the website of the National Bank of Serbia [4] indicate that in times of crisis, the number of loan beneficiaries who have problems with repaying the debt (NPL) has been on the increase.

Having in mind that the research indicates that there are doubts about the elements which are used in the process of determination of the creditworthiness of the SMEs, the authors of this paper reflected on the performance of Erste Bank a.d. Novi Sad (EBNS) in accordance with the accepted credit risk policies. Moreover, no research was published to date that suggests suspicion regarding the publicly disclosed information on the NBS's website.

Methodology

The authors relied on the following data: 1) primary researches: a) conducted from 2007 to 2016; b) conducted in 2015/2016 through interviews with 30 CFOs of the SMEs, 7 credit risk managers (employed at respective banks) and 4 auditors (employed at "the Big 4"); c) one of the authors worked at the EBNS for almost 5 years; 2) secondary data published by Erste Bank a.d. Novi Sad (in the period from 2007 to 2015), the NBS (in the period from 2009 to 2014) and Barjaktarović et al. [4]. In addition to the descriptive statistical method, they also used the method of correlation analysis and approach model to investigate the problem of the validity of the ILASME applied by the EBNS.

At the beginning, the authors shall focus on the ILASME, which is subject of critical analysis and a survey

which was conducted in 2015/2016, in order to examine the current practices in the SMEs investment decision-making process. This shall be followed by a proposal of a quantitative model to determine the connections and relations between the ILASME and asset quality and profitability of the EBNS.

The investment loan approval model for the SMEs (ILASME)

The research is based on existing procedures in the Serbian banking sector. It includes official steps between departments and their responsibilities. Loan approval process consists of the following steps: (1) loan request (prepared by the company); (2) loan application process (within the bank); (3) loan decision (yes or no); (4) entering into a loan agreement (yes); (5) usage; and (6) monitoring the loan (yes). The first step is relevant for further research analysis.

The banks' model for determining the creditworthiness of the customer includes [7]:

(1) Client analysis which covers: soft (qualitative) and hard (quantity) elements, i.e. character and ability of the client, which means determining the net present value and cash flow from investment (primary source of repayment);

(2) Transaction analysis which covers: purpose and amount of the loan, impact of the transaction on the balance sheet and income statement of the company, repayment possibilities, structure of the loan and security structure (collateral is the secondary source of repayment).

This model should provide the bank with a healthy credit portfolio, i.e. customers which will be capable to repay the loan in time. Outside the scope of the research is the loan collection model applied by the bank. Accordingly, the SMEs' point of view should be aligned with the respective model, i.e. achieve good return on investment. Moreover, it should be based on the following: total value of investment including working capital, source of investment financing, repayment capacity, effects of investments and collateral. Finally, the client's objectives (in accordance with the bank's perspective) which are essential to secure the financing

are: to understand its own needs and translate them into financial terms, to understand the product and translate it into non-financial terms, to evaluate opportunities and risks of the existing portfolio, to evaluate risks and benefits of strategic lending market, to understand risks and their main components, to be efficient and to establish a long-term partnership with the bank.

The client`s creditworthiness is the possibility to repay its debts in the future, and it includes: (1) the willingness (character) of customer; (2) solvency or the ability of the client's receivables (cash, capital, market capacity or collateral) to be converted into money (cash) at the right time. Areas covered by qualitative analysis in the company are: ownership structure, management of the company, the business strategy, analysis of the industry in which the company conducts its business activity, analysis of the market position of the company, the business cycle the company is currently in and the SWOT analysis. Areas covered by quantitative analysis in the company include: analysis of the financial operations of the client in the broadest sense and all changes in its size and power. Sources of information for quantitative analysis of the client are: annual reports of the company (balance sheet, income statement, cash flow statement, annex), quarterly reports of the company, cost accounting, projections of the company's business, consolidated statements of the entity, audit reports of the legal entity, unqualified or qualified opinion of third parties and the reputation of auditors.

The cash flow statement provides information about the sources (increase) and usage of cash (decrease). It is used to determine the funds available in the company that can be used in the process of repayment of overdue liabilities. Thereby, the lender always composes cash flow projections more conservatively than the borrower (which includes the financial projections), in order to assess the worst-case scenario of the client`s business and, furthermore, the ability of repaying the debt on the basis of the approved loan in given circumstances. Furthermore, the following essential element of quantitative analysis is the ratio number that summarizes the key relationships and results from the basic financial statements and indicates the financial performance of the enterprise.

Any rational SMEs investor entering into an investment expects specific benefits and increase of present value of its investment. In order to make the investment decision, investor and lender both take into consideration benefits and the assumed risks [8], i.e. they make projections of income statement and cash flows [25]. In the conventional models of long-term financing, it is necessary in the first place to determine what are the additional (incremental) cash flows arising from the investment itself, i.e. the investment cannot persist without it, and it shall be calculated as follows:

Cash flows from investment – Cash flows without investment.

If the SME already operates and wants to calculate net cash flows from the investment alone, it can be done by creating a separate account for the calculation of the primary sources of repayment, separate from the effects of the existing business. Projections of cash flows (forecasts) should reveal: what level of cash will be necessary for the duration of the investment, when will this need occur and how long there must be a certain level of cash. The result of the projection of cash flows is net cash flow after debt servicing. Net cash flow after repayment of the debt represents the total inflow and total outflow of funds from the business, investment and financial activity. Projections of cash flows (inflows and outflows) are derived from the previously projected income statement and balance sheet for each year of the projection.

The key categories of the cash flow projections in the case of investment project financing are [17]: (1) income: operating and other income; (2) expenses: operating expenses and cost of capital; (3) taxes; (4) debt service: payments of principal and interest; (5) reserves; (6) cash changes. Also, it is important to emphasize that the bank will finance an investment whose cash flow is positive after covering all the outflows, including all expenses of an investment loan (principal + interest). Positive cash flows occur when the inflows exceed the expenses. It is understood that free cash flows arising from the operations can be used as follows: operational commitments have been made, the rest is EBITDA; the needs of the investment are resolved, the rest is actually free cash flow before interest and the debt repayment of

the project (interest and principal) closes. The remaining liquid assets constitute a surplus of free cash. It can be generally said that an investor, during the loan repayment period, conducts combined monitoring of the following indicators: net operating revenues, minimum gross profit (EBITDA), minimum capital requirements (in absolute value), minimum debt of coverage ratio, minimum interest of coverage ratio, level of indebtedness with other banks and the percentage of directing payment transactions in a bank approved by the investment loan.

Evaluation methodology – Analysis of the ILASME

For the purposes of critical evaluation of the ILASME in Serbia, the official indicators of the performance of the EBNS for the 2007-2015 period, which are available on their official website, shall be used. The subjects of the analysis are the following indicators: loans in use, asset quality expressed through the level of the NPL, amount (level) of equity, the CAR, financial result, the ROA and the ROE.

Limitations of the analysis are as follows: (1) the same NPL represents the corporate and retail sector in total; considering the individual values of the disbursed loan, the percentage of participation of disbursed loan in the SME sector is higher than in the total credit portfolio; (2) differentiation of long-term and short-term loans approved to the SMEs is not possible; furthermore, 13 months tenure of loan is counted as long-term loan; (3) all data which are available on the website of the EBNS are presented in dinars, regardless of the fact that the structure of placement of the NPL is dominated by those denominated in a foreign currency – there is a question about the rate applied (usually on the last day of the month/quarter analysis, without taking into account the fluctuations that were present in the course of the year/period); (4) the EBNS uses internal rating methodology for expressing exposure to the credit risk and reserves in the level of capital; (5) customer segmentation is based on criteria defined by the Law on Accounting and Auditing [26].

In continuation, the Pearson correlation coefficient is applied in order to determine the impact of the NPLs

on the loans, financial result and capital of the EBNS [18]. The results obtained are then compared to the Serbian banking sector in order to portray the bigger picture (2009-2014 period, published in the research conducted by Barjaktarović et al. [4]).

CFOs of SMEs questionnaire about current practices in investment decision-making process

By using data obtained from the survey conducted by Graham and Harvey in 2001 [16] in the United States of America (USA) and Canada, the authors have created a questionnaire (45 questions in total) comprising four sections: capital budgeting techniques and cost of capital, capital structure and pecking order theory, dividend policy and enterprise risk management concept. This paper focuses on the results of the first two parts (10 questions). The respondents were the CFOs of SMEs during the second half of 2015 and the first half of 2016.

The respondents used a 5-point ranking scale for the answers (with 1 meaning "never" and 5 meaning "always"). The CFOs were asked about how often they used various capital budgeting techniques when evaluating whether they should accept or reject a project. The offered capital budgeting techniques were: the NPV (net present value), the IRR (internal rate of return), the PI (profitability index), the PP (payback criterion), the ARR (accounting rate of return), the DPP (discounted payback criterion) and the SA (sensitivity analysis). Additionally, the respondents were asked whether they implemented an investment and development policy. They were also asked to answer if they made business plans and if they prepared projections of cash flows before making an investment decision. Furthermore, the ways of calculating the project's cost of capital were also relevant for the study. The respondents were instructed to rate the frequency of implementing each method (the CAPM, discounted dividend model etc.). Finally, the last part of the first section measured the frequency of risk adjustments of the discount rate and cash flows.

The questionnaire was sent to 187 SMEs in Serbia, but we received only 30 responses. Furthermore, a similar questionnaire was sent to seven credit risk managers employed at banks, and to 4 auditors (employed at "the Big

4") in order to cross-check the results obtained from the CFOs. Characteristics of the sample are: 1) the ownership structure: 20% are foreign and 80% are domestic-owned; 2) industry diversification: 30% manufacturing and 70% non-manufacturing companies (i.e. retail and wholesale (25%), tourism and hotels (20%), agriculture (10%), telecommunication (5%), IT sector (5%) and consulting companies (5%)).

Research results

The results of the applied ILASME could be observed through the achieved results of the EBNS, such as the amount of loans in use, the amount of the NPLs, the amount (level) of capital, the CAR, the achieved financial result, the ROA and ROE (Table 1). Erste Bank Austria acquired Novosadska banka in 2005, and the transformation process was completed at the beginning of 2007. Having in mind that Erste Group expands business through acquisitions, risk management policy was the first change which was introduced in the acquired subsidiary bank. Clear focus of the new shareholder was to increase market share and improve profitability, in accordance with Erste Group standards [8]. According to the official web presentation of the bank, their main customers are the SMEs and private individuals (more than 60% of credit portfolio is comprised of the SMEs).

The authors expected that the results would be in line with the market trends, including the consequences of government intervention in order to secure market stability and the implemented international standards such as the Basel Accords, International Financial Reporting Standards and valuation of assets/property. Accordingly, the period from 2004 to 2008 was characterized by expansive loan activity of the commercial banks (and consequently, an increase in the NPL). The last quarter of 2008 was the period when the first effects of the global financial crisis reached Serbia, and whose consequences were experienced by all the participants in the financial market, which resulted in an increased aversion to risk. In the period from 2009 to 2012, the growth of loan activity largely continued and in 2012, loan activities of banks recorded a slowdown.

Table 1: Basic indicators of the performance of the EBNS in the period from 2007 to 2015 (in RSD mil/%)

Year /Indicator	2007	2008	2009	2010	2011	2012	2013	2014	2015
Loan	20,836	30,049	30,220	43,808	45,953	55,648	58,212	59,943	75,182
NPL	2,991	4,728	4,425	5,034	6,417	8,045	10,287	9,516	8,801
NPL (%)	14.53	11.43	13.65	11.49	13.97	14.46	17.67	15.88	11.71
Capital	10,215	10,537	10,931	10,164	10,786	11,420	11,895	14,658	15,999
CAR (%)	40.39	26.58	26.06	17.63	24.37	21.34	20.95	20	18
Financial result	174	334	391	318	789	1,250	1,059	273	1,189
ROE (%)	1.7	3.17	3.58	3.13	7.76	12.3	10.42	1.87	7.7
ROA (%)	0.46	0.68	0.75	0.51	1.09	1.55	1.08	0.28	1.1

Source: [8]

It is obvious that the EBNS recorded business performance in accordance with the market situation, its own targets and regulations (local and group level). Loans exhibited an increasing trend during the entire analysis period (this tendency was different from the banking sector, which had recorded a drop since 2013). It could be explained by the aggressive approach to the customers in order to increase customer portfolio and by cross-selling between the bank and associated companies. Also, it is important to emphasize that the bank had taken care about the quality of the NPL, level of equity and profitability in order to provide long-term existence in the market. Having in mind the main topic of this research, loans are relevant indicator of the validity of the ILASME.

In absolute terms, the level of the NPLs mainly displayed an increasing trend (which was in accordance with the banking sector trends), but in relative terms it recorded fluctuations in the range from 11.43% to 17.67%, which was below the market average (but not moving in the same direction as the entire Serbian banking sector). Reasons for the NPLs were: 1) deterioration of creditworthiness of the borrower due to the general insolvency and particular problems in collection of receivables; 2) loans mainly approved in foreign currency (FX) and with interest rates that fluctuated, where both elements of loan agreement were variable, as a result of the bank protecting itself from the market trends or of state actions on a global and local level; 3) in the motivation of managers to obtain their own bonuses on the basis of high volumes of approved loans, where the expected bank's ROE was not considered in relation to the assumed risk. Accordingly, the EBNS implemented the early warning system – EWS in order to recognize early any potential NPL, as combination of quantitative and qualitative factors, on the basis of

existing customers in the credit portfolio, in the first half of 2010 (therefore, this could be a reason why the level of the NPLs, expressed in percentage, was the lowest in the analysis period). Thus, the difference (the EBNS and total banking sector data) is the result of the established credit risk management policy within the EBNS. For the purpose of our further research, the NPL shall be taken as an important indicator of the validity of the ILASME.

The amount (level) of equity mainly displayed an increasing trend, except in 2010. The overall positive trend could be explained by: 1) regulation requirements (in terms of assumed risks, and covering losses); 2) shareholder strategy in order to increase market share. Drop of the level of equity in 2010 should be compared with the NPL and CAR, in order to get a clear vision about trends, and it can be considered as a result of write-off of some non-performing loans which were the result of the past business of Novosadska banka (at the moment of acquisition, those non-performing loans were presented as a "healthy" portfolio, i.e. they represented 60% of the total loan portfolio), and of the success of the implemented EWS (the results of new implemented projects are usually visible at the beginning, i.e. in the early stage of implementation). The CAR recorded was significantly above the legal minimum of 12% and in line with the banking sector average. It means that the EBNS is overcapitalized and that there is a lack of good projects for financing. Having in mind the described relevance of equity, it shall be taken as relevant indicator of the validity of the ILASME.

The EBNS achieved profit (in absolute and relative terms) in the analysis period, but the volume fluctuated (not in the same direction as the total banking sector). It was the result of permanent sales efficiency improvement

and cost optimization (such as the level of provisions, salaries – amount and number of employees, rental of office space – number of premises and pricing, selling the property which was not in the function of the business, etc.). Further analysis of profitability ratios indicates that the ROE displayed higher values then the ROA, but it does not mean that the shareholders did not support the local bank through different lines of credit save for capital increase. In comparison with the banking sector, since 2011 the EBNS has obtained higher values of the ROE, i.e. higher values of the ROA since 2010, which means that the bank recorded higher profitability than the average in the banking sector. It could be explained by the implemented proper risk management procedures, i.e. theoretically speaking, proper risk management in a bank should provide profit on the basis of healthy business. Moreover, relative success of those numbers comparing to the NBS repo rate (as risk-free investment for banks) was different from year to year, which means that assets of the bank were diversified in different financial instruments except loans, i.e. the treasury of the bank probably invested in financial derivatives permitted by the law, cash funds, etc. However, the EVA ("Erste Value Added") is relevant for management at the EBNS (and Erste Group). It represents the acquired profitability and increased market share on the basis of equity increased (benchmark is the reference interest rate of the National Bank of Serbia), but this is not an officially announced piece of information. Bearing in mind the described trend of the financial results, which also consist of interest income and expense, it shall be subject to further analysis of the validity of the ILASME.

To continue, the growth of the NPL shall be determined as a relevant indicator for the quality of portfolio and validity of the ILASME, i.e. the authors shall examine how it affected loans (increasing trend during the analysis period), financial result (the highest fluctuations observed in the period under analysis), and equity (mainly increasing trend in the analysis period). For this purpose, we shall use the Pearson correlation coefficient, where the NPL is marked with an x, while y represents the level of loans, financial result and equity at the EBNS (results are presented in Table 2). The analysis periods are: a) 2007-2015, the entire analysis period (basic), where the 2007 basis was the precondition for clear business after cleaning up the balances of the bank; b) 2007-2012, as the period of general loan expansion; c) 2009-2014, the period for which the result of the Serbian banking sector are available [4]. Furthermore, the obtained results were compared with the Serbian banking sector presented in the research conducted by Barjaktarović et al. [4].

The resulting value of the Pearson correlation coefficient which was above 0.8 for all analysis periods, i.e. in the range from 0.899 to 0.949, indicates a very strong connection between the NPL and the approved loans. It is logical, because the NPL exists in a situation when the loan customer is not in a position to repay the loan, i.e. to repay its debt. However, the existing credit risk management procedure determines which loan applications will be accepted or rejected. Furthermore, the established relation is sensible, because a loan should not be approved if it is not in accordance with the accepted and implemented risk management procedures, i.e. rules.

The resulting values of the Pearson correlation coefficient which refer to the connection between the NPL and the achieved financial result are different throughout all the analysis periods within the basic one, i.e. ranging from medium to a very strong connection. Accordingly, the resulting value of the Pearson correlation coefficient which equals 0.66 indicates a strong connection between the NPL and the obtained financial result in the entire

Table 2: Pearson correlation coefficient for the NPL and loans, NPL and financial result and NPL and equity at the EBNS in the different periods

Periods	Correlations		
	NPL (x) and loans (y)	NPL (x) and financial result (y)	NPL (x) and equity (y)
2007-2015	0.899883651	0.660197348	0.70503236
2007-2012	0.949959494	0.958660742	0.77759149
2009-2014	0.927339917	0.445550843	0.706597103
	NBS	-0.881	-0.968

Source: Authors' calculations, SPSS software

analysis period. Such result is expected, because it covered the period prior to and during the crisis, where the focus was placed on crucial banking products and sales strategy was different. During the respective period, loans were the main banking product which was especially useful for acquiring affiliate businesses. Furthermore, in the period from 2007 to 2012, the resulting values of the Pearson correlation coefficient of 0.958 indicate a very strong connection between the NPL and the achieved financial result (according to the current regulation, the amount of the NPL, observed through the level of provisions for the NPL, directly affects the financial results achieved in the context of such higher level of provisions and implies a lower financial result, and vice versa). Finally, in the period from 2009 to 2014, the resulting value of the Pearson correlation coefficient of 0.445 indicates a weak connection between the NPL and the achieved profit. It could be explained through the measures taken for sales efficiency improvement and cost optimization, where the EBNS applied different strategies to generate additional profit. The loan aversion was present and clear industry crediting strategy was adopted and implemented, according to the risk management profile, i.e. attitude. However, the respective values of the coefficient are not in accordance with the Serbian banking sector (which indicates a strong connection [4]).

If the results are considered in accordance with applicable regulations in the field of risk management and international accounting standards, as well as with contemporary trends in the financial sector regarding the financing products and level of interest rates (reference level is low during the crisis), we can say that the established connection is sensible. This further means that there is reasonable doubt that the ILASME is not set appropriately, in the sense that the creditworthiness of the borrower, the amount and purpose of the loan placement, and the price of risk assumed are not adequately established.

The resulting values of the Pearson correlation coefficient for the relationship between the NPL and equity during the analysis period are in the range of a strong connection. Accordingly, the resulting value of the Pearson correlation coefficient of 0.705 indicates a strong connection between the NPL and equity in the entire analysis period:

it covered the period before and during the crisis, where the focus on crucial banking products and sales strategy was different, but loans were the main banking product useful for acquiring affiliate businesses. Furthermore, in the period from 2007 to 2012, the resulting value of the Pearson correlation coefficient of 0.777 suggests a strong connection between the NPL and capital. However, in the period from 2009 to 2014, the resulting value of the Pearson correlation coefficient of 0.706 indicates a strong connection between the NPL and capital. It could be explained through the measures taken to clean up the balance ("inherited" assets), increase the market share and meet the regulatory requirements. However, those values of the coefficient are not in accordance with the Serbian banking sector (which indicates a strong connection).

The obtained result is meaningful, because the height of the assumed credit risk, in the form of extended loans (and consequently, during the validity period of the loan relationship it is possible that the borrower will have difficulties with loan repayment), is determined by the amount of capital that a bank possesses. If the results which we obtained are interpreted in accordance with applicable regulations in the field of risk management and international accounting standards, we can say that the established connection is sensible, i.e. the amount of the NPL, observed through the level of provisions for non-performing loans, directly affects the amount of capital in the sense of such higher level provisions for NPL includes capital spending and vice versa. This further means that there is reasonable doubt that the ILASME is not appropriately set in the sense that these do not perceive the assumed credit risks in accordance with the amount of capital that the bank possesses, i.e. the creditworthiness of the borrower and the amount and purpose of the placement have not been adequately established, especially in terms of a group of connected companies, of the existing exposure at the time of placement of funds to a group of related parties.

Furthermore, there is also a potential agency problem, in the sense that a manager's bonus is tied to the amount of disbursed loan, but not to the collection of receivables (the Erste Group has defined a motivation system which promotes higher bonuses and lower salaries [9]). This means that by placing a large amount to a client, a manager

can easily achieve the set target and increase the level of credit risk. Since long-term loans are usually extended to legal entities, denominated in a foreign currency and with variable interest rates, these increase the exposure of the bank to this type of risk, endanger the creditworthiness of the borrower, but also increase the level of provisions of commercial banks. In practice, problems with repayment of investment loans start during the third year of repayment, while in the case of housing loans these start during the seventh year of repayment [9].

Doubts regarding the validity of the ILASME in the sense of determining the creditworthiness of the legal entity are already supported by the information contained in the research (conducted in the period from 2009 to 2016) regarding the authenticity of the elements of quantitative analysis of the borrower [1], [28], [5], [14], [13], [23], [24], [28], [35], in terms of: (1) presentation of items in the financial reports (assets, calculation of depreciation, devaluation of receivables, revenues, operating cash flow, the achieved financial result and applied financial analysis), i.e. practice of purchasing an external auditor's opinion; (2) the motives for the previously described actions (such as handling, tax, bonus payments, ignorance).

An SMEs survey revealed that SMEs were most inclined to:

- Use the PP as the capital budgeting technique. Furthermore, 58% of the SMEs most frequently used the PI and 42% of the SMEs used the NPV as the investment criterion in project evaluation (the average values were taken into consideration). The CFOs stressed that less frequent implementation of discounted cash flow techniques was mostly influenced by the inability to determine the discount rate, due to the inefficient capital market in Serbia and the lack of knowledge to apply more sophisticated project evaluation techniques.

- Determine the cost of capital following historical returns on investment. It is noticeable that the most frequent criterion implemented by the companies is the historical return on investments, with an average value for all three types of companies amounting to 32%. The SMEs were the most inclined to apply this method (60% of the respondents stated that they

always and often used this method) when evaluating the cost of capital for their investments. The cost of capital determined by regulatory decisions was the second most used method for determining the cost of capital (average for all the companies from the sample amounting to 15%). The results showed that implementation of the CAPM by the sampled companies was rather scarce (with average value of 8%). The reasons mentioned to justify it were: the inefficient capital market and the general lack of knowledge regarding contemporary financial concept. It appears to be an issue once again, as well as the lack of implementation of financial system regulations in Serbia (well-defined theoretically, but not implemented in practice).

Finally, if a company does not perceive the risk regarding the investment in its full size, it may lead to unrealistic projection regarding the project's cash flow that may mislead the investor to accept an unprofitable project. This should be particularly observed in small and medium-sized enterprises. Even though most of the companies stated that they had put in place well-defined investment policies and business plans and regularly conducted cash flow projections regarding new investments (average rate of responses was 89%, 82% and 94%), its actual implementation in everyday business operations was pointless without determining the accurate numbers regarding the cost of capital. Furthermore, research conducted on global level showed that there is a need for greater financial literacy of entrepreneurs, i.e. the financial performance of their business [2]. It is in line with Vesković's results [35] that the tendency among entrepreneurs to make decisions that might be risky are very common, depending on many variables, such as risk perception, attitudes towards risk-taking and willingness to take risks.

Conclusion

Research which was conducted in the period from 2007 to 2016 in the banking sector in the Republic of Serbia, on the basis of the financial analysis of the bank which stated that its main customers are the SMEs, and a survey conducted in 2015/2016 through interviews with 30 CFOs

of SMEs, have shown that there is objective doubt about the validity of the ILASME applied by the commercial banks in the Republic of Serbia.

The limitations that presented themselves during the analysis do not diminish the significance of the results. By using the Pearson correlation coefficient, it was established that the NPL, as a result of the set ILASME, had a very strong connection with loans, i.e. a very strong connection with the financial result and capital. It served as a basis to further establish a causal link between the observed indicators, while adhering to the applicable legislation in the field of risk management and international standards of accounting reporting, based on the nature of business which the bank conducts (loan placement). This further means that there is a concern that the ILASME is not set appropriately, in the sense that there is doubt in the adequate establishment of the creditworthiness of the borrower, the amount and purpose of the loan and the price of assumed risk. Moreover, the analyses revealed that, while considering an investment opportunity, lenders and investors need: 1) to understand their own needs and to be able to translate these into financial terms; 2) to understand the product and to be able to translate it into simple non-financial terms; 3) to evaluate opportunities and risks of the existing portfolio; 4) to evaluate the risks and benefits of the strategic lending market; 5) to understand the risk and its main components; 6) to be efficient; and 7) to establish a mutual long-term partnership. First and foremost, there is a need for further education and training on the topic of financial literacy and business ethics of the employees of the bank, but also in the company of the borrower. In fact, every stakeholder should observe the process as a lifelong learning one. Furthermore, proactive approach regarding improvement of credit risk management procedures is a precondition. The conducted survey showed that the SMEs use traditional capital budgeting techniques, primarily due to the inefficient capital market in Serbia and lack of knowledge to apply more sophisticated project evaluation techniques.

In addition to this, there is room for improvement of the ILASME applied in the commercial banks in Serbia. Secondly, building partnerships between a bank and an SME client (borrower) should be improved, i.e. only a healthy business cooperation between the customer and the bank leads to making profit from their mutual business. Finally, an appropriate motivation system for the employees (at the bank and at the business entity) should be put in place, which shall rely on evaluation and rewarding (as bonus would not be the only form of award). Future research shall include reviewing the applied model and the results achieved by ProCredit bank Serbia in order to obtain reliability of the implemented ILASME and the business model of the bank in the long-run.

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MODELLING A BMS-BASED AUTOMOBILE LIABILITY RATING SYSTEM: THE SERBIAN CASE*

Modeliranje premijskih stopa autoodgovornosti u Srbiji primenom bonus-malus sistema

Abstract

In this paper the authors examine the viability of applying a bonus-malus system in establishing automobile liability premium rates. They have developed an optimal tariff system which reflects the equivalence principle between the amounts of the premiums and the reported losses of individual policyholders. Based on past incidents of the policyholders, a homogeneous distribution of the risk classes and an improved insurance rating have been obtained. The developed model was tested with the negative binomial distribution and the expected value principle on a sample of 98,978 policyholders in Serbia. As a result, the set tariff system has been financially balanced, i.e. a balance was struck between the cost amounts of total premiums among policyholders and the cost amount of expected future claims. It has been proven that, in the process of modelling the automobile liability rating system based on the frequency of claims, it is optimal to use sophisticated distribution models such as the negative binomial distribution.

Keywords: *bonus–malus system, negative binomial model, Bayesian inference*

Sažetak

U ovom radu autori se bave problemom primene bonus-malus sistema u procesu formiranja premijskih stopa autoodgovornosti. U tom smislu, u radu je formiran optimalni sistem tarifa predmetnog osiguranja koji odražava načelo ekvivalencije između iznosa premije i broja prijavljenih šteta individualnih osiguranika. Poznati oblik iskustvenog utvrđivanja premije, bonus-malus sistem (BMS), podrazumeva analizu prethodnog iskustva osiguranika, čime se obezbeđuje postavljanje homogenih klasa rizika i unapređuje postupak tarifiranja. Opisani tarifni sistem je kreiran primenom modela negativne binomne distribucije i principa očekivane vrednosti na uzorku od 98.978 osiguranika u Srbiji. Postavljeni tarifni sistem je finansijski izbalansiran, odnosno uspostavljena je ravnoteža između iznosa ukupnih premija i iznosa budućih očekivanih šteta. Time je dokazano da je u procesu modeliranja optimalnih tarifa autoodgovornosti, koji se bazira na frekvenciji odštetnih zahteva osiguranika, veoma korisno oslanjati se na izvedene distribucije kao što je negativna binomna.

Ključne reči: *optimalni bonus-malus sistem, model negativne binomne distribucije, Bajesovski pristup*

Introduction

Automobile liability insurance is a form of insurance that protects third party claimants from damages inflicted by the use of a motor vehicle. In most countries, this type of insurance is mandatory, and it is dominant in the total of non-life insurance portfolio. Considering the competitive environment in which they operate, auto liability insurers are facing a problem to maintain cross-subsidies among different risk categories [4]. Therefore, it is necessary to establish a system of tariffs that will reflect the risk of an individual policyholder. The issue of developing an appropriate premium system is very important when considering the overall business of the automobile liability insurers.

The aim of this paper is to develop an optimal automobile liability tariff system, which includes the establishment of equivalence between the number of reported claims of a policyholder and the amount of his/her premiums. In addition to contributing to the competitiveness of the automobile liability insurance market, the implementation of this so-called optimal tariff system is one of the most effective methods to increase traffic safety and to promote additional punishment of careless and unscrupulous drivers. This allows the implementation of one the basic principles that should reflect the price of insurance – the principle of fairness.

The procedure used to penalise the policyholders responsible for activation of the insurance policy by increasing the basic premium, or by granting discounts to individuals who are not incurring damages, known as the bonus-malus system (BMS), is an integral part of tariff systems in practically all the insurance companies in the world. The BMS is virtually the mechanism that strikes the balance between the cost of insurance and previous conduct of the policy holder [1, pp. 11-32], [4, pp. 577-599], [10, pp. 199-212], [11, pp. 196-204].

The described tariff frame was set in the 1910s in England and the Scandinavian countries, while the first actuarial study dedicated to this tariff model emerged in the early 1960s [2, pp. 106-112], [3, pp.119-130], [7, pp. 84-95]. The most significant contribution in this field, according to many authors, was given by Bühlmann [5] and Lemaire [15], [16], [17].

This paper is organised in the following way: the first part describes the bonus-malus system with the aim to highlight the most important features of this system of tariffs, as well as its various applications. The second part of the paper encompasses the problem of constructing the optimal BMS. In this regard, at the beginning of the paper the authors present the well-known Bayesian credibility premium model, and then analyse the problem of modelling the claim counts in automobile liability insurance. Specific attention is given to several common models that are applied in practice. The third part of this paper delivers research results achieved by applying the previously described models on the selected sample, while selecting an appropriate probability distribution to which the obtained data are adjusted. The last part of this paper introduces the most important conclusions.

Literature review on BMS

The process of establishing tariffs, as a key task of an actuary, basically involves the allocation of risks to an individual policyholder according to the possible claims that could be reported. The basic idea in the a priori rating process is included in the classification of policyholders into homogeneous risk classes according to their anticipated characteristics.

The BMS is used in virtually all the countries and is practically based on the concept of fairness. In contrast to the a priori tariff system, which penalises bad drivers, it represents a set of developed actuarial models based on a posteriori concept of evaluation of individual risk factors in automobile liability insurance. Implementation of this model introduces a balance between the probability that the insured is a serviceable and yet an unfortunate driver who has suffered damage, and the possibility that the insured is a really poor driver, which is why he/she should be penalised with higher premiums. Henriet and Rochet [13] point out the two advantages of this model: it solves the problem of the adverse selection – nothing counts but the frequency of reported claims, and the problem known as the moral hazard – the damages that occur over time

should be the main indicator for establishing tariffs in order to encourage drivers to drive more carefully.

In the case of comprehensive insurance, bonuses (discounts) are usually activated at the end of one or multi-year periods, while in the third party automobile liability insurance they are approved in advance. When determining the eligibility for a discount, the common practice is that damages caused by other persons are ignored, so the bonus is often called the discount for lack of guilt.

If *Yi* denotes the random variable that represents one of the values significant for the process of quantifying the risk in automobile liability insurance for the policyholder – *i* (e.g. number of reported claims in a given period), it is clear that the value of this variable will be a function of both predefined values: *X* and *Z*. Therefore, Denuit and Dhaene [8, pp.13-27] define automobile liability insurance cost as the sum of purely random fluctuations of the risk and the variation of the expected claims due to the unknown characteristics – *Z*, which can be expressed by the following relation:

$$E[Var[Y_i|X_i]] =$$
$$E[Var[Y_i|X_i,Zi]] + E[Var[E[Y_i|X_i,Z_i]|X_i]] \tag{1}$$

When it comes to the implementation of the BMS, the basic characteristic of such tariff system is the existence of the base premium, which, together with the discount level, determines the price of the insurance that an individual will pay. In addition, the BMS of each country independently determines the discount level for new policyholders. After each year, the policyholder moves up or down the scale in accordance with the defined transition rules and the last year's performance. During the XX century, a linear BMS was applied in most European countries. Yet in 1994, the European Union adopted a decree abolishing the compliance of mandatory tariff systems. It was emphasised that this system was suppressing market competition, which was not in accordance with the principle of "freedom" in the process of establishing automobile liability insurance tariffs. However, uniform and mandatory bonus-malus tariffs are still applied in France. The legislation enforced by the government has forced the automobile liability insurers to use a uniform BMS, which included an identical application of this highly important instrument for the process of the establishing premium rates. In addition, it

is interesting to note that the system does not function as described above, since there is no reduction scale.

On the other hand, the CRM (coefficient de réduction-majoration) is used in the process of establishing the premiums. This quite simple concept implies the following: each policyholder who does not report the claim within one year will receive a 5% discount on the basic premium, while in the case of an accident for which the insured is responsible, the premium will be increased by 25%. So, in the event of a reported claim for which he/she is responsible, the base price of insurance will be multiplied by 1.25, while each year without any reported claim will imply a new premium price, reduced to 95% of the previous price. In addition to this, the maximum amount of the premiums can reach up to 350% of the base price; while the maximum discount, in other words the best price, can be reached after 13 consecutive years without claims and it amounts to 50% of the base premium [9]. The specific application of the BMS and determining the rules for teetering through the discount scales, maximum discount, malus attitude in relation to the number of reported claims, and so forth, are directly dependent on the economic development of the respective country. Naturally, the more developed countries tend to enforce a stricter BMS, whereas, in developing countries a simple BMS with just a few classes and elemental transition rules is applied in practice. Park et al. [20, p. 25] show that as insurance markets become more mature and policyholders become more sophisticated, countries are transferring to more severe BMSs.

Modelling the optimal BMS

From the policyholders' point of view, the bonus-malus system is optimal if it is financially balanced. However, Wang and Zhou [23] argue that, from the standpoint of the policyholder, it is fair if it is proportional to the individual risk.

Setting up a tariff framework based on previous conduct and the principle of fairness has been discussed in various actuarial works. Several policies, aimed to solve the aforementioned problem, have been developed. According to one developed by Lemaire [16], [17], the design of an optimal

BMS is achieved by using the negative binomial model with the expected value principle. Instead of the negative binomial distribution, for modelling the claim counts, Meng and Whitmore [18] developed a model based on the Pareto distribution. Tremblay [22, pp. 97-106] analyses the problem of establishing the optimal bonus-malus scale using the Poisson-inverse Gaussian model, while using the zero utility principle in the process of determining the premium tariffs. In contrast to the abovementioned and other approaches that have been developed entirely on the basis of information on the number of claims reported, Frangos and Vrontos [12, pp. 1-22] developed a model for the design of the optimal BMS that analyses claim frequency and severity, as well, by using Poisson-gamma as the claim frequency distribution and the exponential-inverse gamma distribution as the severity distribution. The most common problem in applying the said model arose from the policyholders whose claims were just above the limit. Another solution, with favourable empirical results, considers classification of all claims in two categories depending on the nature of the harmful effects thereof. Thus, all claims for which the consequences are solely of a material nature are classified into one group, while claims including injuries are analysed independently. Moreover, Jovković and Ljubisavljević [19] apply the variable sampling method in testing the premium income.

The structure of the process explained in the following sections is the following: first, we shall present the model of structuring an optimal BMS under the Bayesian analysis called the Bayesian credibility premium model; then we shall describe the problem of modelling the claim counts. In this sense, the χ^2 goodness-of-fit test was used to compare candidate fitting distributions. This represents the beginning of the process of establishing the net premium based on the characteristics of preselected distribution. Different models may be applied in this procedure: the expected value principle, the standard deviation principle, the variance principle, the principle of zero utility, and many more. As noted, this paper relies on the expected value principle, whose requirements and application are presented in the last stage of the process of establishing an optimal BMS.

The tariff system established in this paper is derived from the data on reported claims, and is not based on the cost amounts of these claims. Also, the analysis does not include some very important a priori characteristics of the driver that can have a considerable influence on the origination of damages. These represent the basic limitations of the established tariff system, in addition to the fact that most of the countries use significantly less severe BMSs in practice. This particularly applies to the length of a claim-free period, which is necessary to eliminate the influence of a reported claim.

Three basic approaches used to determine the frequency distribution and the claim amount are: empirical, analytical and the moments-based methods.

In the event of existence of the corresponding databases containing a large amount of data, it is possible to use the empirical method to run a smooth and accurate assessment of the cumulative distribution function. The moments-based method comprises evaluation of the moments of distribution, usually the mean and variance, and has a greater application in modelling the claim severity. The most widely accepted in the actuarial literature and in practice is the analytical method that involves finding an appropriate analytical expression that could describe the observed data.

Since the claim frequency modelling process implements a large number of distribution functions, it is necessary to reduce their number. One of the following distributions is applied to claims in third party automobile liability insurance: Poisson, negative binomial and Poisson-inverse Gaussian. In order to determine the analytical expression of automobile liability claim frequency, it is necessary to create a model for each of the three distributions. However, it is important to address the issue of selecting the appropriate model in the selected sample. Note that, in terms of probability calculations and given that known functions depend on a finite number of parameters, each of the models is parametric.

Poisson model

Poisson distribution is among the most important distributions used to determine the probability of the number (frequency) of claims in a certain time period or area. Its use is valid for large events whose probability of occurrence is very

low, where the application of this distribution is based on the assumption of homogeneity of the population on which the respective analysis is conducted. It occupies a dominant position in modelling claims per unit of time for the insured individual. A random variable, describing the number of claims in a given time interval, could be represented as a Poisson random variable $-X:Poi(\theta)$, and has a probability mass function:

$$p_k = e^{-\theta} \frac{\theta^k}{k!} \ , \theta>0 \qquad (2)$$

The mean and the variance of the Poisson are both equal (this feature is also known as equidispersion), where θ is equal to the average number of occurrence of an event (damage) per unit of time.

$$E(X) = Var(X) = \theta \qquad (3)$$

Estimates of values for parameters in this distribution can be derived by applying the maximum likelihood method or the method of moments. Since the first and second moments in the observed distribution are equal, this model is, usually, rejected in practice. The reasons for its rejection shall be analysed on a selected sample of policyholders.

Negative binomial (Poisson-gamma) model

Let us assume that the frequency of claims for the individual automobile liability portfolio can be approximated by a Poisson distribution, in which the parameter θ of the Poisson distribution takes on different values. Thus, each policyholder is characterised by a certain value of this parameter, which means that the behaviour of each insured person is represented by a single obtained value θ of the random variable Θ.

The following equation is known as the mixed Poisson distribution:

$$p_k = \int_0^\infty e^{-\theta} \cdot \frac{\theta^k}{k!} \, g(\theta)d\theta \ , k=0,1,2,... \qquad (4)$$

where $g(\theta)$ represents the density function of the random variable Θ.

Furthermore, let us assume that the parameter of the Poisson distribution Θ has a gamma distribution whose parameters are a and b, where $\Theta: \Gamma\ (a, b)$ applies:

$$g(\theta) = \frac{b^a\, e^{-b\cdot\theta}\theta^{a-1}}{\Gamma(a)} \, g(\theta)d\theta \ , a,b>0 \qquad (5)$$

The resulting distribution of the number of claims in the portfolio, known as the negative binomial distribution, will then have the following form:

$$p_k = \binom{k+a-1}{k}\left(\frac{b}{1+b}\right)^a\left(\frac{1}{1+b}\right)^k = \binom{k+a-1}{k}p^a\left(1-p\right)^k \qquad (6)$$

whose first and second moments are equal, respectively:

$$E(X) = \frac{a}{b} \quad \text{and} \quad \sigma^2 = \frac{a}{b}\left(1+\frac{1}{b}\right) \qquad (7)$$

Estimation of the unknown parameters of the described distribution is calculated by a maximum likelihood method or the method of moments.

Poisson-inverse Gaussian model

Assuming that the claims frequency for the insured individual has a Poisson distribution, where the "behaviour" of each policyholder is determined by a single θ realisation of the random variable Θ, we shall review the case when the Poisson distribution parameter Θ adjusts to the inverse Gaussian distribution [14], [21].

Thus, the random variable is distributed according to the inverse Gaussian distribution, where $X: IG\ (\alpha, \beta)$ applies, if its density function can be represented by the following function:

$$f(x) = \frac{\alpha}{\sqrt{2\pi\beta x^3}}\, \mathrm{e}^{\left(-\frac{1}{2\beta x}(x-\alpha)^2\right)} \ , x>0 \qquad (8)$$

The expected value and variance of the random variable are equal to:

$$E[X] = \alpha \quad Var(X) = \alpha\beta \qquad (9)$$

With the imposed assumption that an unknown parameter of the Poisson distribution Θ is distributed according to the inverse Gaussian distribution – $\Theta: IG\ (\alpha, \beta)$, we assume that $E\ (\Theta) =1$, since we need to find the average frequency of claims in one portfolio. Therefore, as for $\Theta: IG\ (1, \beta)$, and:

$$f_\Theta(\theta) = \frac{1}{\sqrt{2\pi\beta\theta^3}}\, \mathrm{e}^{\left(-\frac{1}{2\beta\theta}(\theta-1)^2\right)} \qquad (10)$$

we get an expression that represents the probability mass function, apropos, the resulting distribution of the number of claims in the portfolio:

$$p_k = \int_0^\infty e^{-\theta} \cdot \frac{\theta^k}{k!} \frac{1}{\sqrt{2\pi\beta\theta^3}} e^{\left(-\frac{1}{2\beta\theta}(\theta-1)^2\right)} d\theta \quad , k = 0,1,2,... \quad (11)$$

An inverse Gaussian distribution is an excellent choice for modelling positive right-skewed data, which are typical for the frequency of claims arising from automobile liability insurance.

Research results and discussion

In order to determine which of the analysed models would be optimal for modelling the frequency of claims in automobile liability insurance, and why the Poisson model should be rejected, we need to test in practice the adaptability of the empirical frequency distribution. Testing shall be conducted by using the χ^2 goodness-of-fit test, which is the most widely used statistical test in the above mentioned sense [1, pp. 11-32]. Implementation of this test is based on the rule that all expected frequencies belong to five or more grouping procedures, with the level of significance α = 0.05.

The sample size in the analysis is 98,978 automobile liability policyholders in one insurance company in Serbia. Table 1 shows the frequency distribution of the selected portfolio of claims in 2015.

Table 1: Observed distribution of the number of claims in the portfolio

Number of claims (X)	Number of policyholders (f_i)
0	88,928
1	9,235
2	755
3	55
4	5
≥ 5	0
Σ	98,978

The average (mean) number of claims in the sample is equal to:

$$\bar{x} = \frac{1}{n} \cdot \sum_{i=1}^{n} X_i \cdot f_i = 0.110429 \quad (12)$$

while the variance of the observed sample is equal to:

$$s^2 = \frac{1}{n-1} \cdot \sum_{i=1}^{k} f_i \cdot (X_i - \bar{x})^2 = 0.117431 \quad (13)$$

We shall now determine the expected frequency of claims by applying each of the considered models, and then test the goodness-of-fit for the obtained frequencies to the distribution assumed. Expected (theoretical) frequencies are obtained when the calculated probabilities (for each of the previous models) are multiplied by the sample size.

The information on the fitted Poisson distribution appear in Table 2.

Table 2: The number of observed and fitted claims for the Poisson model

Number of damages: X	Observed frequency (f_i)	Fitted frequency (f_i')
0	88,928	88,629.88
1	9,235	9,787.27
2	755	540.40
3	55	19.89
4	5	0.55
≥ 5	0	0.01

Using the maximum likelihood method or the method of moments, we can estimate the unknown Poisson distribution parameter, from which the following expected frequencies are derived:

$$f_i' = P(X = i|H_0) \cdot n = \frac{\hat{\theta}^i}{i!} \cdot e^{-\hat{\theta}} \cdot n \quad , i = 1,2,3,4,5 \quad (14)$$

Table 3 presents the expected claim frequencies, under the assumption that the observed frequencies follow a negative binominal distribution. We have adjusted it according to the estimated parameters of negative binomial distribution by the moments method: $\hat{a} = \frac{\bar{x}^2}{s^2 - \bar{x}}$,

$\hat{b} = \frac{\bar{x}}{s^2 - \bar{x}}$ and the recursion $p_{k+1} = p_k \cdot \frac{k + \hat{a}}{(k + a) \cdot (1 + \hat{b})}$.

Table 3: The number of observed and fitted claims for the negative binomial model

Number of damages: X	Observed frequency (f_i)	Fitted frequency (f_i')
0	88,928	88,928.19
1	9,235	9,234.60
2	755	754.82
3	55	56.14
4	5	3.97
≥5	0	0.27

Finally, we have used the Poisson-inverse Gaussian model and calculated the expected frequency of claims, where, for the estimation of the unknown distribution parameters $\hat{\alpha} = \bar{x}$, $\quad \hat{\beta} = \dfrac{\bar{x}^2}{s^2 - \bar{x}}$ the method of moments is used, and the recursion method is used to determine the probability:

$$p_k = \frac{\beta(k-1)(2k-3)\, p_{k-1} + \alpha^2 p_{k-2}}{(1 + 2\beta)k(k-1)} \qquad (15)$$

The results are illustrated in Table 4.

Table 4: The number of observed and fitted claims for the Poisson-inverse Gaussian model

Number of claims (X)	Observed frequency (f_i)	Fitted frequency (f_i')
0	88,928	88,922.45
1	9,235	9,250.46
2	755	741.45
3	55	58.41
4	5	4.78
≥5	0	0.41

Final conclusions derived are presented in Table 5, showing the obtained χ^2 statistics test values for each of the three models analysed.

Observed distribution adjustability to the assumed distribution will be tested with the following hypotheses:
H_0: The number of claims per auto insurance policy is adjusted to the assumed distribution
H_1: The observed distribution of the number of claims is not adjusted to the assumed distribution

The decision to accept an alternative or to retain the null hypothesis depends on the comparison between the obtained value of the χ^2 statistics from the above table and the corresponding critical value of the χ^2 distribution.

Let us evaluate the number of degrees of freedom for the χ^2 statistics. Since the class number of the analysed variable X_ number of claims equals $k = 5$ (the last expected frequency does not equal 5 or more, so the total class number should be decreased by 1), and since the observed frequencies are dependable in a way that their number is fixed, we will have one degree of freedom less. Also, we had to estimate one parameter from the given data which was the reason for the loss of another degree of statistical freedom. Thus, the number of degrees of freedom, φ is equal to: $\varphi = 6{-}1{-}1{-}1 = 3$. From the χ^2 distribution, $\chi^2_{3;0,95} = 7.815$, according to $\chi^2 = 215.44 > 7.815 = \chi^2_{3;0,95}$, we can conclude that the given distribution of claims does not comply with the Poisson distribution.

On the other hand, the number of degrees of freedom for the χ^2 statistics, in the case of the negative binominal model, as well as in case of the inverse Gaussian distribution, is equal to: $\varphi = 6{-}1{-}1{-}2 = 2$, because we had to estimate two parameters from the given data.

Using the critical value of the χ^2 distribution for an ascertained number of degrees of freedom suggests that the $\chi^2_{2;0,95} = 5.991$, and since $\chi^2 = 0.53 < 5.991$ and $\chi^2 = 0.89 < 5.991$, we cannot reject the hypothesis of adjustability of the given distribution to a negative binomial distribution, as well as to a Poisson Inverse Gaussian distribution with a 5% risk of error.

Determining the probability of a distribution function, i.e. the model which best suits the observed frequency distribution of claims, shall be the beginning of the second stage in the process of establishing the premium rates.

In the observed case, it is determined that in the further process of establishing tariffs, the characteristics of two distributions could be applied. Since the approximation of the negative binomial distribution is slightly advanced (the distance of the realised χ^2 statistics from the critical value for this model is larger than in the case of the Poisson-inverse Gaussian model), in the text below we shall describe a model that establishes a system of optimal BMS, designed on the assumption of this distribution.

Table 5: Obtained χ^2 statistic test values and estimated parameters

Distribution	Poisson	Negative Binomial	Poisson Inverse Gaussian
Parameters	$\hat{\theta} = 0.110429$	$\hat{a} = 1.741346$ $\hat{b} = 15.768978$	$\hat{\alpha} = 0.110429$ $\hat{\beta} = 0.063416$
$\chi^2 = \dfrac{(f_i - f_i')}{f_i'}$	215.44	0.53	0.89

One of the important characteristics of the negative binomial distribution, which will be of particular interest for this analysis, is that if the a priori distribution of the unknown Θ gamma, with the parameters a and b, in other words, if: $\Theta{:}\Gamma(a,b)$, than the a posteriori distribution of the claim frequency parameters is also gamma, whose parameters are now equal to:

$$a' = a + k \quad \text{and} \quad b' = b + t \qquad (16)$$

where $k = \sum_{i=1}^{t} k_i$ represents the total number of claims per insured, and t represents the number of years to be taken into analysis.

Specifically, the estimate of the mean frequency of claims for the automobile portfolio, whose data on claims for the previous period are represented by the vector $(k_1,k_2,.....k_t)$, is equal to:

$$\theta_{t+1}(k_1,k_2,....k_t) = \frac{a+k}{b+t} = \frac{a'}{b'} \qquad (17)$$

Note that the stated expression represents a form of credibility theory according to which the premium is a weighted average of the individual risk and the average value of the collective risk.

In our case, assuming that the credibility factor can be represented in the form of: $z = \dfrac{t}{b+t}$, the estimate of the mean frequency will have the following form:

$$\theta_{t+1}(k_1,k_2...k_t) = z \cdot \frac{k}{t} + (1-z) \cdot \frac{a}{b} \qquad (18)$$

where $\dfrac{a}{b}$ represents the average, a priori premium, while $\dfrac{k}{t}$ represents the result of individual observations of the policyholder.

Finally, for the purpose of designing an optimal BMS for the given automobile portfolio based on the elements of the Bayesian analysis, we can apply a principle according to which we shall assign to each policyholder a premium proportional to the estimate of his/her claim frequency.

This simple principle, known as the expected value principle [3], [5], [6] requires the policyholder to pay a net premium plus a security loading α which is proportional to the net premium, and can be represented as:

$$P = (1+\alpha)E(X), (\alpha>0) \qquad (19)$$

Thus, a policyholder, whose previous conduct in terms of reported claims is represented by the vector $(k_1, k_2, ..., k_t)$, will pay a premium according to the following formula:

$$P(k_1,k_2,...k_t) = c\,(1+\alpha)\theta_{t+1}(k_1,k_2,...k_t) = c\,(1+\alpha)\frac{a'}{b'} \qquad (20)$$

where c is a constant value, and α represents the security loading.

In accordance with this principle, the rule for establishing an optimal BMS for the analysed automobile portfolio may be illustrated in the form of the following ratio:

$$\frac{\int_0^{\infty} \theta du(\theta|k1,\, k2,...\, kt)}{\int_0^{\infty} \theta du(\theta)} \qquad (21)$$

when, assuming that the amount of base (initial) premium is equal to 100 currency units, we reach an expression for determining a posteriori net premium, or a rule to determine the premium amount in the optimal BMS.

$$P'_{t+1}(k_1,k_2,......k_t) = 100 \cdot \frac{\frac{a+k}{b+t}}{\frac{a}{b}} =$$
$$= 100 \cdot \frac{b(a+k)}{a(t+b)} = 100 \cdot \frac{a'}{b'} \cdot \frac{b}{a} \qquad (22)$$

Following the results described above, in Table 6 we present the amounts of premiums that are supposed to be paid by the insured in the observed portfolio who is considered to cause k damages over a period of t years.

Data in Table 6 introduce a balance between the premium rates in such a way that a policyholder who reported no liability claim during a one-year period will gain a discount of nearly 6% in the next year, and an additional 5.6% in the following year without claims. Additional discount should be granted for up to 7 consecutive years without claims, in which case the discount would reach 30% of the nominal premium rate. On the other hand, filing one claim in a year will result in an increase in the premium price by 48%, while two claims will increase the nominal premium rate by nearly 100%.

Conclusions

Based on the elements of the credibility theory, by using the negative binomial distribution to model the frequency

Table 6: The optimal BMS – negative binominal distribution model

Number of years without claim	Number of claims reported by the insured						
t	0	1	2	3	4	5	6
0	100						
1	94.04	148.03	202.03	256.02	310.02	364.01	418.01
2	88.75	139.70	190.66	241.62	292.57	343.53	394.49
3	84.02	132.26	180.50	228.74	276.99	325.23	373.47
4	79.77	125.57	171.37	217.17	262.98	308.78	354.58
5	75.93	119.52	161.12	206.72	250.32	293.91	337.51
6	72.44	114.03	155.63	197.22	238.82	280.41	322.01
7	69.26	109.03	148.79	188.56	228.33	268.10	307.87

of claims and the expected value principle for determining the net premiums, we have managed to establish the tariff system. A suggested tariff model for auto liability premium rates is based on an optimal bonus-malus system. It complements the pioneering study of Lemaire [17] and it strongly supports the principle of fairness in the distribution of costs. By using such a model, it is possible to penalise drivers who are causing accidents, and this should result in reduction of claims and increase of safety in traffic.

Empirical research have proven that, in modelling the automobile liability rating system based on the frequency of claims, it is optimal to use sophisticated distribution models such as the negative binomial distribution. This facilitates the establishment of a financially balanced system of bonus-malus, which suggests the level of future premium rates for all expected risks which are equal to the cost of future accidents.

Taking into consideration the fact that the BMS in Serbia has been implemented merely a couple of years and that it is possible to improve its application, the results of this research paper could serve as a solid basis for developing and upgrading the process of determining premium rates in auto liability.

Finally, we would like to note that the established automobile liability tariffs that are derived in this paper, in other words – the presented optimal BMS, could be improved by introducing additional variables into the analysis. This primarily refers to several major a priori characteristics of the insured person, such as gender, age, and so forth, which have been discussed previously. Also, the process of establishing an optimal BMS can be further improved by including data on the cost amounts of claims

reported. Due to the fact that the data mentioned could not be implemented into the model presented, the authors of this paper intend to improve the tariff process as described above when the additional data become available.

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DETERMINING THE DISCOUNT RATE: THE CASE OF OIL INDUSTRY IN SERBIA

Određivanje diskontne stope – slučaj naftne industrije u Srbiji[*]

Abstract

The paper presents theoretical and methodological aspects of determining the discount rate on the example of NIS, as the largest energy company in Serbia and one of the largest in Southeast Europe. The total cost of capital which represents the weighted average of equity and long-term debt costs is used as discount rate. The cost of equity capital is calculated using the CAPM which, despite all its limitations, is still theoretically the most correct and frequently used model in practice. The average cost of long-term debt capital to the company NIS is equal to 14.773%, the cost of equity capital is 12.453% and the total cost of capital, WACC, is 12.505%. The main component of the cost of equity capital is the risk premium of investing in Serbia. The results show that macroeconomic stability strengthening and adequate management of borrowed funds can contribute to reduction of the total cost of capital in the Serbian oil industry.

Keywords: *discount rate, WACC, cost of equity, CAPM, country risk premium*

Sažetak

U radu su prikazani teorijsko-metodološki aspekti utvrđivanja diskontne stope na primeru preduzeća NIS a.d. kao najveće energetske kompanije u Srbiji i jedne od najvećih u jugoistočnoj Evropi. Kao diskontna stopa korišćen je ukupni trošak kapitala koji predstavlja ponderisani prosek troškova sopstvenog i dugoročnog pozajmljenog kapitala. Trošak sopstvenog kapitala je izračunat primenom CAPM modela koji je, i pored svih svojih ograničenja, i dalje teorijski najispravniji i često korišćen model u praksi. Prosečni trošak dugoročnog pozajmljenog kapitala za preduzeće NIS a.d. iznosi 14,773%, trošak sopstvenog kapitala je 12,453% i ukupni trošak kapitala, WACC, je 12,505%. Glavna komponenta troška sopstvenog kapitala je premija za rizik ulaganja u Srbiju. Dobijeni rezultati pokazuju da jačanje makroekonomske stabilnosti i adekvatno upravljanje pozajmljenim izvorima sredstava mogu doprineti smanjenju ukupnog troška kapitala u naftnoj industriji Srbije.

Ključne reči: *diskontna stopa, WACC, trošak sopstvenog kapitala, CAPM, premija za rizik zemlje*

Introduction

The subject of this paper is the analysis of theoretical and methodological aspects of determining the discount rate on the example of the oil industry in Serbia. The determination of adequate discount rate represents the critical step in the investment analysis process and it is the subject of ongoing controversy in financial theory and practice. The application of too high a discount rate leads to underestimation of the present value of expected future cash flows, while too low a discount rate leads to their overestimation. Both situations result in inadequate investment decisions with long-term negative consequences. When choosing a discount rate, it is necessary to take into account pure interest, risk and inflation [21, p. 273]. The assessment of discount rate is especially problematic in developing countries, such as Serbia, in which, due to the underdevelopment of financial market, the mechanisms, i.e. factors for its determination do not exist.

Watson & Head [30], as well as Damodaran [7], point out that the total, i.e. weighted average cost of capital (WACC) should be used as a discount rate if dynamic methods, such as net present value or internal rate of return, are used for investment appraisal. The total cost of capital represents the weighted average of all components of long-term financial sources, including equity, as well as long-term debt finance. The goal of this paper is to determine the total cost of equity to the company NIS, as one of the largest vertically integrated energy companies in Southeast Europe. A special importance of this paper for theory and practice is the use of CAPM, which is considered to be the most appropriate model for estimating the cost of equity. In this paper, we hypothesize that the largest component of the cost of equity in the Serbian oil industry is the country risk premium, while the volatility of NIS's stock returns is lower than the volatility of market returns. Consequently, the opportunities for lowering the total cost of equity should be searched for in adequate management of debt financing.

Capital asset pricing model (CAPM), developed by Sharpe [27], assumes linear relationship between risk and return and enables determining of the cost of equity using the risk-free rate, which is increased by equity risk premium (ERP). ERP includes the systematic risk of investing in a company, as well as the excess of market return above the risk-free rate.

Different from CAPM, which is a one-factor model, the arbitrage pricing theory (APT), developed by Ross [25], assumes that, instead of one beta, the whole set of betas exists – one for each factor. According to that theory, the expected return depends on how a stock reacts to the whole set of individual macroeconomic factors and on the risk premium of each of those factors. Although more sophisticated than the CAPM, the arbitrage pricing theory is difficult to apply in practice.

The estimation of the total cost of equity in natural monopolies, such as companies in the energy sector, is an important starting point for further expert analyses in the process of their regulation. Real discount rate is a necessary assumption for not only making optimal investment decisions, but also for determining adequate fuel prices. In addition, comparison of the profits earned with corresponding cost of capital is the basis for estimating the profitability of this sector. Under conditions of low oil prices, lowering the cost of capital represents an imperative for companies in oil industry.

Kavussanos & Marcoulis [18] examined the impact of market returns and factors, which are suggested by Fama & French [15], on the profitability of American oil companies. The authors conclude that the market return (S&P 500) has the highest impact on the oil companies' stock prices, while the impact of the company's size, measured by market capitalization, and of the ratio of book to market value is very low. This fact justifies the use of CAPM for determining the cost of equity in oil industry.

While estimating the expected returns on oil and gas industry stocks in Canada, Sadorsky [26] proved that this sector is less risky than the market. This result is contrary to that of Ferson & Harvey [16], who argue that real interest rates and market return represent key determinants of the oil companies' stock returns in the U.S. In their research, which covered 34 countries, Ramos & Veiga [24] proved that oil and gas sector in developed countries responds more strongly to changes in oil price than in developing countries. The analysis of the cost of equity in the UK energy market shows that vertically

integrated energy firms have lower WACC in comparison with stand-alone generators [5].

Družić et al. [12] conducted research on WACC calculation on the example of power and natural gas sector in Croatia. The authors prove that WACC is relatively lower if the proportion of debt in capital structure is higher, and in case of monopolistic activities (e.g. gas transmission). In performing an empirical test of the application of the value-based enterprise risk management (VBERM) in the Serbian power sector, Vuksanović [29] also used WACC as discount rate. Research results show that the cost of equity is almost twice the debt cost in the case of the public enterprise Electric Power Industry of Serbia. Momčilović et al. [23] calculated the cost of equity for eight largest companies in the Serbian food industry using the CAPM and Downside CAPM. According to their results, a relatively high cost of equity in food industry arises from the country risk premium. However, the results of the similar research on the example of oil industry in Serbia have not been published so far.

Research methodology

In this section, we explain the model for calculating the total cost of equity with all its elements. The total cost of capital represents the weighted average cost of all long-term sources of finance. Since, besides equity, NIS has long-term debt, the total cost of capital of this company is calculated using the following formula [30]:

$$WACC = \frac{K_e + E}{D + E} + \frac{K_d \, x \, (1 - C_t) \, x \, D}{D + E} \qquad (1)$$

where $WACC$ represents the total, i.e. the weighted average cost of capital, K_e represents the cost of equity, K_d is the cost of long-term debt, E is the value of equity, D is the value of long-term debt and C_t is corporate tax rate, which amounts to 15% in Serbia.

It is important to note that instead of the book value, the market value of equity is used. The reason for this is because the nominal value of a share is almost always lower than its market value, which further leads to underestimation of the cost of equity. Since the cost of equity is, by rule, higher than the cost of debt, the use of book value of equity would lead to underestimation of the total cost of capital and thus the discount rate, which could further lead to accepting unprofitable investment projects.

On the other side, some sources of finance, such as bank loans, do not have market values. Theoretically, there is no reason why market values and book values of different sources of finance cannot be used together. It is recommended that market values of long-term sources of finance be used, if they exist. If that is not the case, book values can be used as well [4, p. 366]. For that reason, due to the lack of data on market value of NIS's long-term debt, in this research, the book values are used instead. The cost of long-term debt capital of this company is calculated using the data from the latest balance sheet and income statement according to the following formula:

$$K_d = \frac{Net \; finance \; expanses}{Long \text{-} term \; debt} \qquad (2)$$

The cost of equity of NIS is calculated using the CAPM according to the following formula [9, p. 72]:

$$K_e = R_f + \beta \, x \, RP + CRP \qquad (3)$$

where R_f represents the risk-free rate, β represents the beta of NIS, RP is the mature market risk premium and CRP is the country risk premium.

Risk-free rate

An investment can be considered as risk free if its actual return is always equal to its expected return. According to Damodaran [8, p. 6], that is possible if there is no default risk and no reinvestment risk. Default risk assumes possible financial losses for an investor due to the inability and/or unwillingness of a debtor, an issuer of financial instruments which are kept in his investment portfolio, to settle his obligations [17, p. 24]. Only government securities of some countries do not have default risk. Securities which are issued by companies, even those considered the safest, have default risk and for that reason they cannot be risk free.

Reinvestment risk represents the possibility that the return from reinvesting received cash flows will be lower than the return from initial investment in conditions of falling interest rates. This risk exists if, for example, a six-month treasury bill is used for estimating the expected return for the period of five years [8, p. 6]. Even though this security guarantees receiving of the expected return after

six months, there is still a risk that, until the reinvestment of received cash flows in a new six-month treasury bill, the interest rate could change and the return could be different from the one in the first six months. Treasury bonds with coupons and maturity longer than one year also carry reinvestment risk, since coupons need to be reinvested during the period of maturity at interest rates that are unknown at a given moment.

From the abovementioned, only long-term zero-coupon government bonds issued by developed countries, such as the U.S., are considered risk free. The next question relates to the length of the period of maturity of those bonds. Theoretically, the most correct approach is to use as a risk-free rate the return of those bonds whose period of maturity is equal to the length of cash flows of an investment project. Thus, for example, as a risk-free rate for determining the discount rate for discounting cash flows in the first year of an investment project, the return of one-year government bond should be used. As a risk-free rate for determining the discount rate for discounting cash flows in the second year of the same project, the return of a two-year government bond needs to be used, etc.

Since the application of this approach is complicated, in practice, only one risk-free rate is often used for determining the discount rate, which is used for discounting cash flows from all periods of an investment project. In accordance with that, we also used only one risk-free rate for determining the NIS's cost of equity and that is the rate of return of a ten-year U.S. government bond.

Beta

The beta of a company measures the sensitivity of stock returns to the change of systematic factors which affect all companies whose shares are traded on the stock market. Thus, for example, a company's beta of 1.2 means that, if the average return of the stock market increases by 10%, the return of the share of that company will increase by 12%. Conversely, if the average return of the stock market decreases by 10%, the return of the share will decrease by 12%. From the abovementioned, it can be concluded that the shares of a company whose beta is greater than

1, offer higher return and higher risk than the shares of a company whose beta is lower than 1.

Beta coefficient for any company is calculated using the linear regression, where dependent variable represents the return on shares of a company, and independent variable represents the market return, i.e. the return on the stock market index, which includes shares of as many companies as possible:

$$r_{i,t} = \alpha_i + \beta_i r_{m,t} + \varepsilon_t, \quad t = 1,2,...,T, \qquad (4)$$

where $r_{i,t}$ represents the return on shares of a company i in the period t, $r_{m,t}$ represents the return on the stock market index in the period t, α_i is the intercept on the vertical axis for a company i, β_i is the regression coefficient or beta coefficient for a company i, ε_t is residual, and t is the number of time periods for which the return is calculated.

During the calculation of beta coefficient, three questions are raised: which stock market index should be used, how long the time period for which beta is calculated should be and how long the return interval should be [7].

A rule is to use the index which includes the shares of as many companies as possible, where these shares are weighted with companies' market capitalization. For that reason, for calculating beta coefficient for American companies, for example, the S&P 500 is usually used. Since the NIS's shares are traded on the Belgrade Stock Exchange (BSE), for calculating the beta coefficient of that company, it is necessary to choose one of the BSE indexes, such as Belex 15 or Belex Line. The advantage of Belex Line over Belex 15 is the larger number of shares in the index. Belex 15 includes the shares of 15 companies, whereas Belex Line includes the shares of 34 companies. Besides that, the maximum weight of market capitalization of one company in stock market index is 20% for Belex 15 [3, p. 3], whereas for Belex Line it is 10% [2, p. 3]. This is also the advantage of Belex Line over Belex 15. For all these reasons, we decided to use the Belex Line index.

The next problem is the length of the time period for which beta is calculated. Credit rating agencies in the U.S. often calculate beta coefficients for periods from two to five years [6, p. 26]. Generally speaking, the longer the time period for which beta is calculated, the greater the number of observations in the regression model is and the results are more reliable. On the other side, if a too long

period is chosen, there is a risk that company's business or capital structure has changed during that period. For that reason, a shorter period should be chosen if a company was recently restructured or involved in merger and acquisition activities. Since NIS went public on 9/1/2010 and given that since then its business remained quite stable, we decided to calculate beta for the period of 5 years.

The last problem related to calculation of beta is how long the return interval should be when calculating the return on shares of a company and the return on stock market index. Returns can be calculated on a daily, weekly, monthly, quarterly and yearly basis according to the following formula:

$$Return\ on\ share_t = \frac{Price_t - Price_{t-1}}{Price_{t-1}} \quad (5)$$

$$Return\ on\ index_t = \frac{Index_t - Index_{t-1}}{Index_{t-1}} \quad (6)$$

where $Price_t$ represents the share price of a company at the end of a period, $Price_{t-1}$ represents the share price at the beginning of a period, $Index_t$ is the value of a stock market index at the end of a period and $Index_{t-1}$ is the value of a stock market index at the beginning of a period.

Again, the shorter the return interval, the greater the number of observations in the regression model is and the results are more reliable. However, if return intervals are too short, there is a possibility that during some intervals shares have not been traded. If that is the case, the correlation between the return on shares and the return on stock market index will be lower, which will negatively affect the estimation of beta coefficient. In order to avoid such possibility, instead of daily or weekly returns, we decided to use the monthly returns.

Mature market risk premium

The mature market risk premium is the difference between the average return on shares traded on a mature market and the average return on risk-free securities over a specified period of time. As an approximation of the average return on shares traded on a mature market, we use the average return on the S&P 500 index, while the rate of return on the U.S. government bonds with a maturity of 10 years is used as the risk-free rate.

The risk premium thus defined requires answers to the following two questions: how long should a period of time that will be used for calculating the average returns be and by which method should the average returns be calculated, that is whether to use the arithmetic or the geometric mean?

The advantage of using a shorter time period for determining the average returns is that there is less of a chance that during this period the average investor's attitude to risk has changed. On the other hand, reducing the time leads to an increase of the standard error when calculating the risk premium. For example, the standard errors in case of 5 or 10-year periods can be almost equal to the estimated amount of the risk premium [10, p. 25]. For that reason and in accordance with [9], we have chosen the period from 1928 to 2014.

The average returns can be arithmetic or geometric. The arithmetic mean is appropriate if there is no correlation between annual returns over time. However, Fama & French [14] proved that there is a negative serial correlation between stock returns over the years, leading to overestimation of the arithmetic average returns. Therefore, in this research, we opted to use the geometric mean. Accordingly, the average return is calculated as follows [10, p. 27]:

$$Geometric\ average\ return = \left(\frac{value_N}{value_0} \right)^{\frac{1}{N}} - 1, \quad (7)$$

where $value_N$ represents the value of market index or the price of risk-free security at the end of the last year, $value_0$ represents the value of market index or the price of risk-free security at the beginning of the first year and N is the number of years, i.e. the length of time for which the average return is calculated.

Country risk premium

The country risk premium reflects the specific economic, political and social conditions, as risk factors, in the country where the investment project is being realized, i.e. in which the considered company operates [22, p. 309]. According to Damodaran [9, p. 63], the country risk premium is calculated in the following way:

$$CRP = CDS \times \frac{\sigma_E}{\sigma_B} \qquad (8)$$

where *CRP* represents the country risk premium, *CDS* is the country default spread, σ_E is the standard deviation of the average return on shares of all companies in the country (the standard deviation of stock market index return) and σ_B is the standard deviation of return on government bonds of a given country.

In our case, *CDS* represents the difference between the interest rate on government bonds of the Republic of Serbia and the interest rate on government bonds of that country, whose government bonds are considered risk-free. It is important to note that the two countries' government bonds must have the same maturity and must be denominated in the same currency, in order to exclude the inflation effect on their return. As the government bonds of the Republic of Serbia are denominated either in euros or in dinars, *CDS* is the difference between the interest rate on German government bonds and the interest rate on Serbian government bonds, denominated in euros and with the same maturity.

Belex Line index is used as an approximation of the average return on the shares of all companies in Serbia, so that σ_E in fact represents the standard deviation of Belex Line returns during a certain period. Weekly returns on the index over a period of the last two years are most commonly used for calculating the standard deviation [9, p. 62]. Weekly returns during the last two years are also used for calculating the standard deviation of return on government bonds of the Republic of Serbia, σ_B. For this purpose, ten-year government bonds denominated in euros are taken.

Data

Data on market capitalization, financial expenditures and long-term liabilities for the company NIS as at 12/31/2015 are taken from the website of the Belgrade Stock Exchange. These data are necessary for calculating the average cost of long-term debt capital, as well as for the weights to be applied to the amounts of costs of equity and long-term debt when calculating the total cost of capital. The data are presented in Table 1.

The rate of return on the U.S. government bonds with a maturity of 10 years as at 7/1/2016 amounted to 1.46% (see Table 2). This rate is used as a risk-free rate in our model.

The monthly returns on NIS's shares and Belex Line index are calculated using the data on the share prices and the index values during the period from 7/1/2011 to 7/1/2016. These data are also taken from the website of the Belgrade Stock Exchange [1]. Table 3 shows the descriptive statistical indicators for NIS's shares and Belex Line index.

As can be seen from Table 3, the average return on NIS's shares during the period of five years is almost zero (-0.01%). The same is with Belex Line index. However, the price of this company's shares has fluctuated significantly, which led to very low and very high returns during particular months. The highest return was recorded in February 2012 (27.12%), while the lowest return was achieved in September 2011 (-0.03%).

Damodaran [10] calculated risk premium in the United States as the difference between the average return on S&P 500 stock index and the average return on Treasury

Table 1: Relevant data for NIS

Data on 12/31/2015	Value
1. Number of ordinary shares	163,060,400
2. Share price (RSD)	600
3. Market capitalization (RSD) (1x2)	97,836,240,000
4. Net finance expenses (RSD)	14,671,061,000
5. Long-term debt (RSD)	99,309,246,000
6. The weight of the cost of equity in WACC (3/(3+5))	49.63%
7. The weight of the cost of long-term debt in WACC (5/(3+5))	50.37%

Source: [1].

Table 2: U.S. Treasury yield curve rates (%)

Date	1 Mo	3 Mo	6 Mo	1 Yr	2 Yr	3 Yr	5 Yr	7 Yr	10 Yr	20 Yr	30 Yr
7/1/2016	0.24	0.28	0.37	0.45	0.5	0.71	1.00	1.27	1.46	1.81	2.24

Source: [28].

Table 3: Descriptive statistics for NIS's shares and stock market index Belex Line for the period 7/1/2011-7/1/2016

Statistic	NIS Share Price	Belex Line Value	NIS Monthly Return	Belex Line Monthly Return
Mean	740	1,158	-0.01%	0.01%
Median	713	1,131.5	-0.46%	0.37%
Standard deviation	127	176	7.05%	4.14%
Minimum	539	858.04	-20.03%	-11.94%
Maximum	938	1,445.37	27.12%	9.74%
Range	399	587.33	47.14%	21.68%

Source: Authors' calculation on the basis of [1].

Table 4: Mature market risk premium (U.S. market)

Period	Arithmetic Mean		Geometric Mean	
	Stocks - T. Bills	Stocks - T. Bonds	Stocks – T. Bills	Stocks – T. Bonds
1928-2014	8.00%	6.25%	6.11%	4.60%
1965-2014	6.19%	4.12%	4.84%	3.14%
2005-2014	7.94%	4.06%	6.18%	2.73%

Source: [10, p. 30].

bonds (bills) for different time periods by using geometric and arithmetic means (see Table 4). In our model, the mature market risk premium, as the difference between the geometric average S&P 500 return and the geometric average return on 10-year government bonds for the period from 1928 to 2014, is equal to 4.60%.

According to Damodaran [11], the premium for the risk of investing in Serbia (country risk premium) equals to 6.95%.

Results and discussion

In this section, we present and discuss the results of the research. All calculations were performed in Microsoft Excel 2007 and Stata/IC 12 programs. Average cost of long-term debt capital, K_d, is calculated on the basis of available data, by applying Formula 2, in the amount of 14.773%.

$$K_d = \frac{14,671,061,000 \; RSD}{99,309,246,000 \; RSD} \; x \; 100 = 14.773\% \quad (9)$$

The results of the regression analysis are shown in tables 5 and 6. Estimated value of the beta coefficient for NIS company equals 0.879.

Table 5: Results of the regression analysis

Results	Value
Number of observations	60
F (1.58)	21.00
Prob > F	0.0000
R-squared	0.2658
Adj. R-squared	0.2532
Root MSE	0.06094

Source: Authors' calculation on the basis of [1].

P-value of the beta coefficient is equal to zero, which means that we can reject the null hypothesis which states that β = 0. This is corroborated by the F test, since the value of F statistic is relatively high (21.00).

The standard error of the beta coefficient is 0.192, meaning that with a probability of error of 5% we can conclude that the actual beta coefficient for the entire population (period since NIS went public until today) is in the range from 0.495 to 1.263. Unfortunately, that is a fairly wide interval. Since we are not interested in beta coefficient for the entire population, but for the more recent period within which we are confident that the business of the company has not significantly changed, a high level of standard error is not a problem.

However, what adversely affects the ability of beta to predict the change in returns on company's shares on the basis of changes in the stock market index return is

Table 6: Beta coefficient for NIS

NIS Monthly Return	Coefficient	Standard Error	t	P > |t|	95% Confidence Interval	
Belex Line monthly return	0.8789155	0.1917963	4.58	0.000	0.4949935	1.262838
Cons	-0.0001515	0.0078673	-0.02	0.985	-0.0158996	0.015596

Source: Authors' calculation on the basis of [1].

a relatively low coefficient of determination of 0.266, or 0.253 in terms of the adjusted coefficient of determination. This coefficient measures how well a variation of monthly returns on Belex Line stock exchange index explains the variation of monthly returns on NIS's shares. The higher the value of this coefficient, the closer the monthly stock returns are to the regression line. Figure 1 illustrates the dispersion of NIS's monthly stock returns in relation to the regression line.

Although it would be ideal if the coefficient of determination was somewhat higher, a positive correlation between the stock return and the index return is evident in Figure 1. For the purpose of determining the cost of capital and the discount rate, the resulting coefficient of determination can be considered sufficiently high.

Beta coefficient of 0.879 indicates that the shares of the company NIS can be considered defensive. Such shares are attractive to investors in periods when stock prices are falling on average [30]. The reason for this is the fact that, if the average return on shares of all companies in Serbia, measured by Belex Line index, declined by 10%, NIS's stock return would be reduced by a smaller percentage, that is, by 8.79%.

However, this conclusion should be taken with some reservation. Firstly, although the most comprehensive stock index in Serbia, Belex Line does not include the shares of all companies, but only of 34 of them. Secondly, the market capitalization of NIS participates in Belex Line index in the amount of 10%, which is an extremely high percentage. The reason is undeveloped financial market in Serbia with a small number of companies whose shares are traded on the stock exchange. Finally, even though NIS's shares are traded each day, their trading volume is very small. Unfortunately, the same is true for the shares of other companies, whereby the shares of some companies are traded even less frequently than once a week.

The cost of equity, K_e, is calculated by applying Formula 3, in the amount of 12.453%:

$$K_e = 1.46\% + 0.879 \times 4.60\% + 6.95\% = 12.453\% \quad (10)$$

As can be seen, the main component of the cost of equity capital is the premium for risk of investing in Serbia, which is very high at 6.95%, thus confirming the research hypothesis. Such a result supports the findings of [23]. By comparison, the country risk premium for Montenegro amounts to 5.56%, Croatia 3.86%, Hungary 3.86% and Slovenia 3.40%. The only country in the region with a risk premium higher than the one for Serbia is Bosnia and Herzegovina (10.05%) [11].

It can also be noticed that the cost of equity in the case of NIS is slightly lower than the average cost of long-term debt capital. Such a situation is not common, and on theoretical grounds, it should be the other way round, that is, the cost of own capital should be higher than the average cost of long-term debt capital. The reason is that shareholders bear a greater risk in terms of their investment returns in relation to creditors. Shareholders' return in the form of dividends and capital gains depends on the results achieved, while the return earned by creditors is

Figure 1: Dispersion diagram of NIS's monthly stock returns
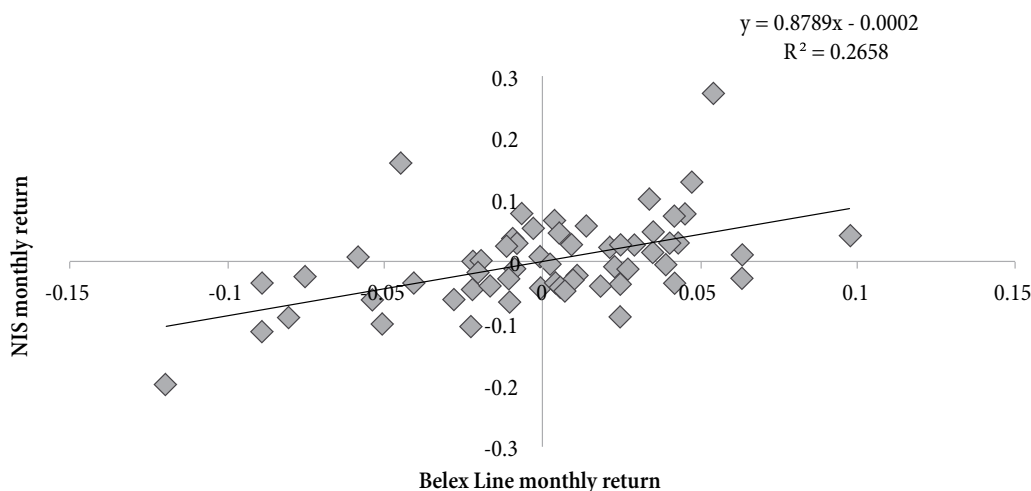
Source: Authors' calculations on the basis of [1].

fixed and equal to the amount of contracted interest rate on borrowed funds. Finally, in the event of liquidation, creditors have priority in the settlement of their claims in relation to shareholders. From the above, we can conclude that such a situation may indicate poor management of borrowed funds of the company.

The total cost of capital, *WACC*, calculated on the basis of Formula 1, equals 12.505%:

$$WACC = (12.453\% \times 0.4963) +$$
$$(14.773\% \times 0.5037 \times 0.85) = 12.505\% \qquad (11)$$

The total cost of capital thus determined can be used as a discount rate if the dynamic methods, such as net present value and internal rate of return, are applied in investment projects evaluation. In that case, interest expense on borrowed funds, as well as other finance expenses, should be excluded from the net cash flows of the investment project, given that they are already implicitly included in the discount rate [20].

Conclusion

The paper presents theoretical and methodological aspects of determining the discount rate on the example of NIS, as the largest energy company in Serbia and one of the largest in Southeast Europe. The total cost of capital, as the weighted average of costs of capital from all long-term sources of finance, including both owned and borrowed funds, is used as a discount rate. The cost of equity is calculated by applying CAPM which, despite all its limitations presented in this paper, is still theoretically the most correct and frequently used model in practice. In accordance with that, we used the rate of return on the U.S. government bonds with a maturity of 10 years as a discount rate. Beta coefficient is estimated on the basis of the linear regression where dependent variable represents the return on company's shares, and independent variable represents the market return, i.e. the return on Belex Line stock market index. Returns are calculated on a monthly basis for a period of five years.

The mature market risk premium is approximated with the difference between the average return on the S&P 500 index and the average return on 10-year U.S. government bonds. We used geometric mean for the period from 1928

to 2014. The country risk premium is the country default spread (the difference between the interest rate on risk-free (German) government bonds and the interest rate on government bonds of the Republic of Serbia, denominated in euros and with the same maturity), corrected with the ratio of the volatility of weekly returns on Belex Line and the volatility of weekly returns on government bonds, observed over the last two years.

The conducted analysis shows that the average cost of long-term debt capital to the company NIS is equal to 14.773%, the cost of equity capital is 12.453% and the total cost of capital, WACC, is 12.505%. The main component of the cost of equity capital is the premium for the risk of investing in Serbia, which is extremely high, reaching 6.95%. For instance, all countries in the region, with the exception of Bosnia and Herzegovina, have a lower risk premium compared to Serbia. At the same time, the cost of equity capital is lower than the average cost of long-term debt capital, which is not logical from a theoretical point of view and may indicate poor management of borrowed funds of the company.

The obtained results indicate possible directions for lowering the total cost of capital in the Serbian oil industry. On the one hand, a prerequisite for lowering the cost of equity capital is the improvement of the macroeconomic environment, through the establishment of economic, monetary and political stability, development of financial market, eradication of corruption, attraction of foreign direct investments, legal protection of property rights and strengthening the rule of law. Minimization of the total capital costs, on the other hand, requires adequate management of borrowed funds at the level of the oil industry in Serbia. This will lead to an increase in the present value of future cash flows that will, in case of an efficient capital market, have positive impact on the share price and market capitalization of the company.

Finally, we conclude with suggestions for future research. Instead of one discount rate, it is possible to develop a theoretical risk-free spot rate curve applying bootstrapping technique in the context of arbitrage-free valuation approach [19]. By incorporating that curve in the explained model, the maturity structure of the cost of equity capital and then of the total cost of capital could be

derived. Following that, each individual cash flow from the investment project could be discounted by a discount rate that corresponds to its maturity, which would enhance the precision of research results. In terms of undeveloped financial market, betas and stock returns have a relatively low correlation and, therefore, the modifications of classical CAPM are proposed for developing countries [13]. Hence, another important direction of future research relates to the comparison between the obtained results and the results which the application of Downside CAPM, capturing the downside risk that investors just want to avoid, would give in the same example.

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GREEN CLUSTERS AS ONE OF THE POTENTIAL PILLARS OF LONG-TERM SUSTAINABLE ECONOMIC GROWTH

Zeleni klasteri kao jedan od potencijalnih stubova dugoročno održivog ekonomskog rasta

Abstract

In the last twenty years, the "green" business has become a popular business concept in the global economy. Continuing changes in the business environment and increasing attention on the environment protection necessitated a change of perspective and strategic shift towards more efficient use of resources and collaboration with other companies within the value chain and beyond, in the form of clusters. Energy-efficient operation, as well as respect for all the principles of circular economy, represent a special challenge for enterprises, but also new opportunities for acquiring and improving competitive advantage. With this in mind, the "green" clusters represent one of the ways to achieve that aim. Clusters as such have the potential for improvement of micro and macro-competitiveness through the convergence of environmental and economic goals.

Keywords: *green clusters, circular economy, renewable energy, value, competitive advantage*

Sažetak

U poslednjih dvadeset godina, "zeleno" poslovanje postaje popularan poslovni koncept u globalnoj ekonomiji. Kontinuelne promene u poslovnom ambijentu, kao i sve veće poklanjanje pažnje životnoj sredini, uslovile su promenu vizure preduzeća i strategijski zaokret ka efikasnijem korišćenju resursa i kolaboraciji sa drugim kompanijama unutar lanca vrednosti i šire, u vidu klastera. Energetski efikasno poslovanje, kao i poštovanje principa cirkularne ekonomije, predstavljaju svojevrsni izazov preduzećima, ali istovremeno i nove mogućnosti za sticanje i unapređenje konkurentske prednosti. Imajući to u vidu, "zeleni" klasteri predstavljaju jedan od načina za ostvarenje pomenutog cilja. Klasteri kao takvi imaju potencijal za unapređenje mikro i makro konkurentnosti kroz približavanje ekoloških i ekonomskih ciljeva.

Ključne reči: *zeleni klasteri, cirkularna ekonomija, obnovljivi izvori energije, vrednost, konkurentska prednost*

Introduction

Clusters are geographic concentrations of interconnected companies and related institutions engaged in the corresponding activity, which are connected by common characteristics and complementarities [18, p. 202]. Michael Porter was the first to introduce them into the economic literature and to point out the role of clusters in the creation and improvement of competitive advantage. Growth of competitiveness is associated with an increase in productivity and growth of innovation that are the result of exchange of knowledge, information, modern ideas and the use of common resources. Success of the cluster stems from the synergy that occurs as a result of cooperation between the different companies in the value chain, but also universities, development agencies, governments and other institutions.

On the other hand, global economic trends and volatile business environment, with a high degree of uncertainty, constantly impose new business challenges to modern companies. In the last twenty years, concepts such as energy efficiency and sustainable development have become imperatives of modern business companies. Companies increasingly pay attention to the environment, as well as to the "green" business. In other words, their production processes become more environmentally efficient, with a tendency to reduce the cost of environmental protection through the use of cleaner technologies and greater use of alternative energy sources.

New "green" context of business and the change of paradigm have become an opportunity for the creation and improvement of competitive advantage and value growth. Consequently, these changes in the business environment and global trends have implied a thorough strategic approach to the company in terms of formulating environmental strategy, which must be consistent with the corporate strategy. In this way, diametrically opposed economic and environmental objectives of the business are often converging.

Bearing in mind the abovementioned facts, the focus of this work will be precisely on analyzing the role of green clusters in improving both competitiveness at the company level and at the level of competitiveness of the national economy. In the first part of this paper, features of circular economy as a new model of the functioning of the global economy and the importance of alternative forms of energy in modern trends of business will be briefly analyzed and presented.

In the second part, the focus will be on green clusters and their role in developed and developing economies. In a global economy, the concentration of green clusters is augmenting and their success is confirmed by the experience of developed economies. On the other hand, green clusters in the Serbian economy are in the early stages of development. A comparative analysis will help us in identifying the existing gaps and basic guidelines for the future development of green clusters in the domestic economy.

Circular economy as a precondition for long-term sustainable economic growth

In the last twenty years, continuous global changes have led to changing of the business paradigm worldwide. Companies increasingly pay more attention to the environment, which is reflected in increased investment activity in this sector, as well as in the acquisition of "cleaner" technologies which are certainly in the function of energy efficiency and sustainable development. Energy efficiency refers to minimizing the amount of energy in achieving certain production or technological process and, on that basis, a reduction in operating costs. Also, the aforementioned concept is closely tied to the idea of circular economy, which aims to increase the resource efficiency and the use of renewable inputs and, furthermore, reduce waste and other harmful substances that heavily pollute the environment.

As such, the model of circular economy assumes changes throughout the product life cycle, ranging from product design, production and marketing of new models, towards new ways of customer behaviour [20, p. 89]. In accordance with this fact, the products are becoming the "new" inputs in other manufacturing processes at the end of their life cycle, as presented in Figure 1. Also, the circular economy aims to completely replace the linear model which was dominant in the world economy, and

which was based on the principle of "take-make-consume-postpone", which ultimately undermines the long-term environmental goals and standards. It is important to emphasize that technological innovation plays a crucial role in shifting the conventional linear economic system to the objectives of circular economy [12, p. 384]. On the other hand, the support and macroeconomic policy are necessary, whose focus moves from the maximization to economic sufficiency and sustainability.

Figure1: Circular economy
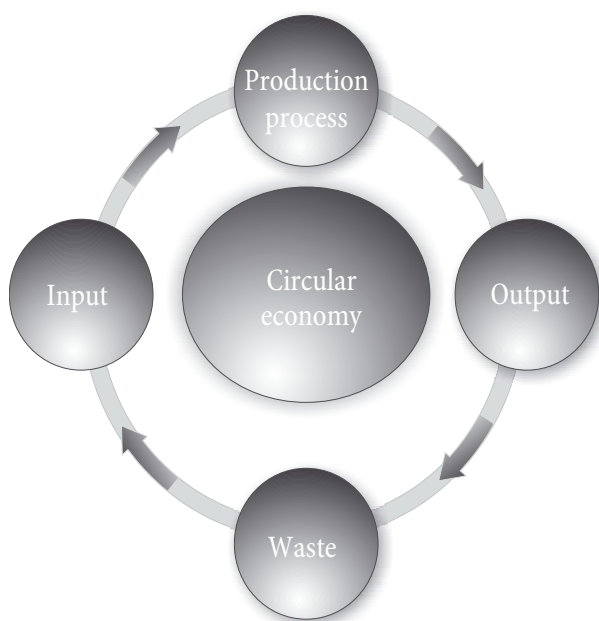
Source: according to [12, p. 384]

The implementation of the circular economy model encouraged further innovation processes and also stressed its relevance for increase of the competitiveness of both enterprises and economies. All these changes, as well as greater involvement of renewables, have contributed to the reduction of operating costs of global companies, as well as to large savings through the emission of CO_2. Some of the most important benefits will be mentioned here [18, p. 359]. Firstly, companies achieve savings in material arising from the substitution, reuse or recycling of production inputs and reduction of environmental costs related to waste disposal. The very process of recycling is a part of a broader concept known as the 3R (Reduce-Reuse-Recycle). Secondly, lower storage costs and lower power consumption lead to an increase in productivity of the production process. Thirdly, the waste processing

and the use of by-products in the form of the "new" input. Finally, reduction of the opportunity costs related to underutilized resources.

Growth of business efficiency, which is further supported by the increase in quality, results in products that are labelled as "eco-friendly". Such products are fully compatible with the environmental and ecological principles. Usually they are of better quality and are safe to use, which implies value added for customers. Also, growth of quality is often accompanied by lower costs of packaging and product delivery, as well as lower costs of production itself because it uses recycled inputs, which ultimately accelerates efficiency of resource use. Besides that, most available studies emphasize the fact that the "green" markets are now reaching critical mass, displaying high growth rate and should continue to do so in the near future, especially in renewable energies and energy efficiency [11]. A lot of companies are now investing and diversifying more in green activities.

Business models based on the circular economy represent a certain step out for companies and require a strategic approach. Namely, in order to approach the economic and environmental objectives, it is necessary to formulate and implement an environmental strategy for a business, which has to be fully compatible with the corporate strategy as a basic guiding principle of the business.

According to Porter, improving performance in accordance with the environment enables companies to actually achieve competitive advantage and reduce costs. Although the transition to the patterns of production and business favourable to the environment can cause short-term costs, it can also bring long-term benefits, because it creates preconditions for technological leadership in products and processes, which will eventually conquer foreign markets [18, p. 369]. Efficient and productive operations induce growth of the market share of companies, as well as their better rank in the global flows. Finally, the growth of competitiveness and the creation of competitive advantage on that basis keep creating value in the long term.

Bearing in mind the abovementioned, the circular economy is becoming a prerequisite for a long-term sustainable growth of both companies as well as developed

and developing economies. The aforementioned concept is a strategy and sustainable policy for the future, because it facilitates the transition from the so-called conventional linear production model to industrial ecology. In other words, the implementation of the idea of circular economy in modern economic systems provides compatibility of economic and environmental objectives. Economic goals are usually expressed in the form of growth in profitability, growth in market share and the level of value created. Environmental objectives refer to the environmental protection.

On the other hand, new trends and impulses from the global environment accentuate and encourage businesses to use renewable energy sources. Individual business on the basis of alternative sources or pooling of complementary businesses in the form of clusters improves business efficiency and other goals, and represents a direct implementation of the goals of circular economy. In other words, it respects all the principles and postulates of the environment. Accordingly, circular economy, the use of renewable energy sources and the association of companies in the form of clusters are unbreakable links that create the perfect ambience for improving competitiveness and sustainable growth of enterprises and the national economy. In essence, the circular economy and the use of renewable energy sources are parts of the diamond of national competitiveness, which are essential for the development of green clusters as well as the improvement of competitiveness in this respect. Also, some authors are emphasizing the very important interrelationship between regional innovation systems and green clusters, in the sense that these systems are facilitating the emergence of green clusters [1]. On the other hand, the aforementioned relationship creates synergy effects which exceed the challenges of climate change and other environmental issues. The special focus of this paper will be precisely on the mentioned bonds, with an emphasis on the role of green clusters in economies worldwide, their micro and macroeconomic effects, which are highly connected, and it would be unnecessary to consider them separately. Accordingly, the circular economy imposes functioning of the economy and companies in accordance with its principles as the new business imperative, it represents an

essential condition for success in global competition and it is also a prerequisite for sustainable long-term growth.

Renewable sources of energy

The new "green" concepts of business are dependent on numerous international treaties, directives and conventions such as the Kyoto Protocol, which was held under the auspices of the United Nations in 1997 [12, p. 424] and the Paris Protocol, which is the result of the conference dedicated to climate change COP 21 in November 2015. These tendencies opted for the world's leading economies to reorient and indicate the use of renewables, and therefore reduce the use of non-renewable energy sources, mainly fossil fuels.

The very name of renewable or alternative energy sources comes from the fact that the rate of utilization of resources does not exceed the rate at which it is produced. There are several types of alternative energy sources, among which:

- hydro energy
- biomass
- solar energy
- wind energy
- energy of high and low tides
- geothermal energy
- biofuels

The use of renewable energy has many advantages. The companies that use them emit less harmful gases (including CO_2), which are considered to be the main cause of ecological problems such as the greenhouse effect and climate changes. Accordingly, there is also a multiplier effect as the increase in utilization of alternative forms of energy stimulates the production of equipment for their use, which further stimulates innovative activity in this area. Furthermore, these sources of energy lead to the decentralization of the energy sector, job creation and entrepreneurship development. The main limitation of renewables is that they do not have the potential to create energy as non-renewable sources, viewed from the aspect of production. Consequently, it would be best to achieve a balanced use of renewable and non-renewable energy sources.

Companies operating within the European Union have incorporated into their strategies the famous principle of "20-20", which means that they will increase the use of renewable energy sources to 20% by 2020, reducing thereby the greenhouse gas emissions by 20% [6]. In 2014, a cumulate, which constitutes 9.1% of total world energy, was obtained from the renewable energy sources, a fact which also represented an increase compared to the year 2013 (8.5%) [10].

Globally, notably increased investment in renewables, with special emphasis on solar and wind energy, was achieved both in developed economies and developing countries. It is very interesting that the amount of investments[1] was approximately the same in 2014 as presented in Figure 2. Also, it is noticeable that developed countries reached the peak of investment in renewable energy sources in 2011 and then made a slight stagnation, while developing economies had a slight and gradual growth of investments over a six-year period (2009-2014).

This statement is significant from the point that many developing economies take advantage of the period of global economic crisis as an opportunity for economic growth, better positioning on the world market and increase in competitiveness in this respect.

According to the data from UNEP (United Nations Environment Programme) for 2014, a table (Table 1) has

been made to show the ranking of world economies based on the investments in renewable energy. The value of investment is expressed in billions of dollars.

Table 1: Total investment in renewables in 2014 worldwide

The economies with the largest amount of investment in renewables	Investment value ($BN)
China	83.3
USA	38.3
Japan	35.7
Brazil	7.6
India	7.4
Germany, Netherlands, Italy	7

Source: Authors' illustration

On the other hand, although Serbia ratified the Kyoto Protocol in September 2007 [17, p. 142], and is a signatory of the Paris COP 21, companies use renewable energy sources in a very small percentage. In our economy, the greatest potential and prospects possess biomass with 63%, then solar energy with 17%, the energy of small rivers with 10%, followed by the wind and geothermal energy with 5% [8].

In the period from 2006 to 2015, it was projected that the share of renewable energy in total final consumption would amount to only 2% [9]. The reasons for this practice are often linked to the incentive policy for using these energy sources.[2] The Energy Development Strategy until

Figure 2: Global new investment in renewable energy: Developed vs. developing countries, 2009-2014 ($BN)
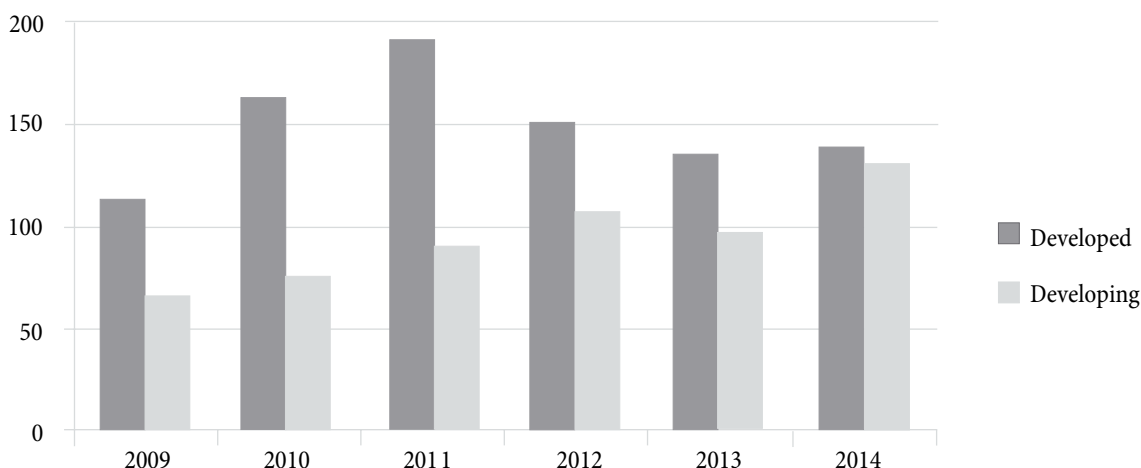
Source: according to [10]

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1   Developed economies have invested 138.9 billion dollars, while developing countries have invested about 131.3 billion dollars. However, higher growth compared to the previous year was achieved in developing economies.

2   Most European countries apply the system of preferential tariffs, known as *feed-in* tariffs, i.e. the system of minimal purchase price. A good *feed-in* system contributes to the improvement of the competitiveness and liberalization of the energy sector.

2025 with Projections to 2030 [21] and the National Sustainable Development Strategy of the Republic of Serbia [15] predict a much more incentive policy for use of alternative energy sources.

Examples of green clusters: Italy, Netherlands and Serbia

New trends and impulses of the business ambience stimulate the association of companies in the form of clusters. Clusters stimulate innovation and productivity of enterprises that ultimately lead to the increased competitiveness. On the other hand, cooperation between different companies within a cluster makes it possible to compensate for weaknesses and mitigate threats in the business environment, as well as to respond quickly to challenges which ultimately contribute to synergy effects. Clusters contribute to the diffusion of new knowledge, ideas and skills that are the main driver of innovation processes [2]. Keeping this fact in mind, clusters can be drivers of technological innovations that are absolutely necessary for the transition from the linear economic system to the model of industrial ecology, based on the principles of circular economy.

Also, cooperation between enterprises increases critical mass of economic subjects in an economy, which continues to encourage the development of entrepreneurship and provides the necessary support for the development of small and medium-sized enterprises. For an economy, collaboration between different clusters within the economy and the region, i.e. cooperation between domestic and foreign clusters, is of special importance. Finally, clusters are extremely important for the creation and promotion of micro and macro competitive advantage in the long run. The most visible results of the clusters are middle-income and developed economies. Environmental changes reshaped the dynamics in business environment through the constitution of green clusters of innovations and entrepreneurs [11]. The focus of our further analysis will be "green" industry clusters in Italy, the Netherlands and Serbia. The basic purpose of the comparison is to identify future directions for the development of green clusters as one of the potential holders of long-term sustainable growth and energy efficiency in the economy of Serbia.

Case of Italy

The European Union has implemented a variety of principles and directives aimed at preserving the importance of the environment, which induced the development of clusters in this area. One of them is the cluster DIPAR (*Distretto Produttivo dell'Ambiente e del Riutilizzo* – Productive Cluster of Environment and the Reuse) located in the Italian region of Puglia [5]. This green cluster is a collaboration of about 164 companies, 6 universities (University of Salento and Bari) and several public bodies and development agencies. Activities of DIPAR are focused on environmental protection and on emphasizing the importance of the recycling process in the form of reuse of certain resources as a function of sustainable development and energy efficiency. Also, in addition to the local regional operations, the cluster seeks to internationalize activities in the Balkans (Croatia, Serbia and Bosnia and Herzegovina), Middle East, China and Africa.

The internationalization activity is very significant for several reasons. Primarily, it is important because of transfer of technology and expertise, then, because of the possible cooperation with foreign partners and joint appearance on the market. Secondly, it encourages innovative cluster solutions related to the problems of waste, landfills and excessive concentration of pollution in the sense that certain types of waste can be used in the next iteration as the input or missing resource. For example, huge amounts of ash that occur as a side effect of the power plants' activities can be further utilized in the construction of road infrastructure. In this way, the environmental costs are being resolved and reduced, and the potential of industry and other economic sectors, resulting in a larger gross domestic product as well as in reduction of unemployment, are being expanded. This is a good example of how the idea of circular economy is functioning in developed economies.

The diffusion of new ideas and knowledge enables the companies in the cluster to become more productive, more innovative and competitive. Protecting the environment is still a current topic that has great potential of improving the micro and macro-competitiveness. As stated above, significant support for DIPAR cluster is provided by

the local regional government, which is in accordance with the Kyoto Protocol and the principle of "20-20" [6]. Accordingly, the cluster encourages the use of renewables with emphasis on solar energy, hydro potential and biomass. Every year in Bari, international symposia and business forums are held, as last year's Alterenergy, with the aim of informing, educating and promoting new ideas as drivers of innovation, clean technologies and the expansion of the boundaries of clusters in the form of new companies as partners. The aforementioned cluster announced the cooperation with certain municipalities in Serbia such as Lazarevac, Ub, Obrenovac, Lajkovac, Novi Sad, which will contribute to the improvement of the poor environmental image, as well as to the energy-efficient operation of domestic companies.

In the Italian economy, technological SPRING (Sustainable Processes and Resources for Innovation and National Growth) cluster is also very important [4]. This cluster brings together large industrial companies, small and medium enterprises in the sector of the chemical industry, as well as development agencies from eight Italian regions: Basilicata, Piedmont, Veneto, Umbria, Sardinia, Puglia, Lombardy and Emilia Romagna, which further confirms the importance of this cluster for the Italian economy. Multiple connections and collaboration between companies within the cluster produced synergy effects in the form of better positioning of the company in the market, and increase of production and productivity, which ultimately contributed to SPRING becoming a technological cluster with significant performance.

National Technological cluster has great support of the Italian Ministry of Education, Universities and Research, as well as universities from these regions that provide support in the form of subsidies for research and innovation processes and the diffusion of new knowledge. The main objectives of SPRING are generally to increase energy efficiency, to make greater use of renewables as raw materials, with emphasis on biomass, as well as to develop products that will fully be made of alternative sources in order to create greater value for consumers. Cooperation between companies along the value chain contributes to improving the competitiveness and sustainable growth of the region and the whole economy. Business strategy and cluster goals are in accordance with the Horizon 2020 (program of the European Union for research and innovation in the period 2014-2020).

Case of the Netherlands

One of the most important examples of successful green clusters in the global economy is the cluster Royal FloraHolland. Netherlands is the leader with a dominant market share in the production of flowers. In support of this argument goes the fact that the participation of the Netherlands in the world export of flowers is around 52%, while a distant second place is occupied by Columbia (11%), followed by Kenya and Ecuador [19]. The total value of the world trade flowers in 2009 amounted to about $30 billion with projected growth trend of 1% per year and 170 million consumers, which further confirms the size of this market. In 2015, total value of Royal Flora cluster export was €5,557 million with annual growth rate of 3.4%. So far, the Netherlands remains the largest player with a 52% in global exports of flowers and plants.

Pioneer producers of flowers have appeared in the 17th century in the Netherlands, but twenty years ago collaboration and networking among companies started and formed Flora cluster. The cluster consists of manufacturers, suppliers, logistics channels and universities from the surroundings of Amsterdam, Rotterdam and The Hague.

An interesting point in the analysis of clusters represents the fact that the Netherlands has become the leader despite the lack of basic resources (land and adequate climate) necessary for the production of flowers. Although it sounds paradoxical, this economy managed to turn the lack of comparative advantage, essential for the production of flowers, into a sustainable competitive advantage. The ongoing implementation of innovative processes within the entire value chain, as well as the use of specialized technology, annulled the potential threats and weaknesses and enabled greater productivity and competitiveness. Also, cooperation with institutions such as the Dutch Flower Council and the Association of Dutch Flower Growers contributed to improving the performance of clusters through continual research and application of new solutions. Logistics infrastructure and channels

contributed to strengthening the competitiveness of this cluster globally, by lowering transportation costs. Seen from the point of Porter's diamond of competitiveness, mentioned factors are important determinants of the success of an economy. This is of crucial importance, bearing in mind the position of the Netherlands in world exports.

For the past ten years, Flora cluster has been using renewable energy sources in its production, mainly biomass and wind energy, and it has been implementing new technological solutions aimed at reduction of the use of fossil fuels and CO2 emissions, which will also reduce the overall energy demand by 65% until 2020 [3]. In support of this conclusion goes the fact that in the last five years the Netherlands had the highest amount of investment in renewable energy in comparison with all the European economies. Also, mentioned innovation was related to the way in which flowers are grown[3], which further reduced environmental costs of companies in the cluster and of economy as well.

Lower costs, better product quality, higher productivity and more efficient production technologies made excellent results in the world market. In the Netherlands, very strong cooperation between different clusters as well as intersectoral cooperation further contribute to the synergy effects and diffusion of new knowledge. Respect of the EU environmental legislation and strict national standards influenced the creation of new sources of competitiveness of the Dutch economy. Green innovation and improvement of the environment along the existing productive and efficient manufacturing have enabled the achievement of sustainable competitive advantages of the domestic economy.

About 90% of the total cluster production of flowers is exported to Germany, France, Denmark, Finland, Hungary and Slovenia. Also, the cluster sells its products to the markets of the Middle East, South America, East Africa, India and Russia. In this way, it gives full contribution to the growth of export of the Netherlands and GDP growth.

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3 Instead of a conventional cultivation of flowers in the country, due to the use of herbicides and pesticides which affected the degradation of soil, flowers are now grown in water and on special wool, which is lowering manipulative costs.

Case of Serbia

Clusters and cluster policy are in the early stages of development in the Republic of Serbia. Most of the clusters were established in 2005 and are now in the early stages of development. In 2005, the Government of the Republic of Serbia with the Ministry of Economy and Regional Development launched an initiative to encourage the process of association of small and medium-sized enterprises in the form of clusters in order to improve the business and national competitiveness and strengthen entrepreneurship.

Following the example of developed economies in the world (USA, Germany, Italy, etc.), the Government of the Republic of Serbia has adopted a program to support the development of clusters, and appointed the Ministry of Economy and Regional Development as a main entity to conduct the cluster policy. The realization of that program began in 2007 with the financial support of the Government of the Kingdom of Norway. In the meantime, the Council for Clusters and Cluster House were established, which, through mapping and informing of clusters, represent their interests and promote them in the best way [16]. Also, National Agency for Regional Development supports networking and enterprise collaboration in the form of clusters.

The Cluster Council is a consultative structure body of the Serbian Chamber of Commerce and a unique advisory body for the development of clusters. The Council was established in 2011 and has two main objectives [13]:

1. The promotion of clusters aimed at enhancing entrepreneurship and general business environment.
2. Initiation of the establishment of new clusters and contribution to the development of individual clusters.

Members of the Council are representatives of cluster organizations in Serbia. Besides the Council, the Cluster House was established in 2011 as well, with technical and financial support from the Danish Programme for Local Economic Development – LEDIB. The Cluster House established the innovative training centre for cluster development based in Niš in 2012, in order to further encourage and support the development of clusters. It has also developed a unique magazine for clusters in Serbia, Infocluster, and set up the annual Balkan Conference

"Cluster days" in Niš. All these data indicate the fact that the clusters in Serbia are seen as one of the pillars of the future development of domestic economy. All of these activities in the field of clusters are in accordance with the Strategy for Competitive and Innovative SMEs 2008-2013, as well with the actual Strategy for Support and Development of Small and Medium Enterprises, Entrepreneurship and Competitiveness for the period 2015-2020.

In Serbia, there are currently 40 clusters; few of them are national, while others are regional. If we focus on the link between clusters and economy sectors, tourism is leading with 6 clusters followed by construction with 5 clusters. Besides them, there are also clusters in textile, agriculture and food production sector. In addition, there are information technology clusters, service cluster, scientific cluster and three ecological (green) clusters which are dedicated to recycling and energy efficiency: Green Building Cluster (in Serbian *Klaster zelene gradnje*), Recycling Cluster South (in Serbian *Klaster Reciklaža Jug*) and cluster Ecopanonia. [14]. The first two clusters are in the region of Southern Serbia, while the third one is based in Vojvodina.

The common features of all three green clusters are the same goals and ecological achievement, such as the growth of energy efficiency, greater usage of renewables, implementation of the European standards, improvement of the "green" performance of companies, as well as continual education and information and spreading of awareness about the importance of environmental protection through various projects, fairs and workshops. Also, clusters tend to engage many universities, development institutions and interested investors in their work. The aforementioned clusters are in the initial stages of development and they currently do not have concrete results in terms of production, exports, reduction of unemployment rate or activities in foreign markets. Nevertheless, green clusters have great potential and prospects that can be achieved with the necessary financial support from the government and foreign funding, and also with the expansion of relationships within clusters, as well as between domestic and foreign clusters.

Green Building Cluster promotes the idea of construction, general planning and design that is energy efficient. It was founded in 2011 in Niš. In addition to construction companies, members of this cluster are three faculties: Civil Engineering and Architecture, Mechanical Engineering and the Faculty of Economics in Niš, Department of City Planning, Engineering Chamber, Chamber of Commerce of Niš, as well as local municipality. The main objective of this cluster is to encourage the construction of the so-called "smart" buildings and other facilities. Consequently, Green Building Cluster aims at increasing the participation of recycled waste in the production of building materials, which is also one of the basic ideas of circular economy. The second objective is related to the greater use of renewable energy sources. In the future, the cluster will seek to expand cooperation with the investors, manufacturers and suppliers of construction materials in order to increase the value added within the value chain and to improve the performance of the cluster. As mentioned above, it is necessary to cooperate with other complementary clusters in order to increase the competitiveness of the domestic economy.

Recycling Cluster South was founded in 2010 by private companies from South-East Serbia. Like the previous cluster, it also includes universities and the regional Chamber of Commerce. The mission of the cluster is to achieve the objectives and to strengthen regional cooperation in the field of environmental protection and sustainable development by integrating the activities of business entities that deal with waste management and recycling. Unlike the previous cluster, which is focused on improving energy efficiency through a "smart" construction, Recycling cluster "South" emphasizes the importance of recycling for one economy. Accordingly, Recycling Cluster South promotes the aforementioned idea of 3R (Reduce-Reuse-Recycle). The specific objectives of the cluster are related to waste management: reduction of the amount, flow control and maximum utilization of the same value as the new inputs in order to achieve more favourable impact on the environment. Recycling Cluster South promotes entrepreneurial spirit and encourages the networking of small enterprises in the cluster. Apart from that, the expansion of a network of recycling centres and landfills has also been announced, in order to minimize the high environmental costs caused by waste.

Cluster Ecopanonia was founded in 2011 in Novi Sad. As in the case of the aforementioned clusters, Ecopanonia aims to protect the environment, to make the optimal use of renewables, to strengthen the intra-regional and inter-regional economic competitiveness and to improve the quality of life. Apart from the educational, informational and research roles, the cluster seeks to enhance innovation centres as well as to improve the production of solar panels, biomass, pellets, briquettes and production of electrical and thermal energy on that basis. Members of the Cluster are 36 local and foreign companies, universities and institutions. Ecopanonia is the first green cluster in Serbia that included three companies from Hungary engaged in the manufacture of products from alternative energy sources (biomass, biogas, geothermal) – Mvm Wrapped, EMB, EU Fire. Cooperation with Hungarian companies is a good example of collaboration of companies in the region, which is very important in terms of knowledge and experience that come from an economy that has successfully completed the transition process and is also a member of the European Union. In addition to these three companies, the cluster includes companies such as Koning, Record Erdeš, Alma Mons, and the Faculty of Engineering and Environmental Engineering as REECO – organizer of conferences and exhibitions on environmental protection.

Conclusion

The main goal and focus of this paper was to outline a new way for the improvement of the national competitiveness and the competitiveness of local companies through the establishment and development of green clusters. Besides the fact that clusters give the best results in terms of improving competitiveness in the middle-income and developed economies, some foreign solutions and experiences could be applied in the domestic economy. The consequences would be more than desirable: energy efficient operations could reduce operating costs. On the other hand, clusters as holders of innovation processes, can create a presumption of production that is more competitive and productive; such products would have the prospect of a successful placement on the demanding European market, which would contribute to the increase

of exports and reduction of the current account deficit. Export growth induces growth of gross domestic product and living standards as the main indicators of economic growth and activity of an economy.

Although the European Commission projected growth of the domestic economy round 2% for the year 2016, this rate is still below 4% – below the rate that ensures sustainable economic growth [7]. This fact should not be discouraging, as it suggests two things: first, that the domestic economy emerges from recession, and that there are signs of economic recovery; second, that there is a place for improvement of company and economy performance that can be achieved in different ways and, most importantly, that it is not unattainable. Therefore, cluster policy, in combination with environmental policy, should be an integral and important part of the economic policy of one country. The implementation of the same should encourage cooperation between local companies, as well as partnerships with foreign clusters.

Clusters, and especially green clusters, are organic, i.e. natural way to enhance growth. Cluster development affects other sectors in a synergic manner because, e. g. they encourage the development of civil engineering, traffic infrastructure, as well as tourism. In addition, a positive impact on the development of entrepreneurship and small business development of the analyzed sector is more than obvious.

Green clusters are bringing together often divergent economic and environmental objectives of each economy. As such, they are operating in accordance with the principles of circular economy through the use of renewable energy and recycled materials while improving competitiveness, innovation and productivity of enterprises and economies. Circular economy and the use of alternative sources of energy are inseparable links and significant determinants of the Porter's diamond of competitiveness. This process is not unidirectional. Precisely green clusters can be one of the pillars of technological innovations that are necessary to replace the linear economy with circular economy. On the other hand, the diffusion of new knowledge and skills within the cluster opens up opportunities for differentiating products and services, as well as the emergence of entirely new products, which further supports the fact that green clusters have

great potential to create long-term competitive advantages. In accordance with the abovementioned, we can conclude that green clusters provide a good basis for the development of knowledge-based economy that is growing sustainably.

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HOW ORGANIZATIONAL DESIGN AND ERP IMPLEMENTATION HAVE BECOME INVESTMENT IN COMPETITIVENESS: THE CASE OF "SINTELON"*

Kako su dizajniranje organizacije i implementacija ERP softvera postali investicija u konkurentnost – slučaj „Sintelon"

Abstract

At the end of 2002, Sintelon entered in strategic partnership with Tarkett, as a privatized, well-organized and restructured company with implemented ERP software as well as with the potential for investment and growth in the broad area of Europe and Asia. The direction of restructuring of Sintelon was defined and elaborated primarily in three documents – studies: Revision assessment of the proposed new organization of Sintelon, The functioning of Sintelon after restructuring and Sintelon strategic planning methodology. The new organizational solution implied formation of divisions based on criteria of business areas (business lines) while maintaining strategic support functions at the company level. The improvements in the information system made possible for hundreds of people within the company to have better understanding of the links between financial and non-financial elements of the business, to develop more precise and detailed plans and to better understand the overall business process.

Keywords: *restructuring, organizational design, information system, privatization*

Sažetak

U strateško partnerstvo sa Tarket-om Sintelon je, krajem 2002. godine, ušao kao privatizovana, odlično organizovana i restrukturirana kompanija sa implementiranim EPR softverom kao i sa potencijalom za investiranje i rast na širokom prostoru Evrope i Azije. Pravac restrukturiranja Sintelona definisan je i razrađen, pre svega, u tri dokumenta – studije: „Reviziona ocena predloga nove organizacije Sintelona, Funkcionisanje Sintelona posle restrukturiranja i Sintelon metodologija strategijskog planiranja. Novo organizaciono rešenje podrazumevalo je formiranje divizija na bazi kriterijuma poslovnog područja (biznis linije) uz zadržavanje strategijskih funkcija za podršku na nivou preduzeća. Unapređenja u informacionom sistemu omogućila su da na mnogo mesta u kompaniji stotine ljudi bolje sagleda veze između finansijskih i nefinansijskih elemenata poslovanja, preciznije i detaljnije planira i bolje razume ukupan proces poslovanja.

Ključne reči: *restrukturiranje, dizajniranje organizacije, informacioni sistem, privatizacija*

Introduction

Today everyone knows that the former company Sintelon from Bačka Palanka successfully operates as Tarkett Eastern Europe, not only according to the national standards but according to the international ones as well. Also, many would cite Sintelon as an example of successful privatization, although it would be more accurate to say that it is a case of successful restructuring. At the annual SAP conference in Belgrade, which was held on October 11, 2011, Nikola Pavičić, Sintelon's CEO and key person since the 1970s, named three big events – privatization, introduction of SAP and strategic partnership with Tarkett in response to a question as to how he would explain the success of Sintelon. On that occasion he said that in 1997 Sintelon hired professor Dragan Đuričin to develop the company's restructuring plan with a view to turning it into a successful and competitive entity, comparable with the best companies in the world.[1] This paper is about a success story in the area of privatization and other forms of restructuring, particularly the organizational design. Joining efforts with Dragan Đuričin on that assignment, we formed the basis of very productive work on transformation of Sintelon in the period 1997-2002.

At the end of 2002, Sintelon entered in partnership with Tarkett, as a privatized, well-organized and restructured company. At that time, the bigger part of the SAP information system had already been installed and started to function. Since 2003, many business successes have been achieved, but their basis was set earlier. Many local companies have entered into strategic partnerships with the world's leading companies, but they have not achieved similar results, because those were acquisitions and integrations of local companies into larger multinational organizational units. The strategic partnership with Tarkett is a big event in Sintelon's history, however, it is important to emphasize that Sintelon was extremely prepared for future market success. There is no doubt that some form of strategic partnership between Sintelon and a multinational company in the field of floor coverings would have been realized, even if the restructuring had not been undertaken in the period

1997-2002. But, without the restructuring, the effects on shareholders (employees and former employees) of Sintelon would have been different and probably significantly reduced. Undeniably, we could say that great successes in the period of strategic partnership with Tarkett will not be diminished by emphasizing the significance of the previous period in which Sintelon prepared the groundwork for it.

The introduction of SAP in Sintelon is a big achievement, but it can be said that it was a necessary, and even coercive move during negotiations with potential strategic partner. Information system based on SAP solutions, which replaced the previous information system introduced in the 1980s, was needed to allow quick and efficient integration of operations with the selected strategic partner. Almost all the major world's players in the business of floor coverings were using SAP, and that was a logical solution for Sintelon. It was not realistic to expect that Tarkett or other companies would begin to use IT solutions developed in Sintelon. The introduction of SAP was an expensive and a complex job that had to be done, but it should be said that this is not about activities that create value, but infrastructure that provides information to decision-makers at different levels. This should be emphasized, because Sintelon is not the only, although it was the first domestic company to introduce SAP. Regarding the use of SAP, Sintelon is no different in relation to dozens of local companies which, for various reasons, have not been so successful.

The third factor mentioned by Sintelon's CEO was privatization. As with the first two, Sintelon had been addressing the issue of privatization for many years. What was supposed to be a one-time act in an environment in which the issue of transformation of the social capital into a private one was being decided by acclamation, turned into a ten-year process with an uncertain outcome. It is undisputed that it was necessary to start and finish the privatization due to inability of socially-owned enterprises to successfully operate in conditions of open market economy, but the whole process was primarily a process of social wealth redistribution [10, p. 70]. In addition, some potential problems that were identified in 1994, such as the lack of investors, obstruction of state bureaucracy, the question of gradualism/radicalism in the implementation, are still the same as the actual questions

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1   http://www.livetv.rs/Video/8187/SAP-World-Tour-2011-Deset-godina-od-kada-je-prva.shtml

in terms of which privatization model should be applied to the remaining non-privatized businesses and which model of capitalism should be chosen [4, p. 225]. Different laws and by-laws were brought in altering the existing laws and by-laws, numerous steps and phases of privatization enforced, there was mistrust, conflicts and litigations in the triangle between the state, workers and managers of the companies. Similarly, like in case of SAP, Sintelon did nothing specific in the area of privatization that has not been done in other several hundred cases. It was a time-consuming, complex, uncertain and painful process, and it needed to be done, but it did not create value.

Tools and methods

The direction of Sintelon's restructuring was defined and elaborated primarily in three documents. The first document, Revision assessment of the proposed new organization of Sintelon, was presented to the managers of the company in June 1997, the second, Functioning of Sintelon after restructuring, in June 1998, and the third, Sintelon strategic planning methodology, in July 1999. For the purpose of application of certain relevant aspects of restructuring, the advisors for specific areas were hired and they formulated solutions for key issues, wrote instructions, assisted in the implementation of the proposed solutions, solved problems and dealt with the harmonization and cooperation of teams responsible for certain aspects of the restructuring (e.g. teams for measuring the rate of return, information system, compensation system, etc.). As for the important aspects of the restructuring which required finding of quality and innovative solutions, the following should be singled out:

1. solution of organizational design and concept of functioning of the company
2. business plan methodology and methodology for profitability measurement based on value-added criteria
3. methodology for financial evaluation of investments and strategic plans
4. compensation scheme for managers
5. human capital development
6. information system

New organizational design of Sintelon

The company management had an idea about the new organizational design and engaged external consultants to test its feasibility, which led to a consistent proposal for a new organizational design. Consultants reviewed a number of documents, including the Initial ideas for a new organization, the Rule book on internal organization of jobs, the Statute of the joint stock company, the Rule book on quality control, Preliminary study for development of the information system, financial statements for the period 1990-96, and have gathered the necessary information by means of questionnaires filled out by the Department for planning and analysis, and through direct interviews with managers of all organizational units.

The assessment of proposals for the new organization of Sintelon contained the following parts:
1. basic information about the company
2. assessment of financial health
3. possible models of organization, including organizational charts
4. assessment of the current organization, based on insight into the legal form, size, and degree of diversification, technology, environment, strategy and management style
5. the main principles of renovation of the existing organizational model – system of operational planning decentralization, industrialization of supporting activities and virtual integration
6. proposal of new macro-organization (text and graphics), in which they identified the main strategic business units (SBU) and strategic functional units (SFU)
7. proposal of micro-organization for all organizational units
8. hierarchy and span of control
9. business relations inside the company

Before restructuring Sintelon was organized as functional hierarchy, and the most important result of the study [5, p. 29] was the proposal of a new macro-organization. Based on the analysis of the legal form, size, and degree of diversification, technology, environment, strategy, management style and lack of transfer pricing

problems, the consultants came to the conclusion that the proposed solution should include the strategic business units and strategic functional units. In order to ensure a sustainable solution, it was necessary to form a division based on the criteria of business areas (business lines) while maintaining strategic supporting functions at the company level. Figures 1 and 2 contain the organizational scheme before restructuring and the proposal of a new macro-organizational scheme identifying SBU and SFU, respectively.

In the document, the macro-organizational schemes are followed by micro-organization proposal relating to the functioning of certain SFUs and SBUs. At the end of the document [5, p. 44], the powers of the corporate governance bodies such as Management Board and Executive Board are described, together with the proposed ways of functioning in internal market. This rounded the description of the proposed economic organism in which the organizational structure, the management and the business model represent the anatomy, nervous system and physiology of the system respectively [5, p. 48].

Business planning

Restructuring of Sintelon on the basis of the newly proposed organizational design started without delay,

and the consultants prepared a document The functioning of Sintelon after restructuring [6] for the managers at all levels of governance (for better understanding of the entire process), in which they elaborated the earlier decision and gave the relevant descriptions. The study contained the following chapters:

- impact of organizational transformation in the management process
- role of planning (the fundamental importance of planning, additional factors affecting the importance of planning, levels of planning)
- role of control
- formulation of objectives (and planned tasks)
- harmonization of goals
  - the relationship between cash flow and growth rates at company level
  - the relationship between capacity and market potentials
  - the relationship between cash flow and growth at the level of SBU
  - the relationship between cash flow and growth at the level of products
- miscellaneous
  - concept of governance
  - financial statements
  - key performance indikators

Figure 1: Macro-organization chart of Sintelon before restructuring
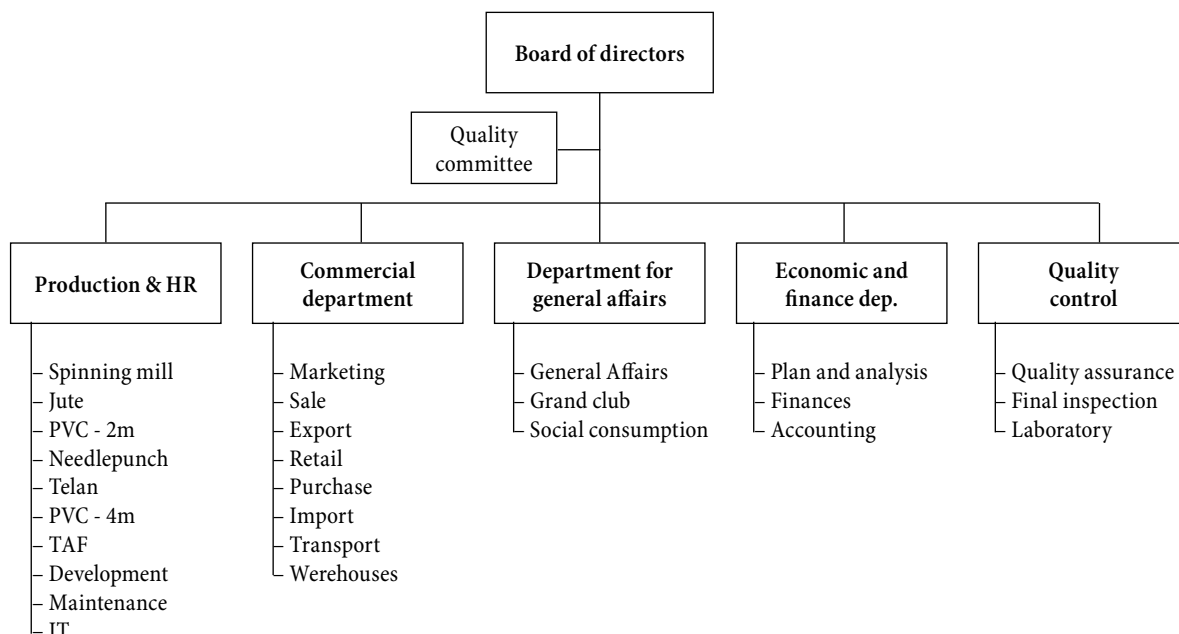
In short, thoughtful manner of functioning of Sintelon can be described as follows [6, p. 8]. Firstly, business lines are strategic, operational and accounting units, and top management of the company is engaged in development of business, finance, infrastructure works (IT, quality control, accounting, legal affairs, human resources) and external communication. Secondly, SBUs are the smallest organizational parts of the company which are meaningful for strategy formulation. Characteristics of SBUs are: autonomy in supply and sales, technological completeness, ability of allocation of administrative costs and responsibility for financial results. The financial result of SBU is free cash flow available for investment at a company level. SBUs apply for funds through investment projects. The mechanism of decision-making for allocation of funds is such that the proposals are created "top-down", while the decisions are made "bottom-up" through hierarchical structures. Thirdly, in everyday business activities, SBUs have a high degree of autonomy. Independence is reflected in the field of procurement and sales, production and planning. Being an investment center in the accounting/reporting terms, SBUs have the greatest degree of independence, although they do not have the character of a legal entity. At the SBU level, the accounting department is producing the statutory financial reports (balance sheet, income statement and cash flow statement). Fourthly, management of the business units is performed via control of the planned rate of return on assets employed. There was also the possibility of monitoring the contribution of the free cash flow, and the increment of their own capital and economic value added.

In fact, an essential part of the concept of functioning of complex and decentralized companies, such as Sintelon, is the planning system which consists of two components – business planning (for fiscal year, quarterly, and monthly) and strategic planning for the three-year period [6, p. 9].

Figure 2: Proposal of a new macro-organizational scheme
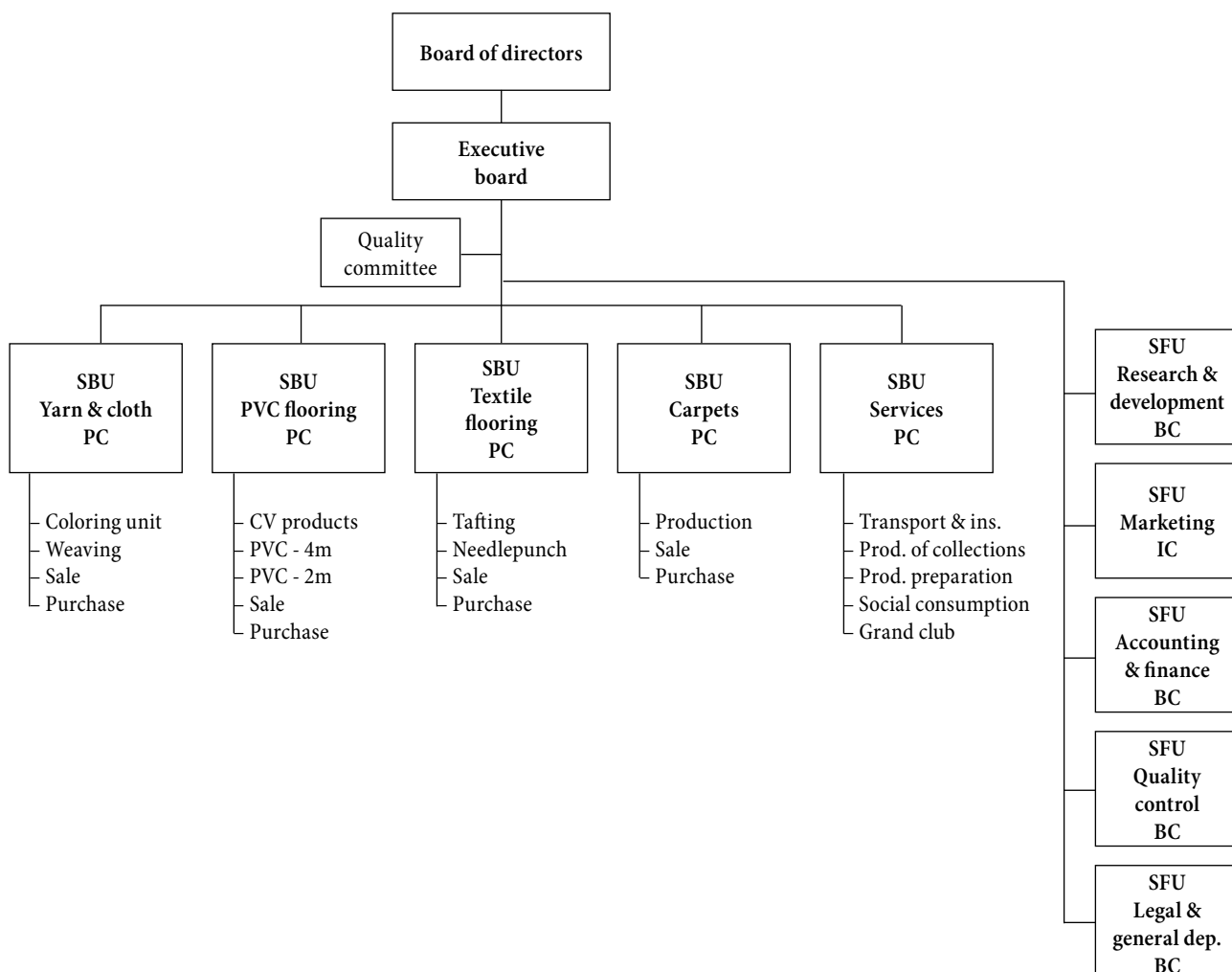
Strategic planning

The Document on strategic planning methodology was presented in July 1999 as a further elaboration of the matter from the two previous documents and did not treat just strategic planning. At that time, the application of some aspects of a very complex restructuring involving, for example, business plans, had already been advanced. The document processed the following materials [7]:

- organization and functioning of Sintelon
- strategic planning
- value in the concept of strategic planning
- the value imperative
- performance measurement system
- financial determinants of value
- strategic determinants of value
- organizational determinants of value
- selection of investment projects
- maximization of value

One of the goals of the document was the demystification of strategic planning model, which is based on the concept of value-based management [8]. The document was supposed to enable Sintelon managers to master the details of the concept in order to apply it, and actually, it contained detailed instructions as to what the managers of individual SFUs and SBUs should do. Next to the names of SFU and SBU, there stands the adjective 'strategic', and each one of them should formulate and implement their own strategy. Today, much more is known about the strategic management than in 1999, and the document contained "up-to-date" knowledge available at that time. Basically, it was about value-based management.

Financial aspects of restructuring and the information system

A significant part of the document on strategic planning is related to the financial aspects of the business. In order to implement value-based management in Sintelon, it was necessary to design, develop and implement procedures related to business plans and profitability measurement for business units and the whole company, as well as procedures related to the analysis and selection of potential

investment decisions and financial projections of strategic plans.[2] By the end of 1999, Sintelon had completed a business plan for about 25 parts and the whole company in accordance with unique business plan methodology. The whole process was integrated into the Sintelon's information system, making it possible, based on new information and analysis, to innovate monthly business plans for the next three months.

Like any other company management system, this one is also based on the use of feedback, and linking the output information from the system to the input information. One of the examples for the use of feedback that university teachers often resort to is to ask the students to stretch their hand, and then hit their nose. When they do this, students often do not understand what is going on, but when they are asked to close their eyes and do the same thing, then they realize that the finger misses the target. The secret is to make it possible to open the eyes during the movement of the finger to determine its position, as the new information affects its movement toward the target. If the eyes are closed, then there is no guidance. This analogy can be used to describe a situation in which at the end of each month managers analyze the achievement of the business plan and then update the plan for the next three months, as opposed to a situation in which there is only an annual business plan whose realization is analyzed at the end of the fiscal year.

By the spring of 2000, Sintelon had a fully functional system for measuring the rate of return which, in a very unstable environment, made it possible for each SFU and SBU to determine the profitability achieved in the previous month and from the beginning of the year, and how much capital each organizational unit engaged. For the process of analysis and selection of investment projects, Sintelon adopted a solution that is based on the well-known theory and practice of evaluation of projects, and that solution was fully compatible with the previously adopted business

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2   In the domain of the business plan methodology, for measuring the rates of return and financial assessment of investments projects and strategic plans, Sintelon adopted and implemented original solutions. These solutions have been described in several articles [9], [11], [12], [13], [14,] and most concise and complete overview is given in the book "Financial projections and business management" (available at: www.nebojsamrdja.com) [17].

plan methodology. This solution was used in 2000 and 2001 in the evaluation of dozens of investment decisions and the financial projections of strategic plans for the parts and the whole company.

At the end of the '90s, Sintelon used information system that was basically set back in the '80s. This system was maintained and renewed and it was fully able to meet the information requirements of the company's management which, during the restructuring project, increased exponentially. IT sector of the company enabled decentralized considering, at dozens of points, of all financial and non-financial aspects of the business in order to make detailed business plans by month for each organizational unit; and then, only few days following the end of the month, data about achievements can be considered and compared with the planned ones. At many places in the company, hundreds of people were in a position, through the process of business planning, to examine the links between financial and non-financial elements of the business and compare them, in short time, with the realization of the plan. This has led to a better understanding of the process operations and more accurate and detailed planning.

The information system allowed holding of a quarterly conference by the 15th of the current month, where all SFU and SBU managers would present to the Executive Board the achievements from the previous quarter and from the beginning of the year, and for that occasion, all necessary information about all planned and achieved results were provided in electronic form. The following image, which was part of an internal conference held in Sintelon in mid-

November 2001, could be used for illustration purposes. It shows almost unbelievable coincidence of the planned and realized income during the first ten months of 2001, and all that with an increase in revenues of about 60% compared to the previous year, which was mainly the result of the activation of investments [16, p. 4].

Results and discussion

It is indisputable that the restructuring was successful. Sintelon entered into strategic partnership with Tarkett, one of the world's leading companies in the field of floor coverings. Although these two companies are hardly compatible by size, the strategic partnership was more of a merger than an acquisition. This is one of the few such examples in Serbia. Even today, managers in Tarkett make decisions that affect the creation of value, and company is not turned into a manufacturing plant that receives orders for production by e-mail. A proverb which says that "every success has a thousand fathers" is generally known, but in this case there was much more. In one unusual period, large-scale resistance to restructuring was not organized and the vast majority of workers accepted to work under the "new" rules set by the company's top management. For entering into the project of restructuring and its success, the most deserving is Nikola Pavičić, who has managed the company since the 1970s as the CEO, while the greatest burden of restructuring implementation was borne by the executive and expert staff led by Dragan Žarković who, without compromise, implemented suggested solutions parallel with the everyday market struggle to survive in

Figure 3: Sales by months (million DEM)
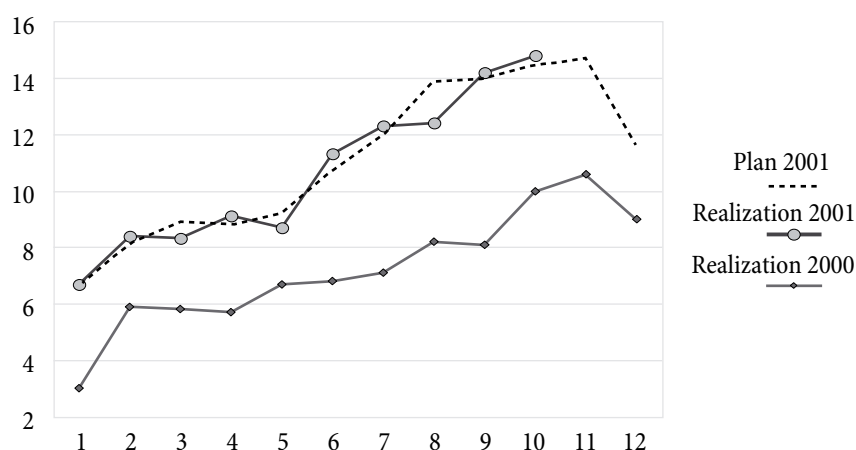
a very unfavorable business climate. The catalyst role in every process of restructuring belonged to Dragan Đuričin, Chairman of the Supervisory Board.

Today we know, for example, that the three key elements of the new business models which were chosen by Jorma Olila in 1992, the newly appointed CEO of Nokia, were:

a. new products (mobile phones) and the industrial structure of the company

b. fundamental changes in the financial structure (release from dependency of bank financing in order to effectively respond to new market situations)

c. introduction of innovative model of network company that required a new company culture (Nokia values): the will to work together for the benefit of the customer; giving people responsibility and encouragement to take risks with confidence and sincerity where mistakes are permitted; the desire to achieve the goal of 120% and to not give up before the difficulties and willingness to test and change their own opinion [2, pp. 31-38]

On the other hand, the general public is not familiar with the key elements of successful restructuring of Sintelon. The authors of those studies discussed, of course, the well-known theoretical and practical solutions in the field of restructuring, such as the case of ABB [1, pp. 199-200], which created ABACUS reporting system that allowed the responsibility for such operations to slip deeper into the organization in 1988, or the relevant literature on the development of business plans [3]. However, the manner in which the companies operated in previous decades was specific, and foreign experience, regardless of whether it was the "best practice", could not be directly applied. Target may be the same, but not the manner of its fulfillment. Local consultants were forced to find innovative solutions based on the knowledge of local specifics and best practices developed in the market economies.

The privatization process in Serbia began shyly in 1990 and accelerated in 1993, when significant number of employees became owners of a significant part of the share capital in the companies where they worked. It was the well-known privatization model of "takeover from inside".

Precisely, the model of privatization was a combination of "give away" and sale of shares to insiders under privileged conditions for majority of equity capital of the company being privatized (60%), and transfer of minority part of equity (40%) to state funds. Privatizations completed by 1993 were virtually canceled in 1994 and 1995, and a new wave of privatization began in 1997 under the new law, which actually retrieved previous condition. Although the privatization law privileged employees, which was an important stimulus for entering in the privatization, most of the socially-owned companies did not enter the process until the end of 2000. Privatization was supposed to be only the first step in restructuring while the ultimate goal was increase in competitiveness. It was not possible to implement a successful restructuring of the company without the formation of organizational structure and corporate governance that exist in joint stock companies in market economies. The management of numerous companies have failed to enter the privatization process under the law from 1997, and a few years later, these companies became "objects" of privatization under the new law. On the other hand, among the companies which have been privatized in 1997, there were not many of those which underwent complex restructuring.

Sintelon belongs to a small group of companies that have engaged in activities which increase their value. As an illustration, one can use the fact that the total income of Sintelon at the end of 2002 was 165 million DEM which is more than at the end of 1996, when total income amounted to 57 million DEM.[3] Tarkett Eastern Europe, as a successor of Sintelon, in year 2015[4] generated revenues of 503 million EUR and the number of employees at the company level increased from 1.805 to 3.319.

Conclusion

The purpose of this paper is to draw attention of business practitioners, advisers and academicians to the unknown aspects of successful local restructuring project. After 15-20 years, the issue of business secret is no longer relevant, and in the meantime, the new changes in the strategy and

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3 Data from public financial reports.
4 Data from Consolidated financial reports Tarkett, Backa Palanka for 2015.

functioning of the company have occurred. Unfortunately, there are not many examples of successful restructuring in Serbia, and it would be good to have more of them, and to speak and write about them. Today, privatization is generally mentioned in a negative context, as it is the very concept that took on such a connotation. The social experiment of self-management and social ownership on the basis of economic activity ended in the early 1990s with a broad consensus that it should be abandoned. On the other hand, there was no consensus on the method and pace of transforming social capital into private equity. Instead of a single act, the privatization took place mainly as a ten-year (or longer) process of wrangling between the state, workers and company managers. Many companies have failed not because they were privatized, but because of absence of restructuring. It is possible to find examples of companies that were comparable to Sintelon in 1997 by size and other characteristics, which few years later went bankrupt, although privatized in a similar manner. Example of Sintelon's restructuring shows that it was not forbidden to be engaged in activities which lead to the creation of value. This paper is a call to reveal, discuss and share knowledge about domestic successful stories of multi-pronged restructuring, but it does not offer an answer as to why there were few such examples.

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