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Are we facing regional depopulation in Serbia? A subnational population projection

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Summary

Population projections at sub-national level in Serbia are usually published as a part of the strategical documents in the field of spatial planning, in a time interval of 10-15 years. Following the results of the 2011 census, the national statistical office published its sub-national projections at municipal level for the first time after 40 years. In both cases, methodological background is not clearly stated or suffers from some inconsistencies. Additionally, their hypotheses on future fertility are typically too optimistic based on pure subjective opinion of the projection producers with no supporting arguments. The official subnational projections, 2011-2041, issued by the national statistical office, do not properly address the migration component as they completely disregarded current international migration impact. Such an approach is particularly unfortunate in case of traditional emigration areas of the country.

In order to overcome fully subjective approach in defining hypotheses in the official projections, we used the Bayesian based model for forecasting fertility and mortality indicators, implemented in the regular series of the United Nations' World population prospects, and the migration cycle concept, being a special case of the well-know "push-pull" migration model, as a conceptual framework for defining migration hypothesis. It resulted in the reference or most probable scenario, which we contrasted to the "optimistic" one that assumes the realization of recently adopted National Birth Promotion Strategy. Both scenarios cover the medium-term period 2018-2050. Our projections refer to the level of districts, which we believe is the lowest territorial level for making reasonable assumptions on migration rates in Serbia. The interpretation of the projection results is formulated in clear recommendations for policy makers. In contrast to the official sub-national projection, our results suggest that Serbia will face severe regional and sub-regional depopulation by the mid-century unless prompt policy measures targeting current migration patterns are being taken.

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I. Introduction

1. The need for projections of population dynamics in Serbia's districts and regions stems from the challenges of demographic development at the sub-national level, which is often an overlooked or incorrectly addressed issue in official projections, strategic documents and spatial development plans. The first sub-national population projections for Serbia (at municipal level) were published in 1979 by the Demographic Research Centre of the Institute of Social Sciences and their jump-off population was based on the results of the 1971 Census. The last one refers to the current official sub-national projection by the Statistical Office of the Republic of Serbia (SORS), published in 2014 and based on the 2011 census. Failure to predict changes in migration and fertility trends was a key source of discrepancy between forecasted and actually registered changes in population dynamics of smaller territorial units. This is the main conclusion that emerges from the evaluation of past sub-national population forecasts in Serbia (Nikitović 2004). A similar verdict stands for the current official projection, which will be demonstrated and discussed by making comparisons with the projection prepared in this paper. Due to the significantly reduced population size of a considerable number of municipalities in Serbia compared to the periods of creation of past projections, and because of frequent changes of municipalities' borders, the district level was chosen as the basic territorial unit for making population forecasts in this paper.
2. The main objective of this paper is to present and interpret population projections at the district level in Serbia in order to consider the effects of the potential implementation of recently adopted policy measures in the area of birth stimulation, as well as the effects of expected socio-economic changes related to the country's accession to the European Union in the coming period. The specific objectives derived from the main one are the following: to estimate the balance of international migration at the district level, to make an estimate of the jump-off sex and age structure of the population including the impact of international migration, to evaluate the potential demographic effects of the current Birth Promotion Strategy, to offer an alternative to the official sub-national population projection given their known methodological shortcomings. In order to achieve the stated goals, it was necessary to carry out the following steps: to choose a theoretical and conceptual framework for formulating assumptions about the future change of population dynamics, to define hypotheses and scenarios of demographic future in accordance with the basic goal of the paper, to produce population projections at the district level using cohort-component method, and to evaluate the official sub-national projection from the viewpoint of the results presented in this paper.

II. Conceptual framework of the projection

3. The projection time horizon covered in this paper represents the medium-term period – from the most recent population estimates to the mid-century. Official estimates of the Serbia's population by sex and age at the district level as of 30.06.2018, published by the SORS (2019), were taken as the basis for calculating the initial age and sex population structure in the projection. These estimates are based on the 2011 Census and the subsequent changes of the population structure that have been induced by births, mortality and internal migration between the census day and mid-2018. Given that the estimates thus obtained did not include the impact of international migration, which is particularly important for highly emigrated areas, it was necessary to correct them by including an assessment of the balance of international migration between 30.09.2011 (the census day) and 30.06.2018.
4. To express uncertainty about the future trends of all three determinants of population dynamics, the scenario approach was chosen. Despite advancements of methodology in probabilistic projections, albeit primarily at the national level (Nikitović 2016), the choice of the scenario approach for projections presented in this paper can be simply explained. Users

of demographic projections at lower territorial levels typically seek answers to the "what if" questions offered by projections presented through multiple scenarios / variants. Assessing the potential effects of the current Birth Promotion Strategy, as one of the basic goals of this paper, involves just such an approach. Also, probabilistic methods require longer time series of historical data on demographic and migration events, which are often unavailable at the sub-national level. However, it should be noted that we used the benefits of the probabilistic approach in terms of reducing the subjective judgment while formulating both the fertility and mortality hypotheses in the reference scenario. The future paths of total fertility rate and life expectancy at birth in this scenario represent the most likely trajectories from their prediction intervals derived by running the same global model used to produce the current World Population Prospects by the United Nations' Population Division (hereafter: the UN model) (UN 2019a).

5. The objectives of this paper were to formulate two fertility scenarios – expected (reference) and optimistic. The first relates to the future change in total fertility rate (TFR) resulting from the projection by the UN model on the basis of available time series, and the second to the realization of the goals defined in the current Birth Promotion Strategy. The syntagma "optimistic scenario" can be explained by the very goals of the Strategy, which presuppose much higher increase in TFR if compared either to observed tendencies or the forecasts based on the UN model. In formulating the mortality hypothesis, no alternative scenario was defined because of the relatively stable changes in this component, and because of the focus of the paper itself on the impact of fertility and migration at the subnational level. Given the limited quality and availability of the time series on migration and far greater uncertainty about their future trends, especially at the sub-national level and in the longer term, compared to the natural components of population change (births and deaths), only the "expected" migration scenario is formulated. This is almost common practice in official projections by national institutes as well as in projections made by renowned international agencies such as Eurostat and the UN Population Division. Thus, the two scenarios of Serbia's demographic future presented in this paper differ from each other only in the assumption of fertility.

A. Theoretic and empirical background of the expected scenario

6. The UN model implies that low-fertility areas across the globe should experience a mild to moderate, post-transition recovery in total fertility rate. This model, in its first version from 2010, predicted that countries that had experienced very low fertility rates would in the long run restore the replacement fertility rates (UN 2011), i.e. within the next 3-4 generations. It thus implicitly suggested that the contemporary decline in birth rates is not an irreversible process, as it is not unprecedent in the twentieth century (Kohler et al. 2002).

7. The concept of the UN model allows each country to have its own pace in the process of fertility recovery, reflecting one of the general principles of the demographic transition in terms of the peculiarities of individual trajectories (Sobotka 2008). The key counterarguments to the general assumption of the model in terms of global convergence of total fertility rates towards the replacement level (fertility decline in high-fertility regions and recovery in low-fertility ones), are that it has no theoretical or empirical justification globally, especially in the advanced economies of the Eastern Asia (Basten et al. 2012). On the other hand, in addition to the empirical evidence from the last 10-15 years suggesting that the period of the lowest recorded fertility in the world may be behind us, recent research based on the Human Development Index suggests that a well-known negative correlation between economic development and fertility, typical of the entire twentieth century, may be reversed, that is, economic progress can lead to higher birth rates in the richest societies (Myrskylä et al. 2009; Luci-Greulich and Thévenon 2014) and thus become a development guideline for all other low fertility populations. Successive adjustments of the UN model in its revisions after 2012 including the current WPP2019 set could be interpreted in that way

as they allow each country to reach its target total fertility rate based on its own as well as the experience of other low-fertility countries that have experienced fertility recovery. In most cases it would result in target TFR of 1.85, and in the Southern Europe region 1.75 (UN 2017b; 2019b).

8. Such a conceptual framework takes into account the macro and micro geographic differentials in the spread of demographic change – driven by differences in economic and sociocultural character, which is consistent with the diffusion of innovations theory (Rogers 2003). More recently, interpretations of the spatial patterns of demographic change based on this theory indicate that sociocultural heterogeneity prevents the equal diffusion of attitudes and information that supports contemporary reproductive ideas and behavior (Yücesahin and Özgür 2008).
9. In this paper, we have developed the hypothesis of international migration in Serbia within a theoretical concept called "migration cycle model" that describes the transition from a country of emigration to a country of immigration. The concept can be regarded as a specific interpretation of the "pull and push" migration theory (Fassmann and Reeger 2012), which reflects the path of the "old" immigration countries in Europe that had experienced a transition from emigration to immigration in the conditions of below replacement fertility (Fassmann et al. 2014). In that way, we opted for an empirically grounded scenario that relies on contemporary changes in the European context instead of an almost completely arbitrary scenario, such as that in regular revisions of the world population projections by the UN, which keeps the initial net migration constant during the projection horizon (UN 2017a; 2019a). Based on empirical evidence about spreading of the migration transition not only from northwest to south, but also to the east of the continent (Drbohlav et al. 2009), as well as undisputed facts about the expected continuation of migration pressure on Europe from the Middle East and Africa (Pastore 2017), we thought that the migration cycle model is the best framework for formulating the hypothesis on international migration in the territory of Serbia. Given that the EU membership is Serbia's strategic goal, and that the accession process of the Western Balkan countries remains one of the European Union's priorities (European Commission 2019), Serbia's EU accession is set as a pivotal point in the migration transition hypothesis, primarily because of the socio-economic transformations that EU membership entails, which also give rise to opportunities for transforming the country's migration pattern.
10. From the viewpoint of the migration cycle model, the Western Balkan region could be considered as stuck in the initial, pre-transition stage (Nikitović 2019). Similar to the concept of demographic transition, the migration cycle model does not imply that the stages of the cycle last for the same amount of time or exhibit identical characteristics in different countries. It is rather general concept of the transition process according to which some countries that are entering the process later could potentially require a shorter period of time to adapt than the states that transitioned earlier (Fassmann & Reeger, 2012: 67).
11. Non-commercial software was used for all calculations in this paper. Probabilistic simulations of the trajectories of total fertility rate and life expectancy at birth, as a tool for formulating the expected fertility and mortality scenario, were performed using software R and its packages bayesTFR (Ševčíková et al. 2015) and bayesLife (Ševčíková and Raftery 2015). Projections of the population by age and sex at the district level in Serbia were calculated using Spectrum.

B. Possible change in fertility rates – expected and optimistic scenario

1. Optimism of the official projections

12. The total fertility rate in Serbia has oscillated between 1.4 and 1.45 since 2005. Most former socialist states that belonged to the lowest fertility group have recently experienced a rise in

TFR (Bulgaria, Czechia, Estonia and Slovenia have even exceeded 1.5). In the pre-projection period, practically the entire territory of Serbia is characterized by a below replacement TFR.

13. The optimism of contemporary official projections of the Serbia's population, which is reflected in the overestimation of the registered total population, is primarily the result of unreasonably optimistic assumptions about the change in TFR (Nikitović 2013). This could be confirmed by the finding that "the low and constant variants of official projections were closer to the real values of fertility than the medium and low ones" (Nikitović 2004: 118). Similarly, the current projection by SORS (2011-2041) assumes, according to the "middle", or most likely, variant, that the TFR will increase by 22% in the region of South and Eastern Serbia and by 27% in the Vojvodina region, in just 30 years. However, no grounding in the theoretical and/or empirical domain has been provided for the "predicted reversal in fertility trends" (SORS 2014: 10). Therefore, the "middle" variant can be characterized as very optimistic, as it predicts a major change in the observed "tendency to decrease fertility".
14. Other relevant fertility projections for Serbia in the same period did not find sufficient arguments to predict a significant increase in TFR, predicting levels of 1.50 and 1.58 by 2041, respectively (Kupiszewski et al. 2012: 22; Nikitović 2013: 71). In addition, the main scenario of EUROPOP2018 for all EU Member States (Eurostat 2019) predicts, for example, only a slight increase in TFR in Croatia (1.53 in 2050), which has a similar history of this indicator as Serbia. The UN WPP 2019 foresees TFR of 1.51 for Serbia in the 2040-45 period (UN 2019b).

2. Fertility hypothesis – expected scenario

15. As the UN model recognizes only the territory of Serbia including Kosovo, it was necessary to model TFR for the territory of Serbia without data for this region. The model was adjusted to lower territorial levels (regions and districts) in accordance with the available historic data sets. For every district, a median of the prediction interval resulted from the UN model was taken as the forecasted TFR over the projection horizon. In general, a target TFR for districts with a pre-projection TFR below 1.45 would be around 1.55, and for those with TFR above 1.45, it would be close to 1.70. The UN model has shown that districts in eastern Serbia represent the nucleus of low TFR in the country, i.e. that the potential for positive changes in this indicator is the weakest in this area. A slightly higher forecast of TFR would characterize the surrounding districts in the region of Southern and Eastern Serbia and certain districts of the Vojvodina region. According to the UN model, the maximum target TFR was projected for western and southwestern districts in the region of Šumadija and Western Serbia. These finding were supported by the results of the spatial autocorrelation analysis with respect to change in TFR between 2002 and 2011 at the municipal level in Serbia (Nikitović et al. 2019).

3. Fertility hypothesis – optimistic scenario

16. The projected values of TFR in the optimistic scenario, aligned with the goals of the Birth Promotion Strategy, were put in the context of the prediction interval obtained by the probabilistic procedure when formulating the hypothesis of the expected fertility scenario. This evaluation, based on the UN model, indicates the probability of 7–10% for achieving the optimistic scenario in 2035 and 3–7% in 2050 in the case of districts with a lower TFR at the beginning of the projection, or 5–10% in 2035 and below 3% in 2050 for the districts with higher TFR at the beginning of the projection. In this scenario, the highest increase in TFR was predicted for the first 15 years of the projection. Although the scenario implies that policy measures will last even beyond the horizon of the current strategic document, experiences from countries with a long tradition of population policy implementation indicate that the effects on birth rates are generally strongest in the initial period of the

implementation (Frejka and Gietel-Basten 2016). The forecasted increase in TFR across districts would be 20-35% by 2035, and 10-15% from 2035 to 2050 depending on the pre-projection TFR in each district; the range of the target TFR across districts would be 1.70−1.85 in 2035, and 1.85−2.1 in 2050, which is in accordance with the target TFR of 1.85 at the country level after 15 years of the Strategy implementation, and with the potential 2.1 on the long run (Government of Republic of Serbia 2018: 16). However, even in case of the optimistic scenario, there is no realistic basis to assume that the replacement TFR could be reached by the mid-century in all districts. This is a conclusion based on the recognized spatial patterns of demographic trends in Serbia over the past half a century, in accordance with the theory of diffusion of social innovations (Nikitović et al. 2016), as well as on recent findings on the link between fertility and economic development at sub-national level in a European context (Fox et al. 2019). Therefore, as in the expected scenario, the lowest target values (TFR = 1.85) would be in districts of traditionally lower fertility in the region of South and Eastern Serbia, whilst that level would be reached already in 2035 in higher fertility areas in the western and southwestern Serbia.

C. Mortality Reduction - Expected Scenario

1. Optimism of the official projections

17. As compared to the European average, and particularly to the EU level, Serbia is lagging behind it as regards life expectancy at birth for both sexes. In 2017, the difference between Serbian and average EU-28 life expectancies amounted to 5.4 years for females and 5.2 for males. However, the differences are considerably greater if one makes a comparison with the countries that have achieved the best results in decreasing mortality. So, for example, the life expectancy at birth for males was in 2017 over 81 years in Switzerland, Iceland and Norway, and for females exceeded even 85 years in Spain, France, Switzerland and Italy. Nevertheless, the life expectancy of males in Serbia is higher than in Belarus, Moldova, Russia, Ukraine, Bulgaria, Estonia, Lithuania, Hungary, and Romania and close to the one observed in Slovakia and Poland. As for the life expectancy for females, there are only a few countries (Russia, Ukraine, Belarus, and Moldova) lagging behind Serbia (UN, 2019b). Thus, if one considers the life expectancy at birth, Serbia is much closer to the ex-communist countries than to other ones. However, the gap between the sexes in life expectancy at birth in Serbia (4.9) is almost the same as the one in the EU-28 (5.2) in 2017. In addition, it is worth noting that, according to official abridged life tables, the sex gap has been stabilized since the 1990s amounting to the average of 5 years in the 2011-2018 period.
18. Unlike the majority of past population projections, which underestimated the actual increase in life expectancy at birth during the twentieth century (Nikitović 2013), the current official projection of Serbia assumes a very optimistic change of this indicator in the 2011-2041 period. The authors justified it by the observed improvements in life expectancy in Serbia since the beginning of this century (SORS 2014: 10). The lowest increase in life expectancy per decade is predicted for women in the Belgrade region (1.5 years) and for men in the region of South and Eastern Serbia (1.8), while for the rest of the population this increase amounts to above 2 years; the highest increase is assumed for the region of Šumadija and Western Serbia – 2.5 and 2.4 years for men and women, respectively.
19. In the European context, such a high increase in life expectancy has been recently observed only in post-communist societies after the fall of the Berlin Wall. However, the historical pattern of mortality in the population of Serbia is different from that pattern (Kupiszewski et al. 2012), which is the first counterargument to the assumption made in the official projection by the SORS. The second refers to the very slow changes in survival rates of the persons aged 55 and above since the 1980s (Devedžić and Stojilković 2012), which, on the other hand, should be the main source of future rise in *e0* based on the preventable mortality indicators in Serbia (Marinković 2017) and the potential for progress compared to the

progress made in the European context (Galjak 2018). This is why other relevant projections of mortality in Serbia over the same period (2011–2041) are much more prudent in predicting further increase in *e0* – an increase per decade is 1.3 years for women and 1.6 years for men in the projection made by Kupiszewski et al. (2012: 30), and 1.15 years for men and 1.05 years for women in the first ever projection of the population of Serbia that had been made by the means of the probabilistic model used for the UN projections (Nikitović 2013).

20. Additionally, the current official projection includes a controversial assumption regarding the reduction of the gap between the sexes in life expectancy at birth. Numerous projections by statistical institutes across Europe and international statistical agencies, and both stated projections of Serbia's population, predict a mild trend in the reduction of this gap. On the other hand, the current projection by SORS predicts a very intense reduction of the gap between the sexes in *e0* in the Belgrade region (2 years in three decades), and minimal in the region of Šumadija and Western Serbia, while it predicts the opposite trend in the other two regions – an increase in the gap for 0.5 years in the region of South and Eastern Serbia and even for 1 year in the region of Vojvodina (SORS 2014: 10).

2. Mortality hypothesis – expected scenario

21. In formulating the hypothesis on mortality of the population, the UN model was used. The same procedure as in the case of the hypothesis on fertility was applied – adjustments were made to the input data regarding the coverage of the territory and the chosen level of its administrative division (districts), while for every district a median of the prediction interval that resulted from the UN model was taken as the expected *e0* over the projection horizon.

22. Depending on the pre-projection level of *e0*, an increase in this indicator from 2018 to 2050 would be between 3.45 years for women in the districts of Banat and Bačka (excluding the South Bačka district) and part of the region of Eastern and Southeastern Serbia; 3.71 years in most of this region, and in the districts Mačva and Raška; up to 3.97 years in the region of Šumadija and Western Serbia, the Belgrade region, and the districts South Bačka and Nišava.

23. In the case of men, the increase in *e0* by the end of the projection period would be between 4.12 years in most districts of the Vojvodina region (excluding the South Bačka district) and part of eastern Serbia; 4.44 years in most of the region of Eastern and Southeastern Serbia; up to 4.76 years in the region of Šumadija and Western Serbia, the Belgrade region and the Nišava district.

D. Migration Hypothesis – Expected Scenario

1. Internal migration

24. Frequent changes of political borders in the region of former Yugoslavia since 1991 affected the availability and quality not only of the statistics on international but also on internal migration in Serbia. It was one of the reasons that limited our analysis of input data on internal migration to the period after the census 2011. Regional and sub-regional differences, and especially the growing gap between major urban centres and the rest of the country in terms of economic development, diversification and supply of jobs, housing, health care, overall quality of life, but also subjective perception of opportunities to achieving personal life goals, are the factors that determine the directions and the intensity of internal migration. The Belgrade and South Bačka districts, whose centres are the city of Belgrade and the city of Novi Sad respectively, represent the main attraction zones for internal migrants in Serbia. Most other districts in the country have been recognized as out-migrational for years, especially those in the border and mountain areas of the South and East Serbia region and

the region of Šumadija and Western Serbia. This pattern of internal migration is deeply rooted in previous periods, but also intensified by the process of reducing and ageing of population since the 1990s.

2. Hypothesis on internal migration

25. At the beginning of the projection period, the three-year average of the net migration rate (2016–2018) according to the official statistics, was positive in only 5 out of 25 districts in Serbia. These are the districts whose centres are the largest cities in the country, as well as the largest university centres. However, with the exception of the Belgrade and South Bačka districts, their net migration rate was below 1. On the other hand, the most pronounced emigration was recorded in the border districts of Bor and Zlatibor, and the district of Toplica in the south along the administrative border with Kosovo.

26. According to the only (expected) migration scenario, the net migration rate is projected to gradually decrease by 15% until 2030 in all 20 areas where negative internal migration balance was observed at the beginning of the projection. At the same time, the share of the Belgrade and South Bačka districts, as two prominent zones of attraction of the population in the country, would decrease slightly in the country's balance of positive flows of internal migration at the expense of the increase in the attractive power of the three other large and important districts - Nišava, Šumadija and North Bačka. This hypothesis is the result of two factors. The first relates to the successful implementation of policies aiming at more balanced development of the country, which is one of the strategic goals of Serbia's sustainable development (Government of the Republic of Serbia 2008). The second factor is an estimate of the expected decline in the share of the most active age groups in migration flows in line with the trend observed at the beginning of this century, caused by the decline and aging of the population.

27. From 2030 to 2050, that is in the period when Serbia should become an EU member, a further gradual decrease of the negative balance of internal migration by 15% was assumed in every of 20 districts characterized by this migration pattern; further strengthening of the attractive power of the Nišava, Šumadija and North Bačka districts at the expense of the Belgrade and South Bačka district is also expected.

3. Hypothesis on international migration in official projections

28. Serbia is a typical emigration country with a negligible influx of immigrants, i.e. foreign nationals. Therefore, its international migration balance essentially boils down to the difference between emigrants and returnees, in both cases, of Serbian nationals. Still, certain portion of current returnees includes retired gastarbeiters or “guest workers” from the first mass waves of emigration that began in the mid-1960s as a policy response to the challenge of “surplus in unskilled labour” in the socialist Yugoslavia.

29. A review of the available population projections that refer to the successor states of former Yugoslavia indicates a rather optimistic view on the future migration balance of the region despite the pronouncedly negative trend in this indicator in the last couple of decades. The current projection for Serbia in the period 2011–2041 by SORS is no exception in that regard, although there is no doubt that the country’s net migration rate in the pre-projection period 2002–2011 was negative (Kupiszewski et al. 2012; Penev and Predojević-Despić 2012; ISS 2013). Moreover, the official projection contains a very serious methodological omission regarding migration hypothesis, which is the most important component when projecting small-size populations, such as municipalities or districts. Based on Table 4 in the SORS publication (2014: 11), which provides the starting and projected annual migration balance by regions of Serbia, it appears that the total migration balance of the country is positive (excess of 514 persons), which is certainly impossible given the extremely

emigration character not only of Serbia, but of the entire region of the former Yugoslavia except Slovenia (Fassmann et al. 2014; Josipovič 2016; Nikitović 2016; UN 2017b). In addition, the supporting methodological explanation does not specify how migration hypotheses are formulated at the municipal level (the estimate of international migration is not mentioned), which should be the essential information given the marked differences between municipalities regarding this component of population dynamics. It is likely that the current SORS projection does not include an estimate of international migration in Serbia as it starts from an unrealistic (positive) balance in 2011. Also, by 2041, it is predicted that the net immigration rate will reach more than four per thousand population of the country in 2011 (SORS 2014), which is twice as high as the forecast for Slovenia, or equal to the forecast for Austria in the same year by EUROPOP2018 (Eurostat 2019).

4. Hypothesis on international migration

30. There are few studies that have offered an estimate of the annual international migration flows in Serbia according to the definitions of the United Nations (UN) and the EU (Kupiszewski et al. 2012; ISS 2013). These are based on the migration statistics of the countries that are main destinations of Serbian citizens. The basic limitation of such estimates is methodological in its nature, as it is practically impossible to analyse the statistics of all destination countries due to the unavailability of data or their statistical unreliability in the case of countries where Serbian citizens make up a very small share of immigrants. An additional limitation of this procedure is the inability to obtain longer time series on emigration from Serbia due to frequent changes of the state borders in the period 1991-2008. The result is a data series shorter than a decade, which makes it impossible to draw valid conclusions about trends in the international migration flows from/to the present-day territory of Serbia.

31. The starting point for obtaining an up-to-date estimate of the balance of international migration in Serbia was the estimate of this indicator for the period 2008-2010 by Kupiszewski et al. (2012). Our analysis of the available data showed that the negative migration balance increased after 2010, which was also contributed by the reduced influx of returnees who completed their working career abroad, as the volume of these generations decreased. We estimated that the average annual migration balance of Serbia was −20,692 in the 2011–2018 period, which is certainly a very rough estimate. Nevertheless, it is a starting point that is far closer to reality than any scenario that neglects the migration component or starts from a significantly underestimated volume of emigration based on census results.

32. Despite the known issue of underestimation of the number of Serbian citizens abroad by the census, it is the only source of data that allows analysis of previous trends in international migration at the district level in Serbia. We assumed that the distribution of emigrants by district of origin that was resulted from the analysis of the 1991-2011 census data was the same as the distribution of the actual number of emigrants that is unknown to us. Such an approximation will induce certain deviation when both the estimated and forecasted total international migration balance of the country is distributed at the district level. However, the estimated total migration balance is itself the rough estimation of the unknown actual figure. The final estimate of the international migration balance by districts at the beginning of the projection was obtained by assuming that the share of the oldest emigration zone in Eastern Serbia in the total negative migration balance of the country decreased by 25-30% due to the increase of the share of other non-traditional areas of emigration. Besides the emergence of new "hot emigration zones" in the southwest and southeast of the country (Penev and Predojević-Despić 2012) and new emigration waves from major city centres across the country, the reason for this assumption is the decrease in the demographic potential of the traditional emigration zone, as well as the evidence on recently established emigration of ethnic minorities – from the north of Vojvodina to Hungary and from the east border municipalities to Bulgaria.

33. From the perspective of the projection horizon in this paper (2018-2050), the stages of migration transition, according to the migration cycle model by Fassmann and Reeger (2012), have been interpreted in relation to the symbolic turning point in the transition process in Serbia (2030), which implies that the country should join the EU by then. After 2030, a transition phase should follow during which immigration gradually outweighs emigration, which coincides with the migration assumption in the current EUROPOP2018 (2018-2100) for EU Member States (Eurostat 2019). However, in the period up to 2030, the hypothesis was formulated by analogy with recent and current experiences of emigration from most former communist states immediately after they joined the EU. In addition, the current relaxation of immigration policy towards Serbia by the major destination countries, such as Germany, indicates that increased emigration is also possible in the immediate pre-accession period. In other words, even in a scenario that would not imply Serbia's accession to the EU, it is difficult to avoid the hypothesis that does not predict intensive emigration as long as there is a marked gap in living standards between Serbia and the most developed countries of Europe, as well as the growing demand for labour in these countries due to intensification of population aging.

34. Given the above reasoning, as well as the expected decrease in Serbia's migration potential due to population aging, we assumed that the increase in the average annual negative migration balance would be 15% at maximum. This means that the already high level of the balance in 2018 of −3 per 1,000 population or −20.692 persons would reach −3.5 in 2030 or −23.685. Such a forecast is the result of a previously formulated assumption about the regional distribution of the country's total migration balance. Numerically, the negative net migration rate will increase by 25% compared to 2018 in all districts not recognized as traditionally emigration ones, while the migration balance of "hot zones of emigration" will remain unchanged until 2030.

35. In line with the gradual transformation of the migration pattern in Serbia after 2030, we assumed that the net international migration of the country would turn positive by 2050 and amount to 0.8 per 1,000 population or 5,222 persons annually. The benchmarks for defining the target rate were EUROPOP2018 projections (Eurostat 2019), which implicitly see the EU as an immigration zone. The projected rate is the result of a hypothesis at the regional level, which implies that all districts should reach at least zero migration balance by 2050, i.e. enter the transition phase according to the migration cycle model. The highest rate of positive migration balance, 1.5 per 1000 population, would be in the districts with the largest university centres, in line with the strategic national goals for sustainable population development.

III. Population Scenario Results

A. Expected scenario

36. By the time Serbia should join the EU (2030), the total population of the country would be around 6 million according to the expected scenario. The decrease would continue in the period 2030-2050, though, at a slightly slower pace due to the country's transition from the net emigration to the net immigration stage, and a slight increase in birth rates. Thus, the current population size of Serbia would be reduced by almost two million or by 30.4% until 2050 (Table 1). While in the same period the decrease of the total population in the Belgrade region would be just 4.5%, and in the Vojvodina region slightly less than the national average (27.8%), the region of South and East Serbia would lose almost half of its population (48%), and the region of Šumadija and Western Serbia somewhat less than that (42.2%). The most dramatic loss of population (over 50%) is projected for the area of traditional emigration – in the districts of Braničevo and Bor by over 75% compared to their present population size. In addition to the Belgrade district, reductions of less than 30%, i.e.

below the national average, were forecasted only in districts with the largest city centres, which are not characterized by a negative balance of internal migration during the projection horizon – South Bačka (10.3%), Nišava (23.7%), North Bačka (24.5%) and Šumadija (27.8%).

37. The number of live births in Serbia would decline by almost a third (32.4%) between 2018 and 2050, with this decline going faster by 2030. The average annual number of live births in the entire South and East Serbia region could be less than 5,000 by mid-century – a decrease of 55 percent comparing to the current number, while the districts of Braničevo and Bor would practically reach the limit of survival. It is extremely warning to decision makers. The reason for the large differences in the decreasing trend of live births between the districts is migration, both in the direct (reduction of the fertile contingent) and in the indirect sense (loss of potential descendants of immigrants).

38. Both southern regions of Serbia are more vulnerable in terms of the expected decline in today's working-age population by mid-century, compared to the north of the country – 57.2% in the South and East Serbia region, and 52.8% in the Šumadija and Western Serbia regions versus 36.8% in the Vojvodina region and 14.4% in the Belgrade region. The number of those aged 65 and above will reach its maximum by 2030 and then decrease until it returns to near the present size, as the impact of the large baby-boom generations on the size of the older population will gradually disappear after 2030.

39. The ratio showing the number of working-age persons per one person over 65 years of age in Serbia is projected to decrease by 41.1%, from the current 2.9 to 1.7 in 2050. If we take a look at the distribution of this ratio across districts, we will notice that the range between the district with a minimum and the district with a maximum ratio increases over the projection horizon. Some highly emigrant districts such as Braničevo and Bor would be particularly affected as their working-age contingent is expected to be smaller than the contingent of older ones, which indicates the unsustainability of the current demographic regime in the long term. These results suggest that the existing pronounced regional differentiation in terms of this indicator can only be exacerbated, which would contribute deepening the large differences in the overall level of development between districts.

B. Optimistic scenario

40. Although this scenario predicts a significant increase in the current total fertility rate by 2050 compared to the "expected scenario" shown above, up to the replacement level in most districts of Serbia, a striking decline in total population is inevitable. The long-term implementation of the Birth Promotion Strategy, which is assumed by the optimistic scenario, would mitigate the reduction of the total population predicted by the expected scenario by only 173 thousand in 2050 (Table 1). Moreover, the realization of the Strategy could be interpreted as unlikely if evaluated by the UN model – the likelihood of TFR scenario is below 10% by 2030 and 5% by 2050 in all districts. However, the good news according to the optimistic scenario is that the fall in the number of live births in Serbia by the middle of the century would be far smaller than in the expected scenario, only 14.7% versus 32.4%. If we interpret these results in a probabilistic context, reduction of the number of live births by a third until 2050 would be the most probable future, while achieving the goals of the Birth Promotion Strategy would result in the live births reduction of only one-seventh, but the chances of such a scenario are less than 10%.

41. Even such an unlikely scenario would not significantly affect the highly emigrant districts in the east of the country. This shows that the implementation of measures in the field of fertility policies has almost no effect if there is no implementation of measures in the field of migration. On the other hand, already after the first half of the projection, the number of districts projected to have a minimal decrease in live births (below 15%) would be six in the optimistic scenario versus none in the expected scenario. In the second half of the projection,

six districts would even experience an increase in the number of live births according to the optimistic scenario compared to only two according to the expected scenario. It should be stressed that the main effect of the successful implementation of the Strategy is the recovery of the age structure of the population, primarily the fertile contingent in the medium term. The beneficial effects of these policies on the size of the working-age population can only be expected in the long run, i.e. beyond the projection horizon considered in this paper.

C. Discussion of the scenarios in the context of the current official projection

42. The current sub-national projection for the 2011-2041 period provides only results for the total population. Therefore, comparisons between the scenarios shown above and the official projection will only be made for this indicator (Table 1).

43. The middle variant of the official projection is based on the medium assumption on TFR, which should increase from 2011 to 2041 by 0.32 in the region of South and East Serbia, and by 0.39–0.40 in the other three regions of Serbia. The target TFR was assumed to reach from 1.65 in the Southern and Eastern Serbia region to 1.80 in the Belgrade region (SORS 2014: 9). According to the UN model used to forecast TFR in this paper, the probability of reaching these values in 2041 ranges from 10% in the Belgrade region to 25% in the South and East Serbia region. Compared to the optimistic scenario, based on the implementation of the Birth Promotion Strategy, the realization of the forecasted TFR in the official projection is more probable, though by a nuance, from the viewpoint of the UN model. However, when it comes to the forecast of the total population, the striking difference between the medium variant of the official projection and the two scenarios presented in this paper is noticeable at a glance (Table 1).

Table 1
Forecast of total population by regions and districts of Serbia according to two projections

	SORS 2011–2041		Projection 2018–2050			
Region/District	**Middle var.**	**Zero migrat.**	**Expected scenario**		**Optimistic scenario**	
	2041	**2041**	**2041**	**2050**	**2041**	**2050**
Republic of Serbia	**6,824,556**	**6,136,010**	**5,220,133**	**4,765,915**	**5,312,813**	**4,938,690**
Vojvodina region	1,713,943	1,617,476	1,439,578	1,323,886	1,470,203	1,380,155
Šumadija and West S. r.	1,852,195	1,756,020	1,268,556	1,083,576	1,287,645	1,118,001
South and East S. r.	1,275,827	1,289,500	910,071	757,837	929,241	789,466
Belgrade region/district	1,982,591	1,473,014	1,601,928	1,600,616	1,625,724	1,651,068
West Bačka district	146,309	145,457	111,091	92,367	113,268	95,928
South Banat district	257,264	244,705	194,367	169,652	198,356	176,642
South Bačka district	618,454	548,320	559,751	548,720	570,893	570,481
North Banat district	117,292	117,088	91,783	78,969	94,281	83,167
North Bačka district	164,032	152,266	142,250	133,252	145,712	139,530
Middle Banat district	149,857	149,865	120,062	103,675	122,486	108,084
Srem district	260,735	259,775	220,274	197,251	225,207	206,323
Zlatibor district	254,060	248,658	158,386	123,188	159,894	126,043
Kolubara district	143,649	141,809	115,736	100,922	117,609	104,312
Mačva district	258,167	251,529	167,701	135,827	169,511	139,355
Moravica district	192,764	176,943	148,577	131,298	150,617	135,334
Pomoravlje district	185,669	172,879	113,316	91,717	115,962	95,782
Rasina district	207,337	199,889	128,388	100,801	130,605	104,206
Raška district	328,071	315,739	221,336	199,074	224,360	205,103
Šumadija district	282,478	248,574	215,116	200,749	219,087	207,866
Bor district	81,261	92,010	42,209	24,796	42,871	25,598

Braničevo district	150,749	138,119	56,173	33,722	56,872	34,208
Zaječar district	79,994	83,417	59,214	46,893	60,353	48,626
Jablanica district	169,942	172,865	132,304	111,419	135,544	116,765
Nišava district	319,989	303,853	288,938	272,827	295,836	285,529
Pirot district	64,013	67,167	56,364	47,912	57,691	50,148
Podunavlje district	158,822	166,375	119,041	98,621	121,631	102,749
Pčinja district	184,009	192,012	98,172	72,188	99,935	74,776
Toplica district	67,048	73,682	57,656	49,459	58,508	51,067

Sources: SORS (2014); author's calculations

44. According to the medium variant of the official projection, the forecasted population of Serbia in 2041 is higher by 28.5% than the one projected in the optimistic scenario, despite the less optimistic forecast of the total fertility rate. The projected population size of Serbia in 2041 (6,824,556) is smaller by only 139 thousand than the official population estimate of Serbia in mid-2018 that does not include the impact of international migration (6,963,764), or by 18 thousand than the starting population estimate for mid-2018 according to the projections in this paper. This points to the migration assumption as the main cause of the difference, that is, to the remarkable optimism of the official projection, which completely neglected Serbia's current emigration profile and the arguments of relevant studies on the small chances for avoiding the scenario of increased emigration related to the EU accession, or a longer period of the dominant emigration profile. However, the crucial difference in the population dynamics forecast between the official projection and the projection presented in this paper is fully noticeable at the regional and district level. The biggest differences are observed in districts whose demographic development depends essentially on the migration component, whether they are districts in the zone of traditional emigration, such as Bor and Braničevo, or those strongly influenced by internal emigration, such as Zlatibor.

IV. Conclusion

45. The main objective of this paper was to consider the medium-term effects of the potential implementation of recently adopted policy measures in the area of birth stimulation in Serbia as well as the effects of expected socio-economic changes related to the country's EU accession. For that purpose, we made and interpreted population projections at the district level that aimed to overcome the known methodological shortcomings of the official sub-national projections. The reference scenario of expected demographic development did not imply the effects of population policy but was based on theoretical and empirical models of possible changes in components of population dynamics. In contrast to this "expected" scenario, the optimistic one involved the realization of the goals defined in the recently adopted Birth Promotion Strategy, which presuppose a significant increase in birth rates in relation to the observed long-term tendencies.

46. The projected decrease in the population of Serbia, probably by almost one third or almost two million inhabitants by the middle of the century, is the first and most important message of this work to policy makers. Moreover, the two southern regions would lose almost half of the population, while some districts in the east would experience even more dramatic population loss. Such consequences, in the form of regional and sub-regional depopulation, and the consequent lack of labour supply, are certainly a strong constraint to the already weak economy of the country.

47. The study showed that the measures envisaged by the Strategy are certainly not inefficient and / or inadequate in terms of potential impact, but that their implementation must become of a strategic type, i.e. much longer than the projection horizon shown, since their first effect is to improve the age structure, and that a positive impact on the entire population can only be expected in the decades after the recovery of the fertile contingent. This confirms the findings of previous studies (Kupiszewski et al. 2012; Nikitović 2018) that measures in the

field of migration policy are urgent, not only because of the improvements in the size and vitality of the working-age contingent, but also of the total population. This paper also indicated that the magnitude of regional and sub-regional depopulation that Serbia is approaching to, even in the optimistic scenario of an increase in the total fertility rate, as envisaged by the Birth Promotion Strategy, is far more alarming than the already serious situation at the national level. Moreover, according to this scenario, a resurgence in the number of live births can be expected only in districts along the Danube-Morava corridor, which connects the most developed and populous urban centres with a positive migration balance, while the border and mostly underdeveloped areas facing long-term emigration remain endangered.

48. We have also shown that the population projections at the subnational level in Serbia, 2011-2041, produced by the Statistical Office of the Republic, are unreasonably optimistic, and thus may mislead decision-makers, especially when formulating policies aimed at demographic development of local or regional administrative units. Therefore, we believe that special attention in the preparation of future official projections at the sub-national level, must be devoted to the issue of migration, despite all the difficulties that it entails in the emigration context of Serbia.

References

Basten, S. A., Coleman, D. A., & Gu, B. (2012). Re-Examining the Fertility Assumptions in the UN's 2010 World Population Prospects: Intentions and Fertility Recovery in East Asia? Population Association of America, 2012 Annual Meeting Program, San Fran-cisco (USA), 3–5 May, 2012. http://paa2012.princeton.edu/papers/122426

Devedžić, M., & Stojilković, J. (2012). New Concept of Age(ing) – Prospective Age. *Stanovništvo*, 50(1), 45–68.

Drbohlav, D., Lachmanová-Medová, L., Čermák, Z., Janská, E., Čermáková, D., & Dzúrová, D. (2009). The Czech Republic: on its way from emigration to immigration country. Idea Working Paper 11. http://www.idea6fp.uw.edu.pl/pliki/WP11_Czech_Republic.pdf

Eurostat (2019). EUROPOP2018 – Population projections at national level (2018-2100). Luxembourg: Eurostat. https://ec.europa.eu/eurostat/web/population-demography-migration-projections/population-projections-/database

Fassmann, H., & Reeger, U. (2012). 'Old' immigration countries in Europe. The concept and empirical examples. In M. Okólski (ed.), *European Immigrations: Trends, structures and policy implications* (pp. 66-90). IMISCOE Research Series. Amsterdam: Amsterdam University Press.

Fassmann, H., Musil, E., Bauer, R., Melegh, A., & Gruber, K. (2014). Longer-Term Demographic Dynamics in South-East Europe: Convergent, Divergent and Delayed Development Paths. *Central and Eastern European Migration Review*, 3(2), 150–172.

Fox, J., Klüsener, S., & Myrskylä, M. (2019). Is a Positive Relationship Between Fertility and Economic Development Emerging at the Sub-National Regional Level? Theoretical Considerations and Evidence from Europe. *European Journal of Population*, 35(3), 487–518.

Frejka, T., & Gietel-Basten, S. (2016). Fertility and Family Policies in Central and Eastern Europe after 1990. *Comparative Population Studies*, 41(1), 3–56.

Galjak, M. (2018). East-West Demographic Divide in the EU: A Regional Overview. *Stanovništvo*, 56(2), 1–21.

Government of the Republic of Serbia (2008). *National Sustainable Development Strategy*. Official Gazette, 57. Belgrade: Official Gazette (In Serbian).

Government of the Republic of Serbia (2018). Birth Promotion Strategy. Official Gazette, 56-2307. Belgrade: Official Gazette (In Serbian).

ISS (2013). Dynamic Historical Analysis of Longer Term Migratory, Labour Market and Human Capital Processes in Serbia. SEEMIG project. Belgrade: Institute of Social Sciences (WP3 Country report).

Josipovič, D. (2016). The Post-Yugoslav Space on a Demographic Crossway: 25 Years after the Collapse of Yugoslavia. *Stanovništvo*, 54(1), 15–40.

Kohler, H. P., Billari, F. C., & Ortega, J. A. (2002). The Emergence of Lowest-Low Fertility in Europe During the 1990s. *Population and Development Review*, 28(4), 641–680.

Kupiszewski M., Kupiszewska, D., & Nikitović, V. (2012). *Impact of demographic and migration flows on Serbia*. Belgrade: International Organization for Migration.

Luci-Greulich, A., & Thévenon, O. (2014). Does economic advance-ment 'cause' a re-increase in fertility? An empirical analysis for OECD countries (1960–2007). *European Journal of Population*, 30(2), 187–221.

Marinković, I. (2017). Smoking as the Main Factor of Preventable Mortality in Serbia. *Stanovništvo*, 55(1), 87–106. (In Serbian)

Myrskylä, M., Kohler, H-P., & Billari, F. C. (2009). Advances in development reverse fertility declines. *Nature*, 460(7256), 741–743.

Nikitović, V. (2004). *The Accuracy of Population Projections of Serbia*. Belgrade: Geographical Institute "Jovan Cvijić" SASA (In Serbian).

Nikitović, V. (2013). Demographic Future of Serbia from a Different Anglen. *Stanovništvo*, 51(2), 53–81. (In Serbian)

Nikitović, V. (2016). Long-term Effects of Low Fertility in the Region of Former Yugoslavia. *Stanovništvo*, 54(2), 27-58. (In Serbian)

Nikitović, V. (2018). The importance of a political response for the Serbia's demographic future. In V. S. Kostić, S. Djukić Dejanović, M. Rašević (Eds.), *Towards a better demographic future of Serbia* (pp. 210–227). Belgrade: SASA, Institute of Social Sciences. (In Serbian)

Nikitović, V. (2019). Demographic Processes in the Western Balkans: A Long Term Perspective. In P. Jureković & E. Mandalenakis (Eds.) *Greece and Its Western Balkan Neighbours – Common Challenges in a Changing Europe*. Vienna: Republic of Austria / Federal Ministry of Defence.

Nikitović, V., Arsenović, D., Sekulić, A., & Bajat, B. (2019). Is the Second Demographic Transition a useful framework for understanding the spatial patterns of fertility change in Serbia at the beginning of the 21st century? *AUC Geografica*, 54(2), 168-183.

Nikitović, V., Bajat, B., & Blagojević, D. (2016). Spatial patterns of recent demographic trends in Serbia (1961-2010). *Geografie*, 121(4), 521–543.

Pastore, F. (ed.) (2017). *Beyond the migration and asylum crisis. Options and lessons for Europe*. Rome: Aspen Institute Italia. https://www.aspeninstitute.it/system/files/private_files/2017-02/doc/Beyond_the%20Migration%20and_Asylum_Crisis_web.pdf

Penev, G., & Predojević-Despić, J. (2012). Spatial Aspects of Emigration out of Serbia. Three "Hot" Emigration Zones. *Stanovništvo*, 50(2), 35–64.

Rogers, E. M. (2003). *Diffusion of Innovations* (5th ed.). New York: Free Press.

Sobotka, T. (2008). The diverse faces of the Second Demographic Transition in Europe. *Demographic Research*, 19, 171–224.

SORS (2014). *Population projections of the Republic of Serbia 2011-2041. Data by municipalities and cities*. Belgrade: Statistical Office of the Republic of Serbia (SORS).

SORS (2019). Electronic database. Belgrade: Statistical Office of the Republic of Serbia (SORS). https://data.stat.gov.rs/?caller=SDDB&languageCode=en-US

Ševčíková, H., & Raftery, A. E. (2015). bayesLife: Bayesian Projection of Life Expectancy. R package version 3.0-0. Available at: http://CRAN.R-project.org/package=bayesLife

Ševčíková, H., Alkema, L., & Raftery, A. E. (2015). bayesTFR: An R package for probabilistic projections of the total fertility rate. *Journal of Statistical Software*, 43(1), 1–29.

UN (2011). *World Population Prospects: The 2010 Revision, Volume I: Comprehensive Tables*. New York: United Nations, Department of Economic and Social Affairs, Population Division (Working Paper ST/ESA/SER.A/313).

UN (2017a). *World Population Prospects: The 2017 Revision, Methodology of the United Nations Population Estimates and Projections*. New York: United Nations, Department of Economic and Social Affairs, Population Division (Working Paper No. ESA/P/WP.250).

UN (2017b). *World Population Prospects: The 2017 Revision, Key Findings and Advance Tables*. New York: United Nations, Department of Economic and Social Affairs, Population Division (Working Paper No. ESA/P/WP/248)

UN (2019a). *World Population Prospects 2019: Summary of methodological updates introduced in the 2019 revision*. New York: United Nations, Department of Economic and Social Affairs, Population Division. https://population.un.org/wpp/Publications/Files/WPP2019_Methodological-updates.pdf

UN (2019b). *World Population Prospects 2019: Interactive data*. New York: United Nations, Department of Economic and Social Affairs, Population Division. https://population.un.org/wpp/DataQuery/

Yücesahin, M. M., & Özgür, E.M. (2008): Regional Fertility Differences in Turkey: Persistent High Fertility in the Southeast. *Population Space and Place*, 14(2), 135–158.