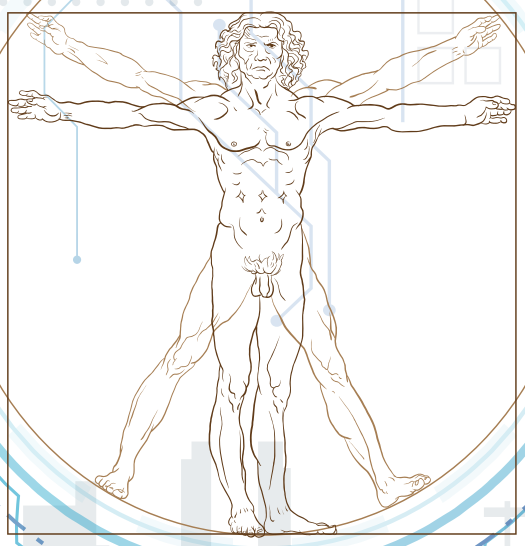
ACADEMY OF ENGINEERING SCIENCES OF SERBIA
UNIVERSITY OF BELGRADE - FACULTY OF GEOGRAPHY

THE e-FUTURE OF CITIES

BETWEEN TEMPTATIONS OF EXPONENTIAL TECHNOLOGY GROWTH AND THE CONCEPT OF HUMAN CITY

EDITOR:
BORISLAV STOJKOV



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University of Belgrade
FACULTY OF GEOGRAPHY

ACADEMY OF ENGINEERING SCIENCES OF SERBIA

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e-FoC

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BETWEEN TEMPTATIONS OF EXPONENTIAL TECHNOLOGY GROWTH AND THE CONCEPT OF HUMAN CITY

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DEMOGRAPHIC CHANGE AS OPPORTUNITY OR CONSTRAINT FOR TECHNOLOGICAL DEVELOPMENT AND ECONOMIC GROWTH IN CITIES OF SERBIA

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Abrstract: *Demographic change, technological development and economic growth are seen in the group of the largest global challenges nowadays. Even though it might not be intentional, they are interconnected and play role of cause and consequence for each other. The nexus between demographics and technology and their interactions have the power to stimulate or to hinder growth, therefore the question what features demographic structure should have in order to push technology and economy forward is relevant to answer.*

Since the time known to humanity, global population increases. The increase has been also growing, meaning that humanity needed less and less time to reach additional billion – the 2 billionth, 3 billionth, 4 billionth, 5 billionth, and the 6 billionth took 123, 33, 14, 13, and 12 years, respectively. But, for the 7 billionth the humanity took 13 years, in addition to an estimation that the total population of the Earth will stop growing within the lifespan of people who live today. In addition, OECD estimates that there is going to be 51 elderly per 100 individuals of working age, which is only one among arguments proving another aspect of demographic change – aging population.

This paper aims at better understating of relations between demography, technology and economy in urban context of Serbia. Statistical data at the level of cities, as they are defined by the Law on Territorial Organization of the Republic of Serbia (2007), are analysed regarding all three aspects, including depopulation, population aging, education structure, working population capacity, employment in technology, etc. The analysed sections of data are interpreted in mutual correlation, thus indicating features of demographic change and their expected outcomes in technology and economics.

Keywords: *demographic change; technological development; economic growth; future of cities; Serbia*

1. INTRODUCTION

In the era of globalisation, the World deals with increasing number of challenges at global scale. Demographic change, technological development and economic growth belong to this group of challenges (RAND Corporation, 2004; Asian Development Bank, 2019; INSEAD Knowledge, 2019). In terms of demography, the most economically prosperous and even some developing countries deal with demographic change, i.e. with depopulation and population aging. Even though number of the Earth's inhabitants has risen since it is known for the human kind, the pace of its increase started to slow down: it took 123, 33, 14, 13, and 12 years respectively to gain the 2 billionth, 3 billionth, 4 billionth, 5 billionth, and the 6 billionth inhabitant, but for the 7 billionth the humanity took 13 years. It is estimated that the trend of decreasing increase will continue and that it will turn to population decrease within the lifespan of generations who live today (Wise, 2013). Based on probabilistic projections (taking in account a set of the key factors affecting population growth), if population at global level get to continuity of 1.5 fertility rate (close to current European average), then Earth's population will fall to half in comparison to the second decade of 21st century and to about 1 billion by 2300 (Ibid.). In addition, share of older population (over 60) increases globally. In 2017 it was about 13% in total World's population, and it grows approximately 3% per year (United Nations, 2017). In OECD countries there is already 28 people of age over 65 for every 100 people of working age (18-64), which is estimated to grow to 51 elderly per 100 individuals of working age (OECD, 2012).

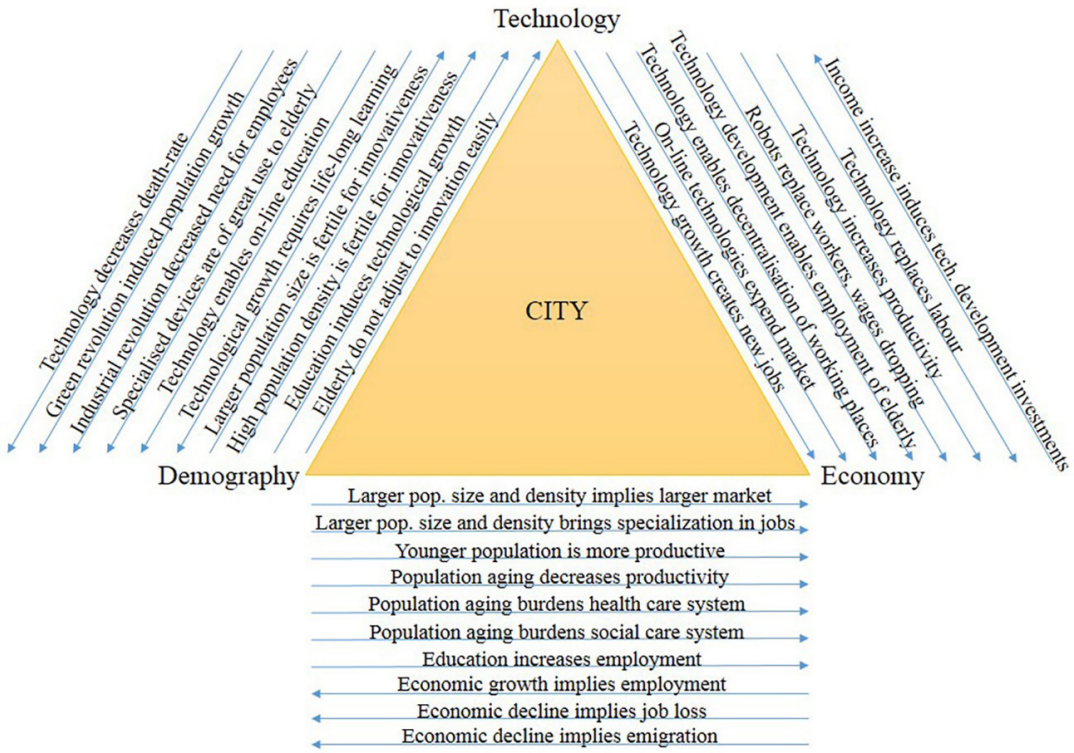

Figure 1: The city context – interrelations between demography, technology and economy. Source: the authors.

Even though it might not be intentional or obvious, demography, technology and economy are interconnected and play role of cause and consequence for each other (Allenbay, 2011) (Figure 1). Demographic structures and trends influence technology and economy directly, but also can boost changes in one of the fields by influencing another. Thus large population size and high population density represent fertile ground for innovativeness in technological development, as well as higher education of population induces technological

growth (Klasen and Nestmann, 2004; Bini Smaghi, 2010). In the case of societies that deal with demographic change, demographic influence on technological development is negative, because elderly are the part of population the least adaptable to innovation (Greenhill, 2011).

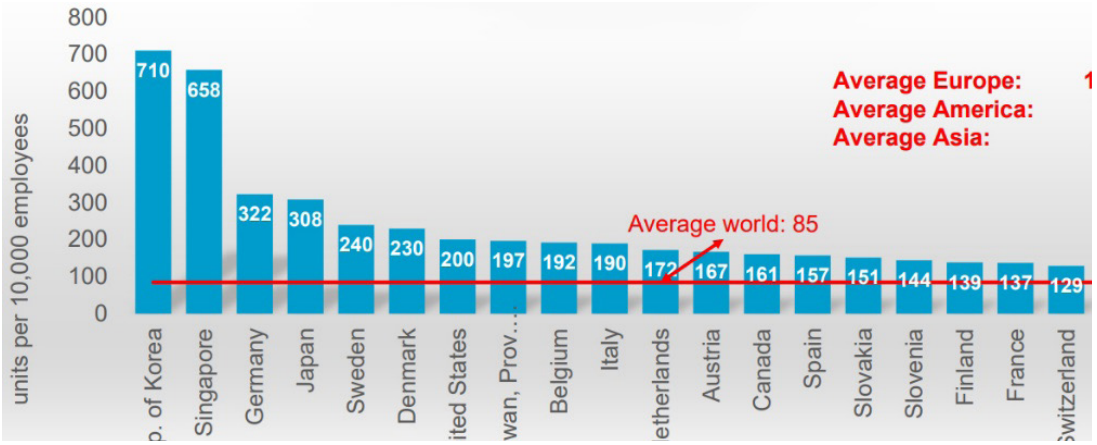

Figure 2: Number of installed industrial robots per 10,000 employees in the manufacturing industry (2017). Source: International Federation of Robotics (2018)

In the reverse direction, advances in technology enabled death-rate decrease and secured further growing of population thank to green revolution and introduction of machines that increase productivity in agriculture and more food for humankind (RAND Corporation, 2004; Hoover, 2016). With the first industrial revolution, machines replaced some processes and enabled shorter working time and reduction of employees, which is the process continuing even nowadays (Figure 2) (Allenby, 2011; Chakravarty, 2016). While need for employees reduces in the same fields, it increases in other: speed of new technology development demands life-long learning that is nowadays available, thanks to the technologies, in location irrelevant education (on-line study programs) (RAND Corporation, 2004; OECD, 2012; Bricka et al., 2015; Chakravarty, 2016; DENKWERK, 2019). Finally, technology responds to demographic issues such as aging population with specialised devices that are of great use for elderly population, especially those that cannot move without assistance (Bundesministerium für Bildung und Forschung, 2013; European Union, 2015; Rodriguez-Montemayor, 2016; Laudicina, 2018).

In the relation to economy, demographic structures and trends influence it by population size, population density and education structure. Economic strength of large population is partially in their capacity to specialize work force in different jobs and skills, so that production process is more efficient. In addition, when combined with high density, large population easily secure much larger market for their products within smaller and continuous space (lower transport costs) (Klasen and Nestmann, 2004). Younger population is expected to be more productive and motivated to work, while, on the other hand, high share of elderly decreases productivity, burdens health care and social care systems (Greenhill, 2011; Wasiluk, 2013). Depending on education structure and level, certain society will have more success in employment and production (RAND Corporation, 2004; Bini Smaghi, 2010; Rodriguez-Montemayor, 2016; Institute for Emerging Issues, 2017; DENKWERK, 2019). In return, economy can boost increase of population by increasing job offer, which is lately conducted through immigration instead of fertility rate, but on the other hand, decreasing economic growth usually leads to emigration from such areas to more prosperous ones (Boserup, 1981).

The third aspect of mutual relations consists of connections between technology and economy. In this relation, direct influence of technological growth and development on economy seems to be more complex

in comparison to one major influence of economy to technology, which is increase of investments in technological development in case when the income and GDP increase (OECD, 2012; Klasen and Nestmann, 2004). The countries that deal with employment deficiency in labour use technologies to replace humans at working place, but since some robots are more efficient than people, technological advancement often leads to drop of requirement for labour, which further causes drop of wages for certain (replaceable) jobs (RAND Corporation, 2004; Hoover, 2016; Chakravarty, 2016; Laudicina, 2018). In contrast, new technologies also create new jobs and enable development of special equipment to increase accessibility and adaptability of elderly to working process. Its influences are relevant in such an extent that they expand market with almost no limitations (on-line sales) or enable decentralisation of working places for those jobs doable and deliverable through the Internet (Klasen and Nestmann, 2004).

The urbanisation still plays active role in population distribution on the globe (Figure 3), so it is relevant to note that increase of urban population is projected to continue in the following decades in spite of the fact that most societies suffer from depopulation and population aging. Since cities are cores of population concentration, cores of technological development, innovativeness and economic growth, appears that cities are of utmost importance for revealing and understanding demographic, technological and economic processes. It is not only for their presented interrelations, but also due to the relevance of these relations in shaping urban environment: combining demographic structure and technologies, urban planners model traffic, urban structures, infrastructure, etc. (Bricka, 2015).

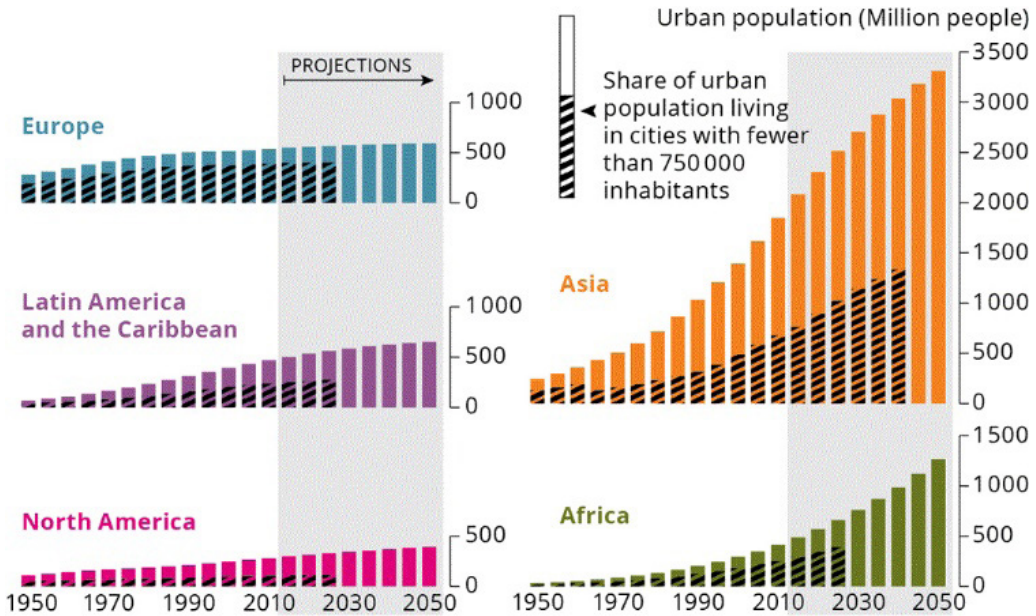

Figure 3: Urbanisation process in the World. Source: European Environment Agency (2015).

Therefore, this paper focuses on the case study of Serbia, particularly cities, in the context of future expectations when it comes to those three major determinants of the city development – demography, technology and economy. The methodology, existing trends and structures regarding relevant parameters, results and finally the conclusion are presented in the following paragraphs.

2. METHODOLOGY

This paper aims at better understating of relations between demography, technology and economy in context of urban areas of Serbia. The research approach is rather quantitative but with significant

qualitative aspect in the result interpretation. The aim was to answer the following research question: how contemporary shifts in demographic structures will influence technological and economic development in cities of Serbia in the future?

In order to answer the question, it was necessary to choose definition of a city. In this case, the list of cities as they are defined by and given in the Law on Territorial Organization of the Republic of Serbia (2007) was applied, which implicates that a city is administratively defined territory consisting of more than one settlement – of which some are urban, while other are rural – with its administrative centre as gravitational centre: Belgrade, Bor, Valjevo, Vranje, Vršac, Zaječar, Zrenjanin, Jagodina, Kikinda, Kragujevac, Kraljevo, Kruševac, Leskovac, Loznica, Niš, Novi Pazar, Novi Sad, Pančevo, Pirot, Požarevac, Prokuplje, Smederevo, Sombor, Sremska Mitrovica, Subotica, Užice, Čačak, Šabac.[1]

The analysis starts with examination of pure demographic parameters regarding demographic change – depopulation and population aging. Depopulation was estimated through shifts of population size in past three census years – 1991, 2002 and 2011, while aging is tested through share of elderly population (65 and more), share of young population (0-19) and old age dependency ratio (65 and more/15-64). The last parameter can be also interpreted in the field of economic development because it shows ratio between share of elderly persons and working population. The analysis continues with education parameters, also observed for the year 1991, 2002 and 2011, except for the computer literacy that was available only for the year 2011. The parameters are share of illiterate population, share of population with computer literacy, share of population with no primary education, share of population with incomplete primary education and share of high-educated population.

Another group of analysed parameters can be estimate as primarily economic, but they also interrelate between demographic structures, technology and economy. Since the data on the field of technological development at the local level are scarce, this paper relies on some parameters such as share of employees working as engineers, technicians and associate professionals, share of employees in professional, scientific and technical activities, and share of employees that perform occupation in the field of information and communication, all three referring only to 2011 because statistical census reports did not contain these categories before. On the other hand, basic parameter such as unemployment, share of working population and share of economically inactive population were analysed for years 2002 and 2011.

The analysed sections of data are interpreted in mutual correlation, thus indicating features of demographic change and their expected outcomes in technology and economics. The relations that were tested are the following:

- If decrease of population also means decrease of working population;
- If increase of jobs in technology and innovations demands increase of education;
- If technological development also means increase of unemployed;
- Finally, what features demographic structure should have in order to push technology and economy forward is relevant to answer.

3. ANALYSIS

Between 1991 and 2011 cities in Serbia lost 0.5% of population, while at the national level the loss was 8.1% (SORS, 2014a). However, the loss is not equally distributed. Namely, four cities increased their population size – Novi Sad, Belgrade, Novi Pazar and Niš – while other 24 cities lost from 0.2% (Kraljevo) up to 18.8% (Bor) (Figure 3). In the cities where population size increased, it increased by 7.3%, while those cities that lost population have lost 12.1%.

1 The data refer to the territory of the Republic of Serbia without Autonomous Province of Kosovo and Metohija. They were not taken in consideration due to the unavailability of statistical data.

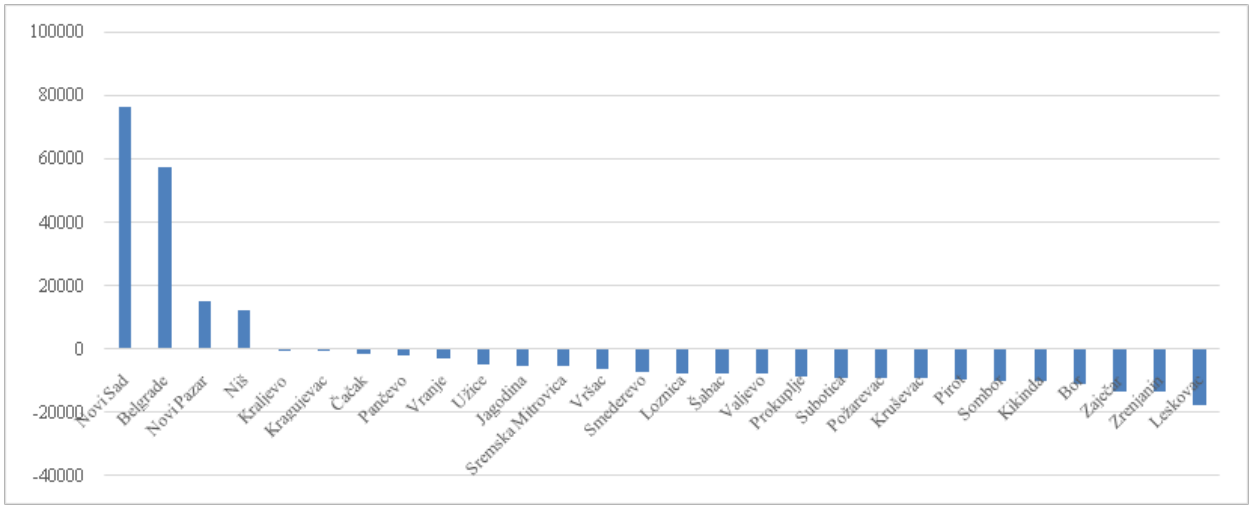

Figure 3: Cities in Serbia - population increase between 1991 and 2011. Source: SORS, 2014a.

As distribution of increase and loss varies in a great range, it is similar to distribution of absolute population size is the cities (Figure 4). The largest city is the capital city of Belgrade, which is almost five times bigger than the second largest Novi Sad and more than 37 times bigger than the smallest city in Serbia – Prokuplje. The Figure 2 also shows that the four biggest cities stand out by population size from the rest of the cities in the country. The capital has 1,659,440 inhabitants, Novi Sad 341,625, Niš 260,237, Kragujevac 179,417 and all other have in average 91,364 ihhabitants. Novi Pazar is, therefore, the only city with less than 150,000 inhabitants that constantly grew in terms of population size since 1991 (16.8%), while Jagodina, Kragujevac, Kraljevo and Požarevac recorded humble population increase between 2002 and 2011 (0.6-3.1%) (Ibid.).

Share of elderly population (65 and over) has been increasing since 1991 (Figure 5) (SORS, 1992, 2003 and 2012a). At the level of all cities together, share of elderly population was 16.4% in 2011, with the following extremes: 8.8% in Novi Pazar and 22.0% in Zaječar (SORS, 2012a). Even in Novi Pazar, where the elderly population share is the lowest, there is increase of the population age recorded. In the same year – 2011, the national average was 17.4%.

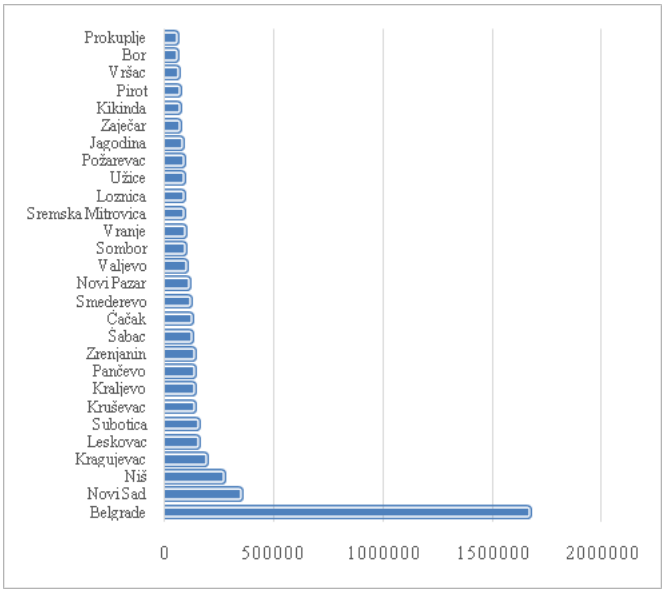

Figure 4: Cities in Serbia – population size in 2011. Source: SORS, 2014a.

The opposite case in with young population (0-19), whose share decreases in all the cities. Expectedly, Novi Pazar that had the lowest share of elderly population in 2011 has the highest share of young population, while Zaječar with the highest share of elderly had the lowest share of young population (Figure 6) (SORS, 2012a). At the national level, the share was 19.9%, with extremes of 16.9% in Zaječar and 32.1% in Novi Pazar.

The trend of the old age dependency ratio follows the previous two parameters. In cases

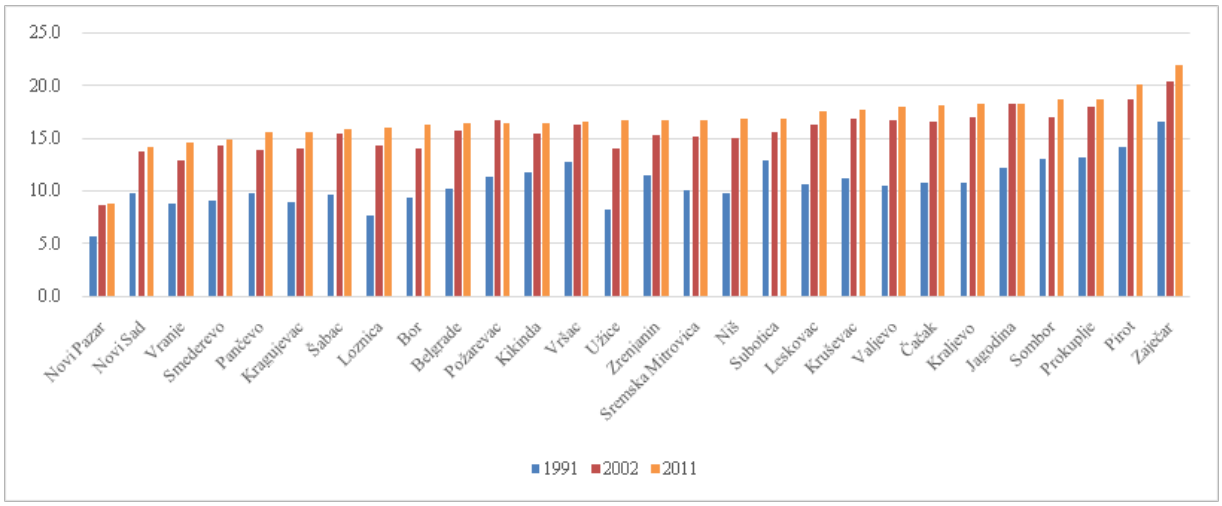

Figure 5: Cities in Serbia – share of elderly population in 1991, 2002 and 2011. Source: SORS, 1992a, 2003a and 2012a.

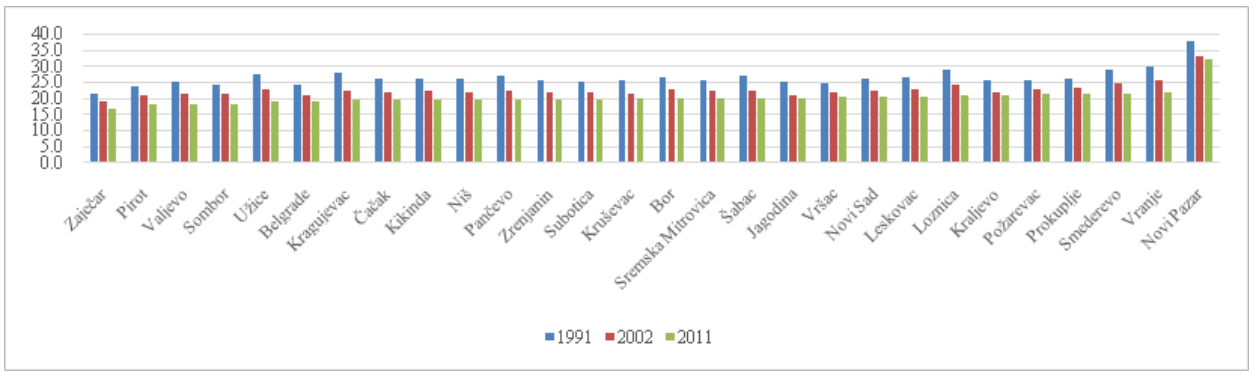

Figure 6: Cities in Serbia – share of young population in 1991, 2002 and 2011. Source: SORS, 1992a, 2003a and 2012a.

of the cities that have high share of elderly, dependency ratio is also higher and vice versa. In average it was 24.4 in the cities of Serbia in 2011. The trend is increasing, while extreme cases are again represented by Novi Pazar (6) and Zaječar (24.7; 31.1; 33.2) regarding all three analysed years (SORS, 1992a, 2003a and 2012a). For example in 2011, Zaječar and Pirot were the only cities where share of elderly individuals was beyond the share of young individuals.

In contrast to elderly and young population shifts, share of working population (15-64) does not really have a clear direction. In most of the cities it fluctuates, but in general, when the numbers are considered on the average level in three census years, share of working population decreased in the 1991-2011 time frame, and it stayed at the same level in 2011 as it was in 2002 (Ibid.). In most of individual cases, the share dropped down in 2002 comparing to 1991, but it again raised in 2011 in the way that it is similar to the level in 1991.

The competence of a population to embrace and create new technologies can be estimated through the level of education. Therefore, parameters such as share of illiterate, under-educated, high-educated and computer literate population are used here. The SORS defines as literate persons those who are 15 years old or more and know how to read and write. Regarding this criterion, a trend is positive, i.e. share of illiterate decreases in Serbia and the cities in Serbia (Table 1) (SORS, 1992b, 2003b and 2013a). Comparing to the national average, population records higher literacy in the cities than in towns and rural

areas, although the difference between those types of areas decreases over time. However, the current state should be significantly improved because contemporary societies strive for complete elimination of illiteracy. In contrast to the desirable figures, Vranje, Prokuplje and Leskovac had more than 10% of illiterate persons in 1991, more than 5% in 2002 and more than 3% in 2011, which qualifies them as the least literate cities. The smallest share of illiterate persons was recorded in Subotica, Novi Sad and Belgrade in all the census years. Belgrade scored 0.8% of illiterate in 2011, which is the lowest value for all the cities and analysed years.

Table 1: Education parameters in the cities (average share). Source: SORS, 1992b, 2003b, 2013a.

Education parameters	1991	2002	2011
Illiterate	5.9	3.3	1.9
No primary education	9.2	5.6	2.7
Incomplete primary education	23.3	15.2	10.6
Completed high education	8.3	10.3	14.9
Computer literate	n.a.	n.a.	33.3
Computer illiterate	n.a.	n.a.	51.8

Regarding primary education, parameters trend is also decreasing. Considering individuals age 15 or more years old that have not completed not even a one grade of primary school, their share in population of the same population cohort decreased from closely 10% to 3% (Table 1) (Ibid.). In addition, population with incomplete primary education (including those that are over 14 and are still in the process of primary education) decreased from more than 20% to about 10% (Table 1). In comparison to the national average, the cities have slightly better rating, which indicates that population in towns and rural areas is not rated far below (Ibid.). The highest share of persons with no school was in Leskovac and Prokuplje, slightly more than 15%. The highest share of persons with incomplete primary school was in Zaječar, with 32% in 1991, 23% in 2002 and 16% in 2011. The lowest shared regarding the first parameter is recorded in Belgrade, Novi Sad and Niš, while regarding the second parameter it was the case of Belgrade, Novi Sad, Niš and Novi Pazar. In 2011, Belgrade was the best rated city in Serbia with 1.2% of population with no primary school and 4.1% of population with incomplete primary school.

Considering the share of high-educated individuals (bachelor and master), the trend is increasing, starting with less than 10% in 1991, and surpassing 15% in 2011 (Table 1) (Ibid.). The data refer to all the cities in average. In 1991 25 out of 28 analysed cities had less than 10% of high-educated persons, in 2002 the number was 16, and in 2011 there was only one city. The city was Novi Pazar, where the share of high-educated increased from 5.3% to 9.7%, but it still kept being the most inconveniently rated city in Serbia. On the opposite side of the list is Belgrade, where the share grew from 17.7% in 1991 to 27.8% in 2011. The other two cities that followed Belgrade over time are Novi Sad and Niš.

The SORS reports about computer literacy for population of 15 years age or older, by counting those who are familiar with all four computer operations (text editing, table creation, sending and receiving an e-mail and the internet usage), while partially literate are those who are familiar with at least one, but less than all four operations. Since the relevance of computer literacy started to increase in Serbia latter than in developed countries, the Census 2011 was the first one to collect this type of information. According to the information collected, one third of the urban population was computer literate, while 51.8% were computer illiterate (not familiar with any of the computer operations) (Table 1). The highest

computer literacy was recorder in the largest cities – Novi Sad (50.8%), Belgrade (48.1%) and Niš (41.3%). On the other hand, the lowest number of computer literate in 2011 was in Novi Pazar, with only 24.1% of population being familiar with various computer skills. Even though population in Novi Pazar does not operate equally with all computer skills, they were computer educated at least to a minimal level, in contrast to population in Leskovac, where the share of population with no familiarity to any of the computer operations was the highest (SORS, 2013a).

Share of unemployed individuals in working population (15-64) decreased in the cities from 2002 to 2011 (Figure 5) (SORS, 2004 and 2012b). In the former reference year it was 19.7%, while in 2011 it was 16.1%. However, in some cities occurred an increase of unemployment – in Zaječar, Prokuplje, Leskovac and Novi Pazar (an extreme case with 26% in 2002 and more than 30% of unemployed in 2011). In 2002, Belgrade (14.1%) and Požarevac (13.1%) were the only cities where unemployment was under 15%, while in 2011 there was 12 other cities in this category, again with Belgrade (8.4%) and Požarevac (9.3%) as the best rated.

Economically inactive population is defined as children aged below 15 and pupils/students 15 and over, pensioners, housewives, and those who did not work or looked for a job in the week prior to census and were not in a position to accept a job even if they would be offered two weeks after the Census.[2] Considering population cohort defined like this, its share in working population increased significantly between 2002 and 2011 (Figure 7) – from 50.8 % to 86.0% in cities of Serbia (SORS, 2003c, 2013b). Observing at the individual city level, increase occurred in each case. In 2002, Belgrade and Subotica (cc. 45%) were in the best position in 2002, which changed in 2011. In the last census year, Valjevo (75.4%), Novi Sad (77.4%) and Užice (79.8%) were in the best position, while all other cities had more than 80%.

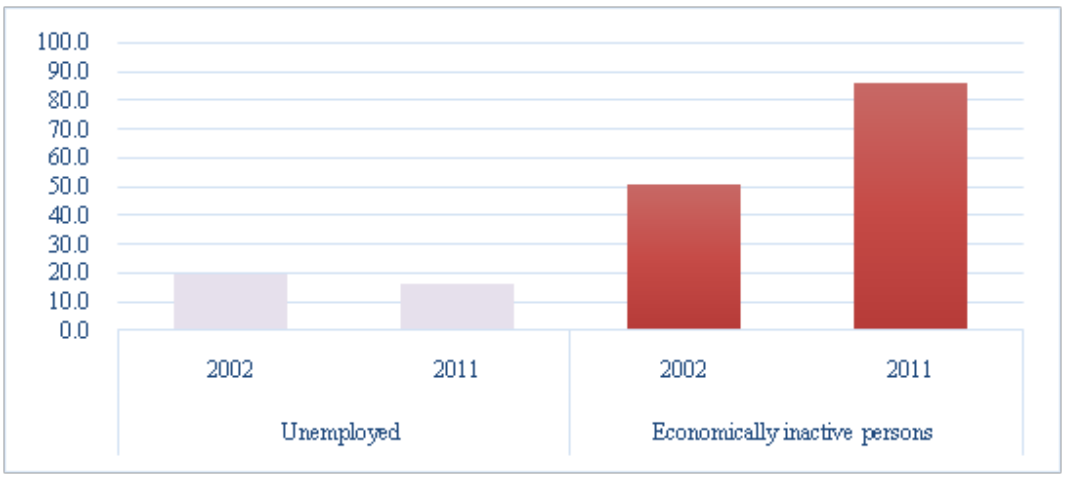

Figure 7: Cities in Serbia – share of unemployed and economically inactive persons in working population (15-64) in 2002 and 2011. Source: SORS, 2003c, 2013b.

The existing statistical reporting allows insight into structure of employees in Serbia, particularly regarding professions that could be brought into direct relation to use of technology, innovation and ICT. There are three categories – employees working as engineers, technicians and associate professionals; economically active population that perform occupation in professional, scientific and technical activities; and economically active population that perform occupation in the field of information and communication. According to the Census 2011, the last category is the least numerous, e.g. the share of employees in ICT sector were

2 The statistical reporting categories were changed in the Census 2011 when compared to the Census 2002: the data for 2002 reffer to the „economically dependent population" category. Therefore, the interpreted growth between those two years should not be literary taken.

small part of the "working body" in Serbia (1.6%) (SORS, 2014a). A slightly more numerous category were those employed as professional, scientific and technical staff (2.7%) and the highest share was taken by the engineers, technicians and associate professionals (16.2%) (Ibid.) (Figure 8). The capital – Belgrade, has the highest share in all three categories, followed by Novi Sad and Niš regarding ICT sector, by Novi Sad and Pančevo regarding professional, scientific and technical activities, and finally by Pančevo and Niš in the case of engineers, technicians and associate professionals.

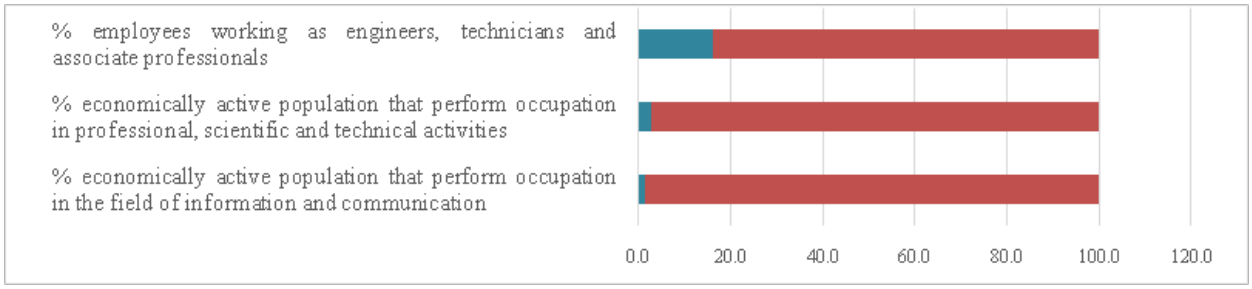

Figure 8: Cities in Serbia – share of employees working in technical and scientific disciplines in economically active population that perform occupation (2011). Source: SORS, 2014a

4. RESULTS

All together, the cities in Serbia are losing their population. So far the "winners", i.e. the cities with increasing population size, are solely four cities out of 28, including the three largest cities and one that keep the pace thanks to different birth-rate of Bosniacs that represent the majority there. A birth-rate that is common for the rest of the country, which results with depopulation in most of the towns and villages in Serbia, indicates that population growth in the three largest cities – Belgrade, Novi Sad and Niš – is the consequence of the migration. Smaller cities, towns and particularly rural areas, represent a "population pool" or "reservoir of population" for the largest cities, because population emigrates from the pool and immigrates into the cities. Since the population pool has been empting already for a couple of decades, it is disputable for how long this process could continue in the future. In addition, the population size difference between few largest and the rest of the cities is significant, so that overall number of inhabitants in all smaller cities is smaller than number of inhabitants in four largest cities together.

When it comes to population age structure, the existing trend is firm and steady at the national level, at the level of all cities together and each city individually. The population in Serbia and Serbian cities is aging. The share of elderly individuals increases, while the share of young individuals decreases. At the national level, the share of young (defined as age between 0 and 19) is higher than the share of elderly, but in three cities – Zaječar, Pirot and Sombor – the share of elderly has already surpassed the share of young, while in other 22 cities the share of young is higher than the share of elderly individuals only up to 5%. This fact, together with the fact that the share of young individuals in the cities of Serbia in 2011 was equal to the share at the national level and a slightly lower share of elderly individuals indicates that the "population pool" is getting old, so that it will lose its capacity and role as the population reservoir due to age structure.

The analysis has shown that the working population trend is not clear, although it decreases in general. Since the trend is very similar at the national level, the working population shifts can be most probably interpreted through the decrease of young individuals share. In the past couple of decades the "population pool" had sufficient capacity to keep replacing working age cohort from the pool of young individuals. But, in the future, as it was previously stressed, the young individuals will keep emptying the pool.

Additional economic problem is unemployment. Although it decreased between 2002 and 2011, rates are

rather high and if they would continue to decrease in the same pace, it would take more than 40 years to diminish it. Unemployment is higher at the national level than at the level of the cities, which corresponds to the stand that the cities are the main gravitational zones. Combined with increase of economically inactive population (more than 35%), where the best rated city in 2011 had more than 75% of them, indicates that share of dependent population (depending on employed) is very high and not economically sustainable for a long run.

Although illiteracy, share of persons without or with incomplete primary education decreases on the one hand, and on the other hand share of high-educated increases in Serbia and Serbian cities, there is still a lot of work to be done on complete extinction of illiteracy. In comparison to national average, computer literacy in the cities is about 5.5% higher, but in general, the score about 40% of computer literate population is rather low.

5. CONCLUSIONS

How contemporary shifts in demographic structures will influence technological and economic development in cities of Serbia in the future? Since it is disputable for how long at least some of the cities in Serbia will be able to demographically grow, the answer is not optimistic. The depopulation, and indirectly decrease of population density (except in two largest gravitational centres towards which gravitate practically the population of the entire country), the innovativeness in technological development is in danger, with possibility that it remains limited on couple of urban centres in the country.

Along with this challenge goes the population aging, which is also in negative correlation to technological development. The elderly population is getting more numerous and its share in overall population increases. Parallel to it, the share of young individuals decreases, while the share of working population remains only slightly altered. However, expectations can hardly be optimistic regarding the length of time for which the trend will continue in the future because individuals that are now young will not be sufficient in number to keep exchanging individuals in working population that will shift to the group of elderly persons. In the case the share of elderly continues to grow and working population once starts to decrease, appears that new technologies and robotisation of working and production processes will be useful alternative for the cities in Serbia. That would be in accordance with the national strategic aim to apply robotics and new technologies in the development of new products and new production processes, and in line with the Strategy and Policy of Industrial Development of the Republic of Serbia (2011). But, since the capacity from the perspective of economic and demographic development for innovativeness is already low in Serbia, the changes are rather lead to the situation where the technologies will be adopted from other countries and other innovativeness centres. The similar outcome can be expected in the case of the technologies that are of use for elderly individuals in order to involve them in working process. The retirement age limit shifts towards higher values in Serbia, therefore, the technologies will be of increasing benefit for the society.

Since that technologies allow decentralisation of working places, Serbia should put an accent on the technological processes and their adoption in the future, in order to make a positive influence on territorial cohesion and balanced population distribution. As population size decreases in most of the settlements (also population density), which leads towards shrinkage of the market, economic development could be supported by investments into products and services that are sold on-line. This indicates that the technology would play a relevant role in economic and demographic empowerment, especially regarding the position in which Serbia currently is. But, in addition, efforts should be put also into social component, especially into education, because technology means nothing if there is insufficient number of those who know how to use it.

Share of unemployed and economically dependent population is too high to be economically sustainable in the future, especially combined together. Assumption is that this is rather caused by slow adoption and adaptation of newly and elsewhere developed technologies, than caused by the replacement of labour by technology.

Therefore, computer literacy and adaptation of current education programs to new (technical-technological) skills, is significantly more meaningful, also as Hoover (2016) reports, than formal education as it is today and increase of high-educated individuals *per se*. The creation of new technologies will bring new jobs that will require specifically qualified labour. The computer literacy of population in the cities of Serbia is not at the satisfying level when observed in the context of the European population in the 21st century, which needs to be changed in order to start contributing to the national economic development in the future.

In conclusion, technology could bring a significant positive influx into economic development of Serbia and Serbian cities, especially regarding its current demographic structures. Unfortunately, chances that the technology will be designed and produced locally are very low, due to the low employment rate and high economical dependency of population (income increase induces technological development investments). In contrast, the success would be already if Serbia manages to embrace existing and developing technologies coming from other countries, before it gets to the position to innovate itself. The embracement of technologies is also expected to help in social aspects. Namely, an adaptation to increasing share of elderly persons can be more successfully managed if technology is used to assist their needs. Technology plays also significant role in health-care system, by innovations in treatments and tools that extend life expectancy. Finally, before innovating in the field of technology, cities in Serbia should improve skills in using existing technologies. Since the process changes in high velocity, adaptation of formal and informal education system to life-long learning concept seems to be of utmost relevance. Only then, it can be expected that the technologies will result in positive demographic impact, such as it was green and industrial revolution of a global population increase and higher life quality (shorter working time, more efficient production, higher accessibility to market, etc.).

Demographic change, as it is currently developing in Serbia and its cities, represent rather a constraint than opportunity. However, an adoption of contemporary technological discoveries might be an opportunity for adaptation to and mitigation of demographic trends, thus also creating better environment for an economic development in the country.

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