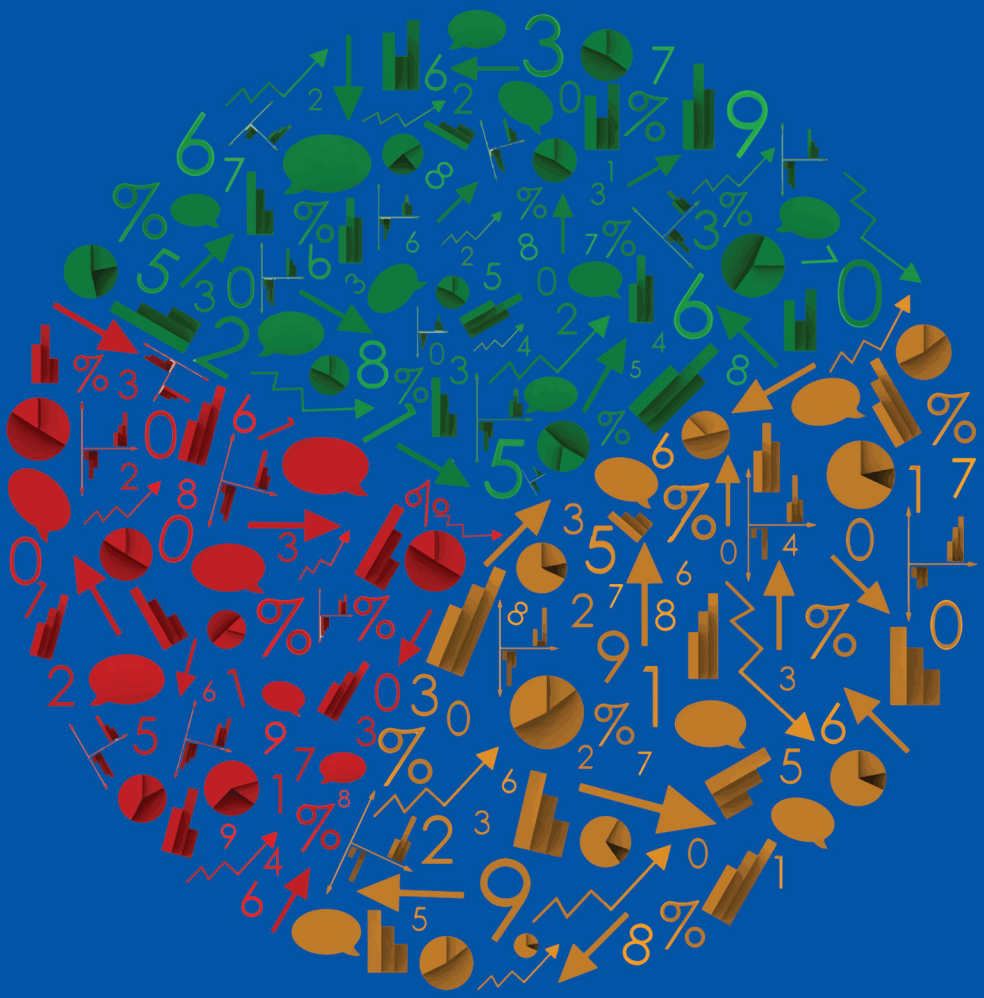
Republic of Nort Macedonia
State Statistical Office

1945-2020

MAKSTAT

Challenges of Official Statistics in the Era of Globalisation and Digitalisation



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The cover was made according to the idea of the student Petar Kalimanovski from the Faculty of Mechanical Engineering in Skopje, under the mentorship of Professor Ladislav Cvetkovski from the Faculty of Fine Arts in Skopje and Professor Jelena Djokic from the Faculty of Mechanical Engineering in Skopje.

Introduction

Dear readers,

We present to you the collection of papers entitled "The challenges of official statistics in the era of globalisation and digitalisation." A challenging title for a conference planned to mark the great anniversary of the State Statistical Office - 75 years of existence and professionalism as the main producer and coordinator of the national statistical system.

The interest for participation in the Conference and the papers submitted by a large number of experts from the country and abroad were a cause for great satisfaction.

However, official statistics once again faced a major and as yet unknown challenge - the Covid 19 pandemic - an unknown and invisible enemy that has made us all, the entire world, change the way we think and act.

This time, too, producers of statistics have successfully handled and are handling the new situation, successfully performing their duties, but they had to, and will have to for the foreseeable future, give up some fine traditions of gathering and socialising of statisticians and statistics enthusiasts.

The Conference had to be cancelled, but the submitted papers are presented in this collection, which is also published for another occasion - the celebration of World Statistics Day on 20 October. This is our modest contribution to the celebration of statistical achievements everywhere in the world, as well as in the Republic of North Macedonia, hoping that next year we will be able to gather in person in one place and celebrate our successes and achievements, especially now that we all work and live in very different circumstances.

Finally, I would like to express my sincere gratitude to all the authors who worked hard and contributed with their papers, which are in fact reflections and good practices for the development of official statistics in the era of globalisation and digitalisation.

Apostol Simovski

Director

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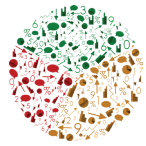

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Macedonia Megalopolis 2020

Introduction

In 2018, Marjan Bojadjiev published a journalistic article "Macedonia Megalopolis" [1]. In December 2019, a round table was held at MANU organized by the Center for Strategic Research.

This paper is a continuation of the ideas presented in 2018 and 2019 regarding the development of North Macedonia.

Basic hypotheses

This paper's basic hypotheses are the following:

- The population number is decreasing and we could freely say that Macedonia is "fading out". There is a natural decrease to which we further add the mechanical outflow of people.
- In Macedonia, the purchasing power is about one third of the European. Nominally, there is a middle class but its purchasing power is limited.
- There is a great disparity between Skopje and the periphery, especially in terms of: 1) the natural increase/decrease, 2) the GDP, 3) the salaries and the purchasing power.
- Perhaps the solution to the abovementioned issues lies in one answer: Macedonia Megalopolis! According to this concept, the whole of the Republic of North Macedonia will be treated as one large urban zone – one Megalopolis.
- To speed up the economic development and thus the development of social life as a whole in the regions, the public administration ought to move from Skopje to ten cities: Tetovo, Gostivar, Ohrid, Bitola, Prilep, Veles, Shtip, Kochani, Strumica and Kumanovo, with Skopje as the capital where the President of the Republic, the Parliament, the Ministry of Foreign Affairs and perhaps the Ministry of Health remain.
- In this way, the regions' GDP would increase by 15%.
- Economic development is followed by a harmonization of the quality of life. Social development offers a new perspective that would influence the population retention in the periphery, and even the reversible migration processes.
- For Macedonia Megalopolis to function, road infrastructure should be built. The value of this investment is around €3 billion, i.e. it corresponds to a ten-year budget deficit.

I Macedonia "fades out"

In the 2018 paper, I drew an analogy between the number of students in elementary and high school and I came to the following conclusion:

In Macedonia, the number of students is annually reduced by 2,5 percentage points.

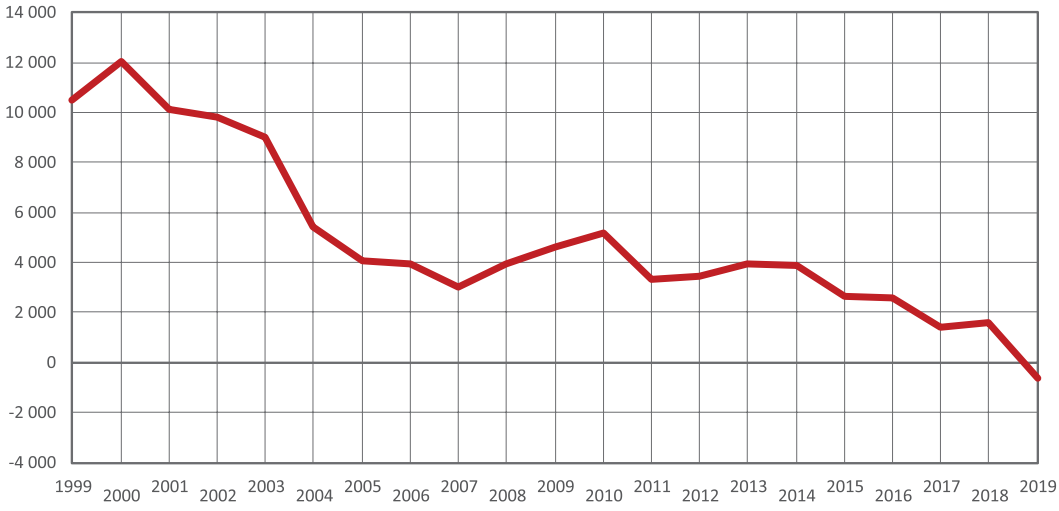
If we apply the same trend to the total number of population, then the result shows that Macedonia has 1,596,000 inhabitants.

Table No.1: Students in elementary school[2]

	Students				
2005/2006	235,691.00			Population in MK in 2012	2,022,547
2006/2007	231,497.00	4,194	1.78%	98.22%	1,986,557
2007/2008	222,359.00	9,138	3.95%	96.05%	1,908,140
2008/2009	216,180.00	6,179	2.78%	97.22%	1,855,116
2009/2010	210,381.00	5,799	2.68%	97.32%	1,805,353
2010/2011	204,439.00	5,942	2.82%	97.18%	1,754,363
2011/2012	198,856.00	5,583	2.73%	97.27%	1,706,453
2012/2013	191,051.00	7,805	3.92%	96.08%	1,639,476
2013/2014	192,165.00	-1,114	-0.58%	100.58%	1,649,035
2015/2016	185,992.00	6,173	3.21%	96.79%	1,596,062
			2.59%		
	78.91%				78.91%

The situation continuously deteriorates, and for the first time in 2019 the natural growth is -601 people.[3]

Chart No.1: Natural growth in apsolute numbers

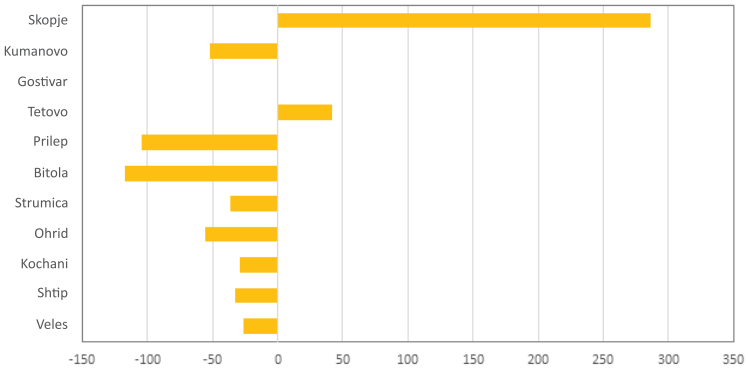


The downward trend in the previous graph, calculated with the least squares method, offers a dark prognosis for Macedonia considering that by 2020 the population will be reduced by 211,538.

Of course, it is unfortunate that in the twenty-first century we can only assume the population number and hope that there will be a census soon.

The situation becomes even more dramatic if we analyse it regionally. Here are our "future capital cities", and this is what the natural growth in them looks like:

Chart No. 2: Natural growth per regional centers[4]



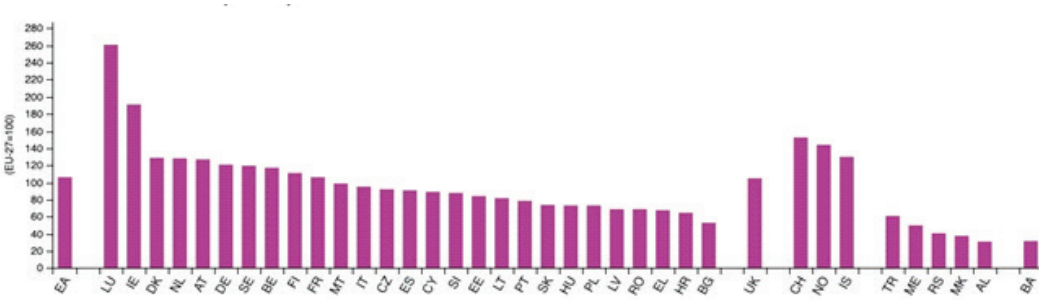
II Macedonia as a middle-income country

The middle class is the dominant engine of modern economies. There are various definitions, what actually a middle class is in terms of income, social status, education, etc.[5]

For the purposes of this paper we will be using the economic analysis of the middle 60% in terms of income. The middle class measured by the share of the middle 60% (spanning from the poorest 20% to the richest 20%) has a stagnant tendency, with an observed decline until 2010 and a very slight growth in the next period.

Macedonia is one of the poorest countries in Europe. In 2018, the GDP per capita of North Macedonia was only 38% from that of the EU.

Chart No. 3: GDP of the EU and candidate countries[6]



According to one analysis, "the Macedonian society is financially poor, i.e. there are no significant issues in the income inequality except at the very top of the income distribution."[7]

Meanwhile, there is an improvement in the Gini coefficient from "40,9 % to 31,9%, which represents a significant decline in an eight-year period, while S80/S20 notes an even greater decline from 11,3 to 6,2.[8]

Macedonia is a social country. Without the social transfers, the situation would have been dramatically worse, that is, the current poverty rate of 21,9% would have been 40,8%.[9]

Salary structure

In 2019 and 2020 there was an increase in the average and in the minimal salaries as a result of a set of Government policies. There remains the fact that the average salary is not a proper indicator of the living standard. According to the professor Marjan Petreski, the medial salary in Macedonia is 18,000 denars with 75% of the employed people earning less than that.[10]

Chart No. 4: The share of the middle 60% in the Macedonian society[11]

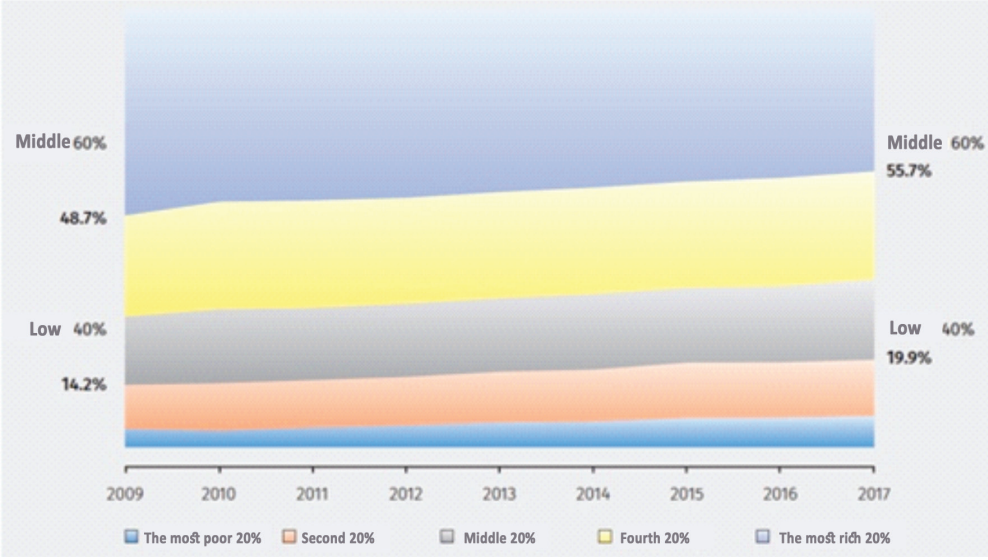
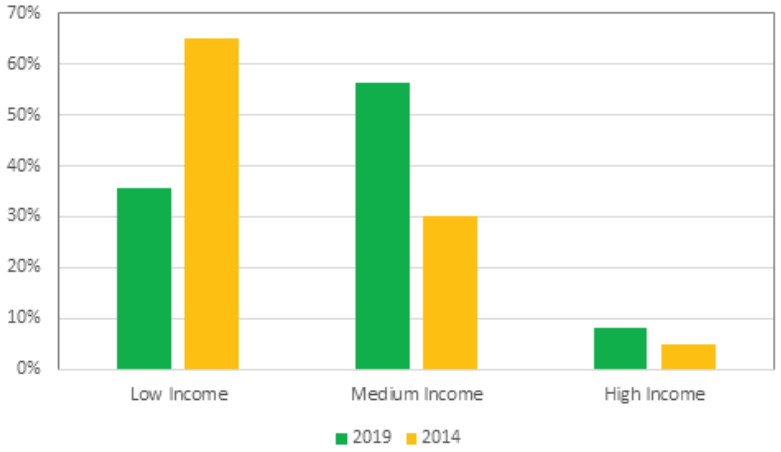


Table No. 2: Income structure in quintiles[12]

Quintiles	MK	Italy	Croatia
I	7.10%	6.23	7.2
II, III & IV	55.72%	52.05	54.4
V	37.18%	41.86	38.4

In the last five years, the salary structure marks an exceptionally positive trend. Low incomes (first quintile) are halved from 65% to 35,7%. Middle incomes are almost doubled from 30% to 55,7%. This is probably due to the aggressive Government policy aimed at increasing the minimal salary.

Chart No. 5: Salary structure in 2019 compared to 2014

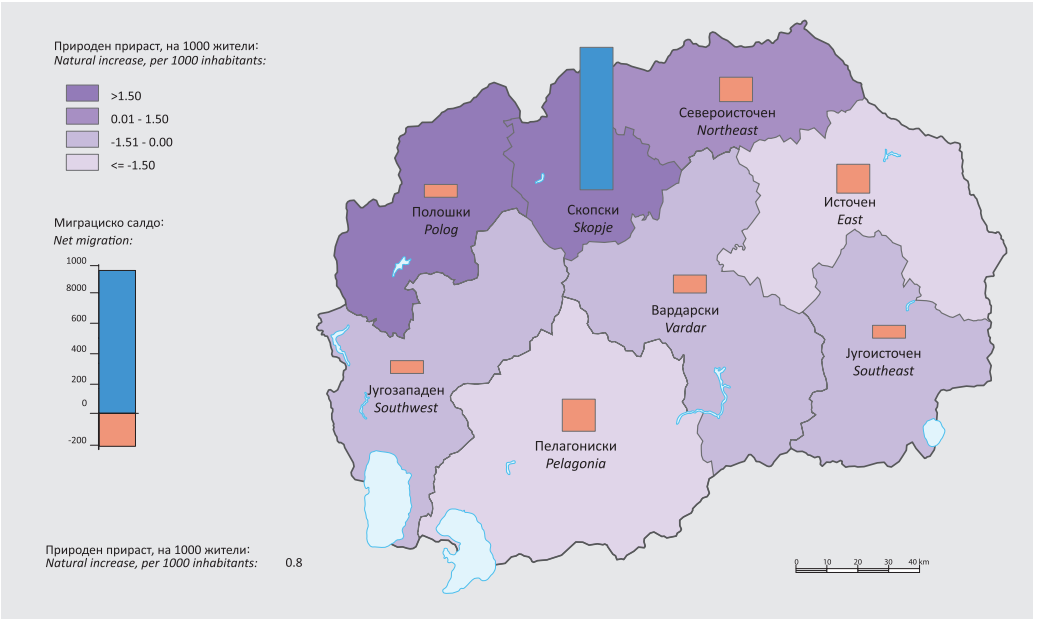


III About the regions in the Republic of North Macedonia[13]

Republic of North Macedonia suffers from population concentration as well as concentration of the economic and cultural activities in the Skopje region. Skopje accounts for 30% of the population with a 40% GDP.

All regions except the Skopje region decline in terms of migration and natural growth, which is evident from the following image:

Map No. 1: Natural growth and migration balance



The regional disparity could be seen from the following numbers, which show that only the Skopje region has a higher GDP and higher salary than the country average (Index 116 and Index 129 respectively).

Chart No. 6: Average salary per regions

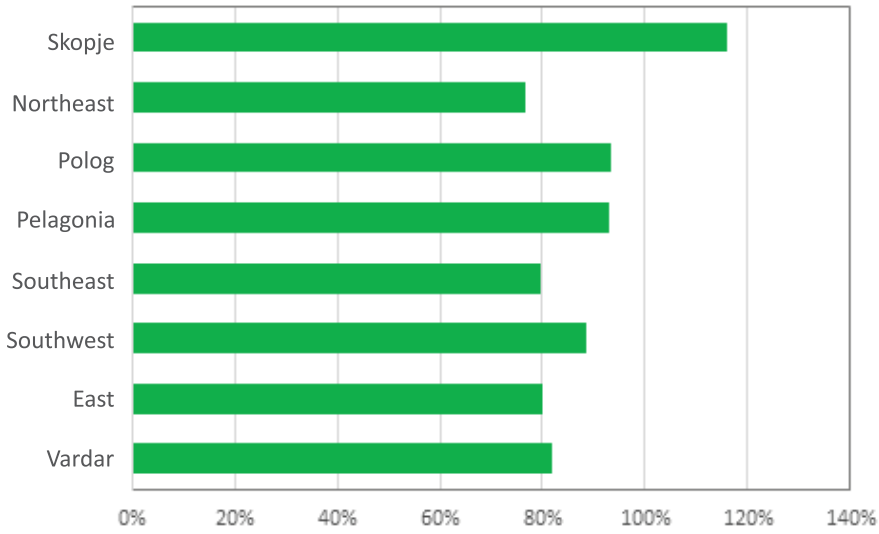
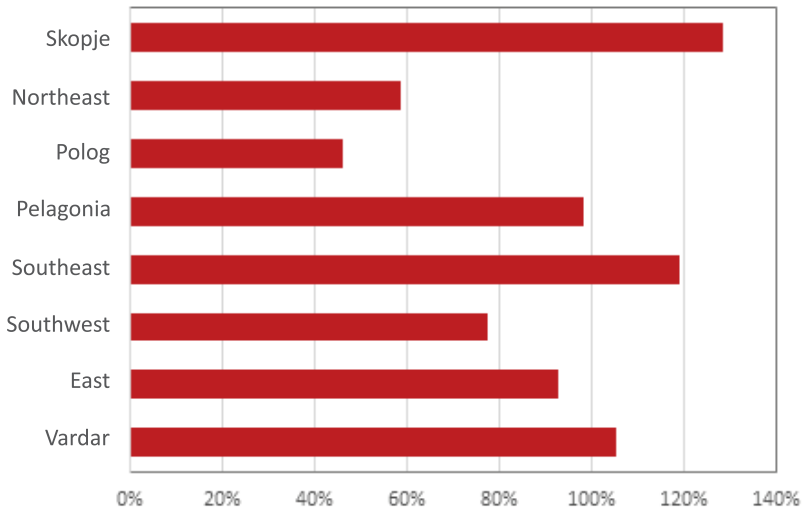


Chart No. 7: Regional GDP per capita



What would be the impact from the dispersion of the public administration in the regions?

Let us begin with the salaries. They amount to 30,6% of 239,7 billion denars[14], meaning 73,348 billion denars. If we manage to take50% of this out of Skopje, that amount would be 36,374, which would lead to a 15,07% increase of the GDP of the regions outside of Skopje due to a multiplication factor of 1,5.

Table No. 3: Calculation of the impact on GDP

MKD239,700	Budget expenditure
30.60%	Salary percentage
MKD73,348	Public administration salaries
36,674	Goal: to manage to take 50% of the public administration salaries out of Skopje
1.5	Multiplication factor
MKD55,011	Multiplication effect on GDP
9.25%	GDP percentage
15.07%	GDP percentage of the regions outside of Skopje

IV Macedonia Megalopolis: Skopje and ten regional centers

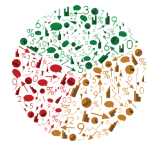
We have previously seen that Skopje is the only region with sustainable development. If we look at the whole country as a Megalopolis, then it is likely that the ideas for sustainable development, creation of jobs, environment protection and enabling citizens to live in a metropolis could work. Macedonia is and Macedonia should be seen as a Megalopolis, if we compare it to the following cities or areas:

Table No. 4: Metropolis areas

City/Metropolitan area (for Skopje, Macedonia as a whole is taken as an area)			
	km^2	Population in the city	Population in the area
Skopje, Macedonia	25 713	687 086	2 022 547
Chicago, Illinois, Metro area	28 163	2 695 598	9 472 676
Paris, France, Metro area	17 174	2 200 000	12 405 426

With this respect, the suggestion is that Macedonia should be treated as a Megalopolis – a metropolitan area with ten urban centers (with around 10,000 inhabitants) and 85 municipalities.

Firstly, the ten urban centers would be the cities with a potential to become regional centers, meaning Tetovo, Gostivar, Ohrid, Bitola, Prilep, Veles, Shtip, Kochani, Strumica and Kumanovo. Secondly, the metropolis (urban center) would be Skopje – not surpassing 40% of the population. The third segment refers to the transport, which should be suitable for a metropolis (metropolitan transport). This implies using fast highways and fast trains to connect Skopje to the ten cities - regional centers, as well as the regional centers to the smaller inhabited areas through arterial roads.



Traffic connection within the megalopolis area

The question that arises is why exactly ten cities. The cities that could become regional centers are chosen.

For instance, Tetovo and Gostivar already function as one center.

Ohrid could become a regional center for Struga, Debar, Kichevo and Resen, especially if road infrastructure is put in place that would make it possible to get from from those places to Ohrid in 30 minutes (the Corridor 8, which has an interstate character, needs to be finished as well).

Regarding Bitola, Prilep and Veles – they would be regional centers for the villages in their vicinity. Shtip, as a regional center, could cover Sv. Nikole and Radovish, while Kochani would be a regional center covering the area up to the border with Bulgaria (Berovo, Delchevo).

Strumica would cover all the populated places in the area up to Radovish.

Kumanovo would cover Kriva Palanka and Kratovo.

It was emphasized that some of the road sections represent international roads. The idea is that "international roads" could be financed by international donors. With such a projection, Macedonia should follow a zero-deficit budget policy in the current balance, while the present level of €300 million per year should be only spent on refinancing the infrastructure.

Table No. 5: Specifications of road investments[15]

International		Quality	km	€ million	Total	Factor 50%
Kichevo - Ohrid	Yes	Highway	57	11.000	627.000	627.000 €
Gostivar – Kichevo	Yes	Highway	45	11.000	495.000	247.500 €
Tetovo – Jazhince	Yes	Arterial road	28	2.540	71.120	35.560 €
Stracin – Kratovo	No	Arterial road	22	2.540 €	55.880	55.880 €
Gradsko - Prilep	No		33,5	690	23.115	23.115 €
Rabrovo, Valandovsko	No	Arterial road	8	560	4.480	4.480 €
Prilep – Bitola	Yes	Highway	43,2	7.700	332.640	166.320 €
Shtip - Strumica	No	Highway	66,4	7.700	511.280	511.280 €
Shtip – Kochani	Yes	Arterial road	32,8	2.540	83.312	41.656 €
Kochani – Delchevo	Yes	Arterial road	55	2.540	139.700	69.850 €
Kochani – Berovo	Yes	Arterial road	57	2.540	144.780	72.390 €
Kumanovo – Kriva Palanka	Yes	Highway	58	7.700	446.600	223.300 €
Ohrid – Bitola	No	Highway	89	7.700	685.300	685.300 €
Debar – Struga	No	Arterial road	52	2.540	132.080	132.080 €
Debar – Mavrovo	Yes	Arterial road	46	2.540	116.840	58.420 €
Prilep – Krushevo	No	Arterial road	32	2.540	81.280	81.280 €

V About the public administration in the Republic of North Macedonia

The public administration remains one of the most popular employment sectors in the country, which is mostly due to the job stability. Expressed in numbers, according to the Annual Report from the Registry of the Public Sector Employees in 2019[16], 132,900 people had become employed in one of the 1,324 active state institutions. According to our assessment of the population number (of 1,596,000), this would amount to 8,32% of the whole population.

The Report also analyses the number of public administration employees on a municipal level. In our future metropolitan center – Skopje, 8.098 people were employed in the municipal administration and all public institutions established by the municipality, which amounts to 15,97 people per 1000 inhabitants. To compare, the situation in the ten regional centers is as follows:

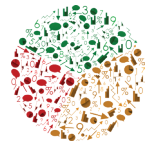
Table No. 6: Public administration employees

Municipality	Number of public administration employees	Number of public administration employees per 1000 inhabitants
Skopje	8,098	15,97
Tetovo	2,775	32,05
Gostivar	1,629	20,10
Ohrid	2,008	36,02
Bitola	2,348	24,62
Prilep	1,945	25,34
Veles	1,315	23,86
Shtip	1,393	29,14
Kochani	957	25,12
Strumica	1,653	30,23
Kumanovo	3,043	28,85

Although the number of employees per 1000 inhabitants seems to be the lowest in Skopje, we ought to keep in mind that this is due to the fact that this statistics only covers the institutions established by the municipalities themselves (794 out of which 40 are founded by the City of Skopje). Not to forget that most of the remaining (total 530) public institutions that are established by the Republic (70), the Government (432), The Parliament (27) and the President (1) are located in Skopje.

VI Complementary (or alternative) regional economic development policies

It is an undeniable fact that one of today's greatest problems is the unequal distribution of all the resources and the whole capital which we have at our disposal. This is also confirmed by UNDP's Human Development Report from 2019. The report has the completely appropriate subtitle: Inequalities in the human development in the 21st century.[17]



This idea about inequality and the need for balanced development stems from cohesive, or better – regional, policy of the EU. The emergency and the importance of this aspect of EU development is evident from the resources it dedicates to this policy – 32,5% of the whole EU budget.

Aiming at aligning our policies with the EU's 'acquis communautaire', mapping cohesive policy within the country and strengthening the capacities of the regions and the local self-government units, our country introduced the Regional Development policy. Its most important element is the Law on Balanced Regional Development adopted in 2007[18], and in terms of its implementation – a Strategy for Balanced Regional Development was adopted for the ten-year period 2009-2019. [19] According to a certain analysis published in 2017, the progress towards the accomplishment of this policy's goals is limited. [20]

It seems as if the goals of the Law on Balanced Regional Development do not differ much from the goals of Megalopolis. Among other things, they cover:

- A balanced and sustainable development of the whole territory of the Republic of North Macedonia based on the model of polycentric development;
- Decreasing the disparities between and within the planning regions and improving the quality of life of all citizens.

According to the Law, the country has an obligation to dedicate a minimum of 1% GDP to encourage the Regional development policy. The resources for financing the development projects of the planning regions are distributed to the planning regions according to the classification of the regions by their development level.

The initial goals of the Strategy were to accomplish an annual development rate of 6,5%; the average GDP per capita to reach 50% of the EU average in 2019; the least developed planning region in North Macedonia to have a GDP per capita not lower than 35% of the EU average in 2019; and the difference of the GDP per capita of the most and least developed planning region not to exceed 2,5 times in 2019.

Due to the overambitious expectations, in 2014 the Government revised its goals: instead of reaching a 50% of the EU average GDP per capita, the projection was decreased to 42% of the EU average.

According to this, if this Strategy is consistently implemented, we are talking about a €100 million per year that could be used to improve the regional development. This amount could be undoubtedly used in terms of regionalization and implementation of the Macedonia Megalopolis project.

The 2009-2019 Strategy is "armed" with quantitative efficiency indicators such as:

Table No. 7

Selected indicators	2007	2009	2013	2019 (expected)
Average regional GDP per capita	(30% of the EU average)	8.424€ (35% of the EU average)	9.500€ (36% of the EU average)	50% of the EU average
The difference in GDP per capita between the most and the least developed regions	3, 47 times	3, 32 times	2, 94 times	3 times

Conclusions

1) The Republic of North Macedonia has a serious demographic problem. All regions except Skopje are in the process of population decline.

2) The salary structure in the Republic of North Macedonia is a lot more favorable in the last five years with an increase of the middle-income class to 57% and the halving of the low-income class. The authors suggest further analysis in the domain of expense structure and an analysis from the Engels' laws[21] perspective. According to some insights, the current consumer basket is still associated with the notion of a low-income country with food expenses are dominant.

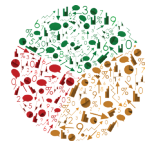
3) The regional disparities in the country are significant in terms of GDP per capita and the average salary. If the Macedonia Megalopolis concept is accepted, new possibilities for the regions' GDP growth of 15% are created.

4) To encourage the economic development and thus the development of the whole social life in the regions, the public administration should be moved from Skopje to ten other cities.

5) The authors suggest a next research that would contain an operative plan for a gradual migration of the administration.

6) In order for Macedonia Megalopolis to function, road infrastructure should be built. The value of this investment is around €3 billion, which corresponds to a ten-year budget deficit.

7) As an allternative, or even better, as a complement to Macedonia Megalopolis would be the implementation of the Law and Strategy for Balanced Regional Development that implies an investment of 1% GDP annually.



ENDNOTES

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[4] Announcement: „Natural population change of the Republic of North Macedonia in the second trimester of 2020", State Statistics Office, 27.08.2020

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QUALITY INDICATORS FOR TIMELINESS AND PUNCTUALITY OF STATISTICAL DATA

1. INTRODUCTION

The State Statistical Office (SSO) produces and disseminates official statistics about the Macedonian economy and society as a basis for making decisions based on quality information.

Quality is defined as "the totality of characteristics of an entity that bears on its ability to satisfy stated or implied need" (ISO 8402:1986) or "the degree to which a set of inherent characteristics of an object fulfils requirements" (ISO 9000:2005).

The quality of statistical results is measured to the extent to which the statistics are relevant, accurate and reliable, timely and punctual, coherent and comparable, accessible and clear, i.e. according to principles 11 to 15 of the European Statistics Code of Practice (2017).

Quality indicators are specific and measurable elements and are used in statistical practice to characterise the quality of statistics. They measure the quality of statistical products or processes. Quality indicators compare the quality between different statistics and different time periods.

Quality indicators are used to inform the users about the quality of statistics and include qualitative interpretations of quality.

2. SCOPE

In the calculation of the quality indicators, are included all published news releases and thematic publications of the State Statistical Office in the reference years from 2016 to 2019.

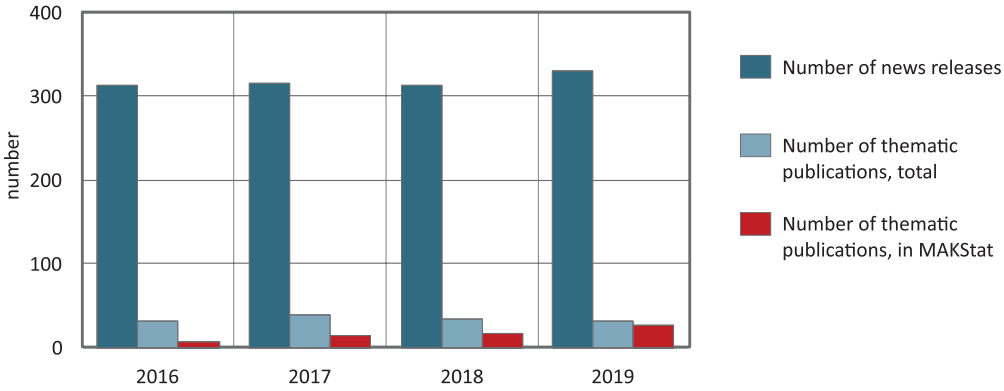
The number of published news releases and thematic publications, in the period 2016-2019, ranges from 343 to 360. In 2019, that number is 360, which is an increase of 5.0% compared to 2016 and 3.4% compared to 2018.

Thematic publications are published in printed form and/or in tables in the MAKStat database.

The SSO, according to the Dissemination Strategy, will reduce the number of printed publications and will publish the data in the MAKstat database. Because of that, the number of printed thematic publications decreased from 23 in 2016 to 5 in 2019.

The published multi-domain publications are not included in the calculation of the indicators.

Chart No. 1: Number of news releases and thematic publications



3. ANALYSIS OF THE TIMELINESS AND PUNCTUALITY OF THE PUBLISHED STATISTICAL DATA OF THE SSO

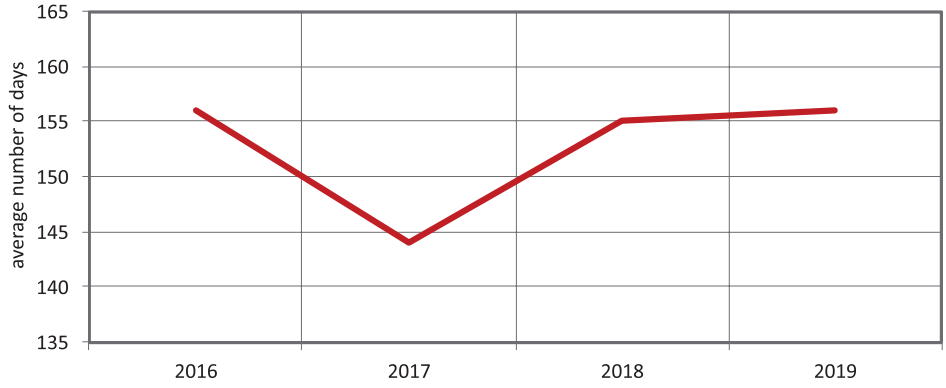
3.1 TIME LAG - FIRST RESULTS (TP1)

Time lag to the first/preliminary results means the number of days from the last day of the reference period, of the statistical data in the statistical survey, to the day of publication of the first/preliminary results in news releases in the current year.

News releases with first results include published estimated and/or previous data.

The total average time lag to the first results in the news releases in the period 2016-2019 is between 144-156 days. The smallest time lag to the first results in the news releases of 144 days is in 2017 and the largest of 156 days is in 2019 and 2016.

Chart No. 2: Time lag to the first results in news releases



The number of news releases with first results according to the periodicity of publication in 2016, 2017, 2018 and 2019 is:

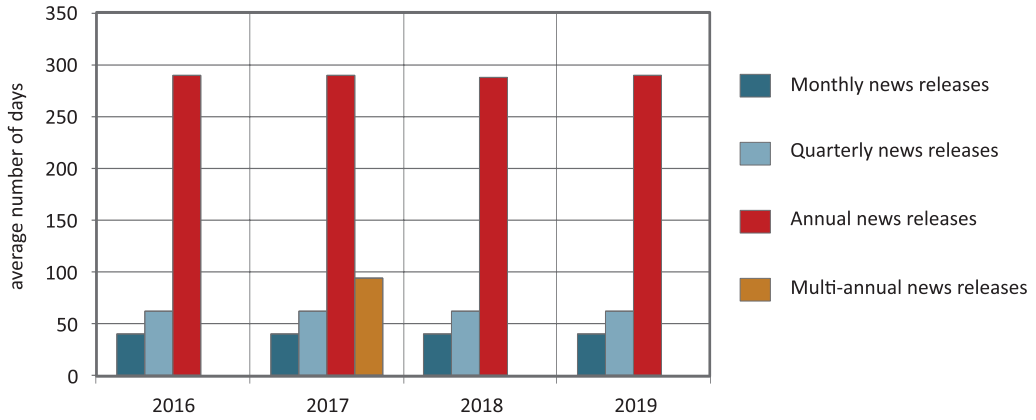
- 3 monthly news releases,
- 2 quarterly news releases,
- 4 annual news releases and
- 2 multi-annual news releases (only in 2017).

The average time lag to the first results is 40 days for the monthly news releases and 63 days for the quarterly news releases in 2016, 2017, 2018 and 2019.

For annual news releases, the average time lag to the first results, ranges between 288-290 days in the period of 2016-2019.

The average time lag to the first results for the multi-annual news releases is 94 days in 2017 and refers to the Census of capacities in retail trade and the Census of capacities in catering trade.

Chart No. 3: Time lag to the first results in news releases, by periodicity



3.2 Punctuality - delivery and publication, final results (TP3.11)

The time lag of the publication of the first (estimated/preliminary) results means the number of days between the date of publication and the date of the planned publication of the first results in news releases in the current year.

The total time lag of the publication of the first results in the news releases is 0.0 days in 2016, 2017, 2018 and 2019.

The time lag of the publication of the first results for the monthly, quarterly, annual and multi-annual news releases is 0.0 days in 2016, 2017, 2018 and 2019.

The time lag of the publication of the first results, total and by periodicity, in 2016, 2017, 2018 and 2019 shows that the news releases were published on the planned date of publication.

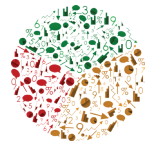


Table No. 1: Time lag of publishing of the first results

Year of publication	Total	News releases				
		monthly	quarterly	semi-annual	annual	multi-annual
2016	**0.0**	0.0	0.0	-	0.0	-
2017	**0.0**	0.0	0.0	-	0.0	0.0
2018	**0.0**	0.0	0.0	-	0.0	-
2019	**0.0**	0.0	0.0	-	0.0	-

3.3 Time lag - final results (TP2)

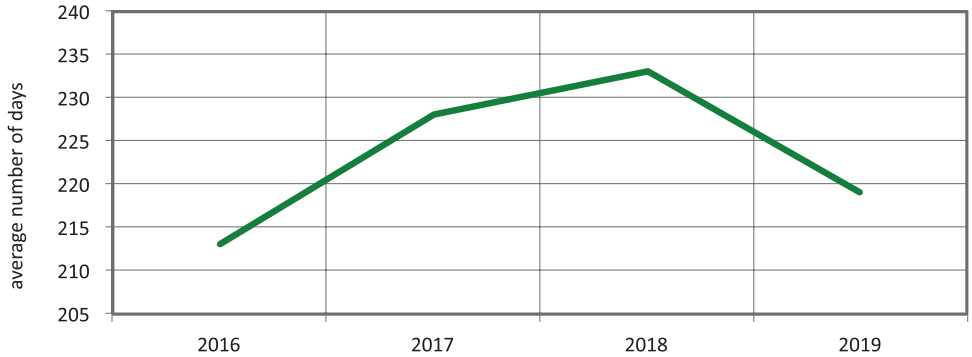
Time lag to the final results means the number of days from the last day of the reference period, of the statistical data in the statistical survey, to the date of publication of the final results in news releases and thematic publications in the current year.

The total average time lag to the final results in the news releases and thematic publications in the period 2016-2019 is between 213-233 days.

The smallest time lag to the final results in the news releases and thematic publications of 213 days is in 2016 and the largest of 233 days is in 2018.

The total average time lag between the first results and the final results is not comparable.

Chart No. 4: Time lag to final results in news releases and thematic publications



The average time lag to the final results in the news releases in the period 2016-2019 ranges from-to:

- 37-38 days for monthly news releases,
- 47-54 days for quarterly news releases,
- 61-90 days for semi-annual news releases,
- 227-261 days for annual news releases and
- 244-392 days for multi-annual news releases.

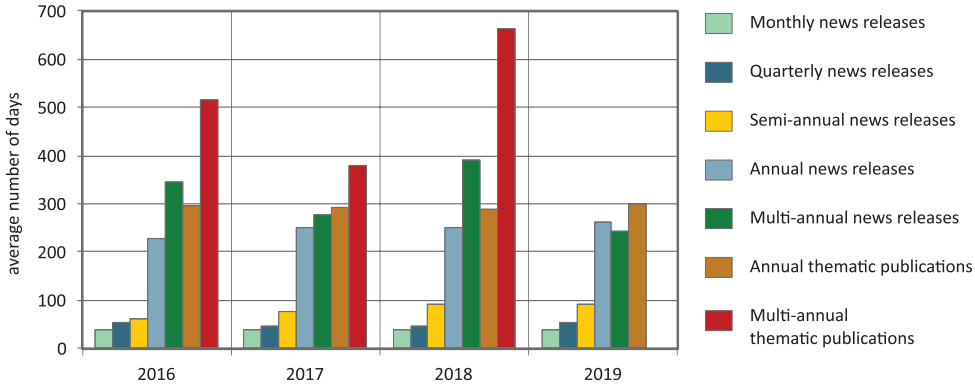
The average time lag to the final results in the thematic publications in the period 2016-2019 ranges from-to:

- 290-300 days for annual thematic publications and
- 381-662 days for perennial thematic publications.

Final results of the data in the statistical surveys are usually published in thematic publications.

Multi-annual news releases and thematic publications, by years, have greater variations in the average number of days, which is a result of the different periodicity of publishing data from multi-annual statistical surveys (2-year, 3-year, 4-year, 5-year and over 5-year).

Chart No. 5: Time lag to final results in news releases and thematic publications, by periodicity



3.4 Punctuality - delivery and publication, final results (TP3.12)

The time lag of the publication of the final results means the number of days between the date of publication and the date of the planned publication of the final results in news releases and thematic publications in the current year.

The total time lag time lag of the publication of the final results in news releases and thematic publications in the period 2016-2019 ranges from -0.7 to 0.3 days.

The time lag of the publication of the final results for the monthly, quarterly, semi-annual, annual and multi-annual news releases is 0.0 days in 2016, 2017, 2018 and 2019.

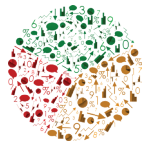
The time lag of the publication of the final results for:

- Annual thematic publications range from -2.3 days in 2017 to 1.2 days in 2016 and
- Multi-annual thematic publications range from -1.3 days in 2017 to 0.7 days in 2018.

The time lag of the publication of the final results, total and by periodicity, in 2016, 2017, 2018 and 2019 shows that the news releases were published on the planned date of publication.

Table No. 2: Time lag of the publication of the final results

Year of publication	Total	News releases					Thematic publications	
		monthly	quarterly	semi-annual	annual	multi-annual	annual	multi-annual
2016	**0.3**	0.0	0.0	0.0	0.0	0.0	1.2	-1.0
2017	**-0.7**	0.0	0.0	0.0	0.0	0.0	-2.3	-1.3
2018	**-0.2**	0.0	0.0	0.0	0.0	0.0	-0.9	0.7
2019	**0.0**	0.0	0.0	0.0	0.0	0.0	-0.1	-



4. Evaluation of the timeliness and punctuality of the published statistical data of the SSO

4.1 Timeliness of the published statistical data

The first results published in the news releases of the SSO in the period 2016-2019 are published on the planned date of publication.

The final results published in the news releases of the SSO in the period 2016-2019 are published on the planned date of publication.

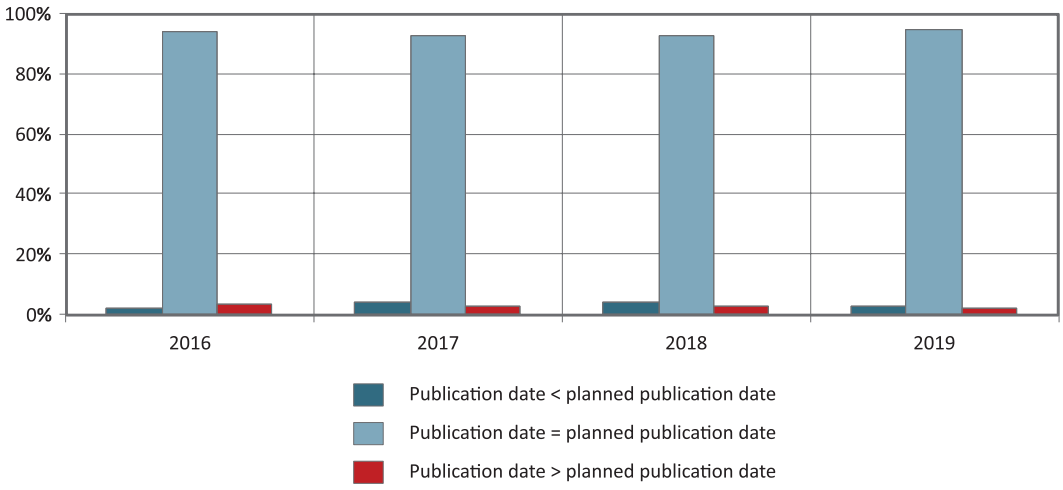
4.2 Punctuality of the published statistics

The time lag in the publication of the first results, total and by periodicity, in 2016, 2017, 2018 and 2019 shows that the news releases are published on the planned date of publication.

The time lag in the publication of the final results, total and by periodicity, in 2016, 2017, 2018 and 2019 shows that the news releases are published on the planned date of publication.

The final results published in the thematic publications of the SSO in the period 2016-2019 deviate from the planned date and the time lag of the publication of data for annual thematic publications ranges from -2.3 days in 2017 to 1.2 days in 2016 and for multi-annual thematic publications ranges from -1.3 days in 2017 to 0.7 days in 2018.

Chart No. 6: Time lag of publishing of the first and of the final results



In 2016, **96.5%** of the total published news releases and thematic publications were published before/on the planned publication date, and 3.5% were published after the planned publication date.

In 2017, **96.9%** of the total published news releases and thematic publications were published before/on the planned publication date, and 3.1% were published after the planned publication date.

In 2018, **97.1%** of the total published news releases and thematic publications were published before/on the planned publication date, and 2.9% were published after the planned date of publication.

In 2019, **97.8%** of the total published news releases and thematic publications were published before/on the planned publication date, and 2.2% were published after the planned date of publication.

Used characters

- = no occurrence

% = share

Sources of data

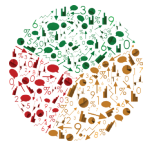
State Statistical Office (www.stat.gov.mk)

- Programe for Statistical Surveys
- Methodological Documentation for Statistical Survey
- MAKStat database
- Advance Release Calendar

References

ESS Handbook for quality reports, 2014 (Eurostat)

ESS Quality and performance indicators (QPI), 2014 (Eurostat)



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Filip Markoski, UKIM, FINKI, student

Statistical questionnaires of the primary and secondary education system

Introduction

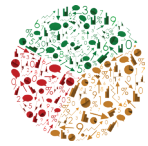
The data collection process (on any phenomenon) is the basis for the creation of both quantitative and qualitative statistical documentation. There are sectors where the statistical phenomenon may not be fully covered, and in others (due to the organizational set-up) records may be comprehensive. In this case we are talking about statistics of the elementary education system, where it is possible that the phenomenon be fully covered. In this context, the processes presented are the following: preparation of questionnaires; data collection; entering the data in the system; updating the data and using the data for the analysis of the educational system (Markoski B. 2011).

In general, the research is based on the identification and recording of data on educational institutions in primary and secondary education.

Preparation of statistical questionnaires of the primary and secondary education system

The data records on the educational institutions in the primary and secondary education are generally kept by the line ministry of education, and (arguably) a limited amount is part of the regular statistics. Our (special) perception and observation of the educational system (in our country) lead to the general conclusion that the records and statistics of the education system are not complete and comprehensive, and hence the idea of treating this system within a special geographical information system (which largely corresponds to statistics). For the immediate implementation of such a system as an imperative, the first problem was set, i.e. data collection (Markoski B. 2011).

In the absence of a systematic database on educational institutions, the preparation of statistical questionnaires of primary and secondary education system was initiated. The preparation of the questionnaires took place in three stages (Markoski B. 2002).



The first stage (of the preparation of questionnaires on the educational institutions of primary and secondary education) was based on the author's intuition (his knowledge and experience in the education system), and a questionnaire was compiled with about 80 requested pieces of information (for each school individually). The notion that the questionnaire was not complete led to the second stage of improvement.

The second stage of improvement involved testing the questionnaire in the field (direct communication with schools, data providers) In order to achieve a more serious approach and improve the questionnaire from its first stage, with the assistance of the Inspectorate of Education, it was sent for testing in about 30 schools across the country (various areas). In a relatively reasonable period of about two weeks, the questionnaires were collected and about 20 new questions and information to be collected were identified, thus expanding the second version of the questionnaire to about 100 pieces of information.

The third stage (according to the same principle) included another test of the improved questionnaire (from the second stage) in about 30 other schools, and based on the feedback, the questionnaire was supplemented with additional 21 requested piece of information, i.e. the statistical questionnaires on the educational institutions of primary and secondary education received a definite form of 121 requested piece of information.

The definite form and content of the statistical questionnaires on the primary and secondary educational institutions is presented below (Markoski B. 2002).

Republic of Macedonia
Ministry of Education and Science

PRIMARY SCHOOL REPORT
for 20/20

1. Name of the school_____

(state the full name of the school, for example, CPS "Dedo Iljo Maleshevski" - Berovo; Regional PS "Dedo Iljo Maleshevski" - v. Smojmirovo, etc.)

2. Business entity number (from single records)
Ordinal number of the unit within the entity

3. Municipality

4. Settlement

5. Street and number Telephone

6. Ownership

7. Activity

8. Date of entry in the register of schools (educational institutions)

9. Decision on the fulfillment of the condition for educational activity, number and date of issuance

10. Founder of the school / educational institution

11. Seat of the founder

12. Number of the Articles of Association

13. Date of establishment day, month, year

14. Status of the school (educational institution) according to its operation

a) four-year
b) six-year (primary music school) in eight-year
d) eight-year (combined with after-school care)
d) school for children with disabilities
e) a school that is temporarily inactive
(the data is provided by circling one of the offered modalities.The report is filled out for each CPS, Regional PS, as well as for schools which are temporarily inactive, i.e. schools where instruction does not take place)

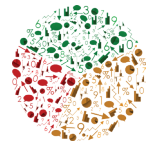
15. Treasury account _____ budget user account _____ revenue code _____program manner _____ depositary bank _____ tax number _____

16. Time of construction of the school building

a) year of construction
b) year of last renovation

17. The construction of the school building was funded by:

a) Ministry of Education and Science
b) self-contribution or solidarity funds
c) donations, grants and assistance
d) other (specify)



18. Type of construction of the school building
    a) solid construction
    b) prefabricated construction
19. Method of heating
    a) central heating
    b) individual central heating
    c) solid and liquid fuel
    d) other (specify)
20. Work in shifts
    a) one shift
    b) two shifts
    c) two with mid shift
21. Instruction is carried out
    a) in one building
    b) in several buildings, state the number
22. Material equipment
    a) number of desks
    b) number of chairs
    c) number of graphoscopes LCD projectors
    d) number of video players TVs
    e) number of computers scanners printers
    f) number of slide projectors
    g) other (specify)
23. Are there any leased premises? If yes, specify:
    a) for what purpose (specify)
    b) the area in m^2
    c) monthly rent
24. Number of premises by type and function
    a) number of classrooms___ with an area of___ m^2
    b) number of laboratories___ with an area of___ m^2
    c) number of workshops___ with an area of___ m^2
    d) number of workrooms___ with an area of ___m^2
    e) number of libraries ___with an area of___ m^2
    f) number of school halls___ with an area of ___m^2
    g) number of gyms ___with an area of___m^2
    h) number of medical facilities___ with an area of___ m^2
    i) number of other premises ___with an area of___m^2
    j) yard ___with an area of___ m^2
    i) number of outdoor sports fields___ with an area of___ m^2
    l) other___ with an area of___ m^2

25. Personal records

	Number of employees funded by MES		Number of employees funded by ancillary activities		Number of employees with inadequate education	
	M	F	M	F	M	F
Teaching staff with						
-university and higher education degree						
-upper-secondary education degree						
-secondary education degree						
-without adequate education, with qualification						
Professional associates						
-psychologists / pedagogues / sociologists						
-librarians						
Administrative and technical staff						
-secretary						
-secretary - accountant						
-treasurer						
-guard						
-janitorial service						
-kitchen workers						
-cook						
-other						

26. Total number of students in the current school year

	I grade	II grade	III grade	IV grade	V grade	VI grade	VII grade	VIII grade
TOTAL								
male								
female								

27. Total number of enrolled students in the last five school years

	1997/1998	1998/1999	1999 / 2000	2000 / 2001	2001/2002
TOTAL					
male					
female					

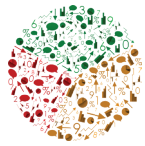
28. What is the language of instruction?

a) Macedonian number of classes_____ total number of students
b) Albanian number of classes_____ total number of students
c) Turkish number of classes_____ total number of students
d) other languages number of classes_____ total number of students
(circle and fill in the blanks)

29. Number of students by place of residence and distance from RPS

Name of settlement	Number of students	Distance from RPS

(Indicate the settlements, number of students coming to your school and distance from Central Primary School)



30. Is transportation provided for students commuting daily?

a) YES

b) NO

31. What transportation do students use to get to school?

a) urban and suburban bus lines

b) other (specify)

(circle and fill in the blank)

Completion of the report is mandatory.

Please submit it in full by mail to:

Ministry of Education and Science of the Republic of Macedonia,

_____1000 Skopje, Republic of Macedonia

and to fax number

Contact telephone numbers:

NOTES:

INSTRUCTIONS

for the completion of the report

The report on primary schools is particularly designed for the purposes of the Ministry of Education and Science of the Republic of Macedonia

1. The report shall be completed in full.

2. The report shall be completed individually for each CPS, Regional PS or a temporarily inactive school.

3. The name of a school implies the full name of the school as given in the explanation of the questionnaire. For the regional primary schools, the name of the CPS is also provided.

4. In schools in larger cities, it is recommended to provide the specific settlement (question no. 4) (e.g., "Skopje – Karposh settlement" or "Radovish – village Buchim")

5. In question number 14 e), schools that are temporarily inactive are schools that used to operate as primary schools, yet due to insufficient number of students, they currently do not operate; however, as property of the Ministry of Education and Science, they are kept in the records. In this context, you are obliged to fill in a special report on these schools as well.

6. Data in questions no. 14,17- 21 and 30 are provided by circling the chosen modalities.

7. Data in questions no. 1-13,15-16,22-27 and 29 are provided by filling in the blanks.

8. Data in questions no. 28 and 30 are provided by circling and filling in the blanks.

Republic of Macedonia

Ministry of Education and Science

SECONDARY SCHOOL REPORT

for 20/20

1. Name of the school_____

(state the full name of the school, for example, Secondary School "Naum Naumovski Borche" - Krushevo; Electro-technical High School "Koce Metalec" – Madjari settlement, etc.)

2. Business entity number (from single records)

Ordinal number of the unit within the entity

3. Municipality

4. Settlement

5. Street and number Telephone

6. Ownership

7. Activity

8. Date of entry in the register of schools (educational institutions)

9. Decision on the fulfillment of the condition for educational activity, number and date of issuance

10. Founder of the school / educational institution

11. Seat of the founder

12. Number of the Articles of Association

13. Date of establishment day, month, year

14. Status of the school (educational institution) according to its operation

a) high school

b) secondary vocational school

d) specialist school

d) school for children with disabilities

15. Treasury account budget user account

revenue code program manner

depositary bank tax number

16. Time of construction of the school building

a) year of construction

b) year of last renovation

17. The construction of the school building was funded by:

a) Ministry of Education and Science

b) funds from ancillary activity

c) donations, grants, assistance, etc.

d) other (specify)

18. Type of construction of the school building

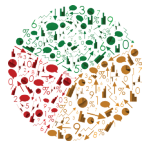
a) solid construction

b) prefabricated construction

19. Method of heating

a) central heating

b) individual central heating



c) solid and liquid fuel
d) other (specify)

20. Work in shifts
a) one shift
b) two shifts

21. Instruction is carried out
a) in one building
b) in several buildings
c) in dislocated classes

The settlement where dislocated instruction take place is_____, and the number of classes of students is_____

22. Material equipment
a) number of desks
b) number of chairs
c) number of graphoscopes LCD projectors
d) number of video players TVs
e) number of computers scanners printers
f) number of slide projectors
g) other (specify)

23. Are there any leased premises? If yes, specify:
a) for what purpose (specify)
b) the area in m^2
c) monthly rent

24. Do you use leased premises? If yes, specify:
a) for what purpose (specify)
b) the area in m^2
c) monthly rent

25. Vocations in the current school year

26. Number of premises by type and function
a) number of classrooms___ with an area of___ m^2
b) number of laboratories___ with an area of___ m^2
c) number of workshops and services___ with an area of___ m^2
d) number of workrooms___ with an area of ___m^2
e) number of libraries ___with an area of___ m^2
f) number of school halls___ with an area of ___m^2
g) number of gyms ___with an area of___m^2
h) number of medical facilities___ with an area of___ m^2
i) number of other premises ___with an area of___m^2
j) yard ___with an area of___ m^2
i) number of outdoor sports fields___ with an area of___ m^2
l) other___ with an area of___ m^2

27. Property and economic premises serving the purposes of the educational process
a) agricultural and livestock property with an area of_____m^2
b) commercial services and student internships (specify)

28. What is the language of instruction?

a) Macedonian number of classes_____ total number of students

b) Albanian number of classes_____ total number of students

c) Turkish number of classes_____ total number of students

d) other languages number of classes_____ total number of students

(circle and fill in the blanks)

29. What transportation do students use to get to school?

a) urban and suburban bus lines

b) other (specify)

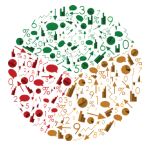
(circle and fill in the blank)

30. Personal records

	Number of employees funded by MES		Number of employees funded by ancillary activities		Number of employees with inadequate education	
	M	F	M	F	M	F
Teaching staff with						
-university and higher education degree						
-upper-secondary education degree						
-secondary education degree						
-without adequate education, with qualification						
Professional associates						
-psychologists / pedagogues / sociologists						
-librarians						
Administrative and technical staff						
-secretary						
-secretary - accountant						
-treasurer						
-guard						
-janitorial service						
-kitchen workers						
-cook						
-other						

31. Number of full-time students in the current school year

	III year	IV year	specialist education
TOTAL			
male			
female			



32. Number of part-time students and specialist education in the current school year

	I year	II year	III year	IV year
TOTAL				
male				
female				

33. Total number of enrolled students in the last five school years

	1997/1998	1998/1999	1999 / 2000	2000 / 2001	2001/2002
TOTAL					
male					
female					

34. Number of students by place of residence

name of settlement_____number of students_____

Completion of the report is mandatory.

Please submit it in full by mail to:

Ministry of Education and Science of the Republic of Macedonia,

_____1000 Skopje, Republic of Macedonia

and to fax number

Contact telephone numbers:

NOTES:

INSTRUCTIONS

for the completion of the report

The report on secondary schools is particularly designed for the purposes of the Ministry of Education and Science of the Republic of Macedonia

1. The report shall be completed in full.
2. The report shall be completed individually for each secondary school.
3. Data in questions no. 1-13,15-16,22-34 are provided by filling in the blanks.
4. Data in questions no. 14,17- 21 and 30 are provided by circling the chosen modalities.
5. In questions no. 21, if there are several settlements with dislocated facilities, they should be additionally written down, or a separate list should be provided.
6. Question no. 26 involves, inter alia, writing down agricultural land, separate livestock facilities, etc.
7. Question no. 34 involves listing the settlements where the students come from and the number of students.

If there is not sufficient space to enter all the information, a separate list should be provided.

Collection of statistical data of the primary and secondary education system

The data collection was conducted by means of submitting the definitely formed statistical questionnaires on the educational institutions, with the assistance of the Inspectorate of Education, to all primary and secondary educational institutions (schools) in the Republic of Macedonia. The originally completed questionnaires over a period of about two weeks were collected in analog format (as not all data providers are electronically connected). This was a full coverage of service providers (at the time of the survey) of about 1,200 schools (Markoski B., Daskalovski V., Stojmenov S., Chabukovski V., Atanasovski P., Petkov Z. 2001).

It is important to note that a small portion of the data was collected through a process of mapping (Srbinoski Z., Markoski B. 2009), for example, geographical coordinates of the school location, since the data providers do not have that specific information, nor are they able to find it; hence, in addition to dynamic and changeable data, the database has static or supposedly unchanging data (Markoski B. 2003).

The process of data collection is accompanied by a review and verification of the validity of data, and their preparation for entry in a purposefully organized geographical information system, i.e. an organized statistical database.

Entering the data in the system

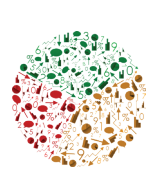
The entry of data from analog to electronic format (during the organization and establishment of a specific geographical information system) should take place with previously prepared data entry forms, with precise ciphers for each piece of information (Markoski B. 2011). The procedure should be similar for the organization and entry of data for statistical purposes.

The level of development of information technologies and information systems should give grounds for the complete electronic communication in the process of data collection and entry (Markoski B. 2002a). This enables data providers to enter their data directly through a specific data entry form in electronic format, and the statistical system to directly download and locate them in the appropriate place in the statistical database. Nevertheless, this is a matter of internal organization of the statistical system.

Updating data

Updating the data (for any database) is one of the basic preconditions for the quality of the data, and accordingly, for the quality of the statistical analyses and studies in general.

In the case of statistics of educational institutions, it is important that a large portion of the data are static (unchanging), hence once entered, the unchanging data (for example: school name, settlement, geographical or rectangular coordinates, etc.) remain in the system, and only the changeable data are periodically updated (for example: number of teachers, number of students, number of classes, etc.). This feature enables less engagement on the part of data providers, hence the statistical records of the characteristics of educational institutions (or other system, for example, health, culture, specific industries, etc.) are maintained with less effort, yet with high quality of data (Markoski B., Daskalovski V., Stojmenov S., Chabukovski V., Atanasovski P., Petkov Z. 2001).



Using the data for the analysis of the education system

The system of questions in the questionnaires is organized so that it enables various analyses from different aspects. It provides spatial-temporal analyses related to the maintenance of facilities, maintenance and change of installations, the state of inventory, etc. on the one hand, but also analyses related to the work processes, the teaching staff, the changes in the structure of students on various grounds, etc. on the other hand.

Such analyses ensure the proper planning and organization of the educational processes as a complex which involves a relatively large pool of participants at the state level, and thus relatively substantial material needs.

Other systems in the country may be organized analogously.

Conclusion

The education system in any country, including ours, based on the scope of the institutions, employees and students, is one of the more extensive systems which also entails employing relatively substantial financial and material resources.

The data records on the educational institutions are generally kept by the line ministry of education, and a limited amount is part of the regular statistics. The system is relatively large and diverse; hence it is important that it include extensive statistical records and database.

The article presents two instruments (questionnaires for primary and secondary educational institutions) for data collection and the procedure how to organize complete data coverage. It emphasizes the need for cooperation among the institutions: Ministry of Education, Inspectorate of Education and State Statistical Office, so that with minor support of the line institutions (mainly administrative-legal) a complete and quality statistical database for educational institutions will be enabled, available for diverse, dedicated and quality analyses needed for the specific sector of education and for society at large.

It has been concluded that the process of updating the data would be relatively small-scale, which in turn allows for a more efficient access by service providers and ensures the complete coverage of the education system in the statistical database.

The article also mentions the technology of geographic information systems as a tool addressing both spatial and temporal aspects of the phenomenon.

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Statistics in geographical research

Introduction

The interaction between statistics and geography is complex as geography provides statistics with the meaning of the spatial arrangement of objects, phenomena, processes, problems, consequences and predictions. Accordingly, through its data records, statistics allows for relevant analyses, whereby the specific unique characteristics are registered in each separate geographical area (region, municipality, settlement).

For the purpose of a more detailed presentation of the application of statistics in geographical research, more attention is paid to:

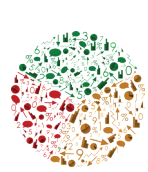
- the scope of geographical scientific analysis based on statistical data,
- the domains of study and the application of data for relevant analyses,
- the aspect of the interaction between statistical data and geographical space,
- the formation of geographical data (geographical coordinates, distances, surfaces, altitudes) based on map-related and direct measurements,
- the issue of the organization and the establishment of GISs as a state-of-the-art tool for the interaction of statistical and geographical data; and
- the guidelines for the development, organization and establishment of modern approaches to data collection, processing, analysis, updating and dissemination.

1. Scope of geographical scientific analysis based on statistical data

Geography, as a science committed to establishing a connection between the typical natural and social sciences, in its methodological approach to study covers a wide range of content related to: relief, climate, hydrography, pedology, flora and fauna, population, settlements, economic (primary, secondary and tertiary activities) and non-economic activities (Markoski B., Markoska E. 2014).

Statistical methods and statistical databases are used in the geographical studies of a large number of the above-mentioned areas. Therefore, one may conclude that statistical methods are used in almost 100% of the processes in geographical studies, and according to our rough estimate, statistical databases are used in over 70%, as a basis for spatio-temporal analyses of phenomena and processes in a specific space.

In the past, geographical research has been based on direct field research, by means of observation, interviewing, surveying, individual measurements, and other approaches. However, due to insufficient coverage, incomplete approach, etc., the geographical analyses and findings seem to have deficiencies. The



introduction of a systematic approach (by society) to records and data collection, classified by individual sectors, the organization of dedicated censuses (population, agricultural holdings, etc.) and the dissemination of statistical data, has provided the basis for solid spatio-temporal analyses.

In the development of the Macedonian geographical thought (Markoski B., 2019), on various occasions, at various scientific and professional geographical gatherings and journals, over 2000 papers have been published (about 250 papers at geographical congresses, about 200 papers at geographical symposia, about 1500 papers in geographical journals in the Republic of Macedonia and abroad). A series of geographical sectoral studies have been prepared for the purpose of the spatial plans at state, regional or municipal level. A series of master's theses and doctoral dissertations in geography, a series of monographic editions on municipalities and settlements have been prepared as separate scientific works, which have been built on statistical databases, among other things.

The analogy is similar internationally. Therefore, I can freely conclude (despite being unable to measure the exact scope accurately) that the scope of geographical analyses based on statistical data is indeed large and, more importantly, it is possible to make relevant analyses based on relevant data and draw relevant conclusions and development directions. Within the Republic of Macedonia, this has been provided by the State Statistical Office for 75 years.

2. Domains of geographical studies based on statistical data

The methodological concept of geography encompasses several different scientific disciplines, which are purposefully oriented towards the study of certain natural and social phenomena. Some scientific disciplines are based on methods based on observations, laws of nature, individual measurements and logical explanations and findings (geomorphology, geology, pedogeography, biogeography, etc.). However, there is a series of scientific disciplines that rely largely on statistical data. Such are climatology, hydrology, population geography, settlement geography, agrarian geography, industrial geography, tourist geography, environmental geography, etc.

Climatology and hydrology are based on data that are of spatial and (long-term systematic and permanent measurements) temporal nature. These are temporal series of data that are recorded in special climatological and hydrological yearbooks (Lazarevski A. 1993) and are processed according to certain methods, thus allowing for spatio-temporal analyses of climatic and hydrographic characteristics of a particular area (temperatures, precipitation, winds, humidity, solar radiation, water flow, etc.). Some of them can be found in the regular statistical publications (for example, in the Statistical Yearbooks).

Population geography and settlement geography are largely based on population statistics, i.e. population censuses in which various demographic data structures, migrations and trends in the development of demographic characteristics are (spatially) presented.

Economic geography is one of the general disciplines which includes a series of separate disciplines that study the primary, secondary and tertiary activities (agrarian geography, industrial geography, traffic geography, tourist geography, political geography, etc.). All are largely based on data derived from regular statistics, that is, otherwise, the relevance of their analysis would be highly questionable.

3. Interaction between statistical data and geographical space

The meaning of statistical data (of any domain) in geographical research is more intense and more efficient, because the analyses of the specific phenomenon are conducted in a specific geographical space. Therefore, (during the analysis) the specifics inherent in the specific territory come to the fore, rendering the findings significantly more relevant and with the possibility of spatial-temporal comparability. In fact, here lies the interaction between statistical data and geographical space, unlike the traditional statistical analysis which analyzes the state of affairs in terms of determining the trends of development of phenomena, without their spatial component (Daskalovski V., Markoski B. 1996).

4. Formation of geographical data for the purpose of statistics

A large number of statistical data are related to a specific geographical space, so it is often necessary to specify the location of that space. The science of geography meets this need by creating its own statistical registers (of geographical names, geographical coordinates, altitudes of places, lengths of rivers, lakes, hypsometric data, cadastral records of agrarian areas, etc.) which are normally based on map-related or direct field measurements (Markoski B. 1992).

Most of the geographical data (unlike most statistical data which are dynamic) are static (unchanging), so it would be useful that statistics use and publish them in its publications as part of the official statistics (Markoski B. 1995). Thus (instead of being available only to geography) the data is made available to other users too (non-geographers), who can add spatial aspects to their analyses, making them more complete and relevant (Markoski B. 1992, RGU 1982).

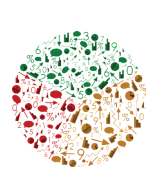
5. Organization and establishment of GISs as a state-of-the-art methodology for the interaction of statistical and geographical data

GIS is an acronym for Geographic Information Systems. It is a scientific methodology and technology whereby geographical objects of interest are mapped, creating databases thereof which interact with the cartographic data, in order to create new information and outputs in a tabular, graphic and cartographic form (Markoski B . 2011).

Mapping is a process whereby in a specific dedicated (GIS oriented) software package a map is created with the objects of interest (for example settlements, educational institutions, industrial buildings, infrastructure buildings or a number of other buildings) which bear location, geographical and cartographic data (which can also be part of the database). Thusly designed special purpose map forms the cartographic basis for the formation of a specific GIS (Markoski B. 2011).

Databases are the second segment in the design of a specific GIS application. Depending on the issue for which the specific GIS system is developed, attribute data are defined which are then collected, entered, stored and updated for each object included in the cartographic basis. For example, if it is a settlement in question, attribute data would be: name of the settlement, geographical coordinates, population, number of buildings, etc.

Interactive link implies that each object mapped on the cartographic basis obtains a unique identification number that is entered in the database and serves as a link between the cartographic basis and the database.



For the purpose of system compatibility, it would be appropriate to take official codes, nomenclatures, etc. whenever possible (Markoski B. 2011).

Upgrading data records in a GIS-oriented device is a benefit enabling future data manipulation to be performed only in terms of data update and a benefit of having constantly up-to-date information.

6. Some guidelines for the development, organization and establishment of modern approaches to data collection, entry, analysis and dissemination

Amid advanced information technologies, the collection of statistical data should be oriented towards electronic collection. To this end, it is important that statistical institutions create a solid questionnaire (for any sector of statistical research) according to which data entry forms are developed. For more efficient access and to assist statistical data providers in the data entry forms (from previous sources, previously submitted statistical record reports), a good practice is standard data related to the institution (data provider) to be entered in advance (such as data on the name of the institution, registration number, etc.) so that the service provider will enter only the required data for statistical purposes. However, it is possible that service providers fail to provide data. Possible measures to overcome this issue is the coordination of the statistical system with the inspection services for each individual sector, so that, among other things, they will be informed on whether data have been submitted to the state statistical office. Similar coordination should be established with the accounting services of each legal entity. This will provide a full coverage of statistical phenomena, i.e. a more solid basis for scientific and professional analysis of the state of affairs.

The electronic data collection will enable direct loading of data from providers in the specific central statistical register. Therefrom, the processing of the collected data will enable the dissemination of the data to the users of statistical data.

Throughout the process, it is important to have full commitment and continuous diligence. The staff in charge should not invest too much effort in working on projects that are usually based on incomplete data and are of highly questionable relevance.

Conclusion

The interaction between statistics and geography is complex as geography of statistics gives meaning to the spatial arrangement of objects, phenomena, processes, problems, consequences and predictions. On the other hand, statistical methods are used in almost 100% of the geographical studies, and statistical databases are used in over 70%, as a basis for spatio-temporal analyses of phenomena and processes in a specific space.

There is a series of scientific disciplines that rely largely on statistical data. Such are climatology, hydrology, population geography, settlement geography, agrarian geography, industrial geography, tourist geography, environmental geography, etc.

The meaning of statistical data in geographical research is more intense and more efficient, because the analyses of the specific phenomenon are realized in a specific geographical space.

The science of geography creates its own statistical registers (of geographical names, geographical coordinates, altitudes of places, lengths of rivers, lakes, hypsometric data, cadastral records of agrarian areas, etc.) which are normally based on map-related or direct field measurements. Most of the geographical data are static

(immutable), so it would be useful that statistics use and publish them as part of the official statistics in order to make them available to the rest of the non-geographical scientific public.

Upgrading data records in a GIS-oriented device is a benefit enabling future data manipulation to be performed only in terms of data update and a benefit of having constantly up-to-date information. Hence, amid advanced information technologies, the collection of statistical data should be oriented towards electronic collection and direct loading of the data from the providers in the specific central statistical register.

As an illustration, in the development of the Macedonian geographical thought to date, on various occasions, at various scientific and professional geographical gatherings and journals, over 2000 papers have been published (Markoski B., 2019).

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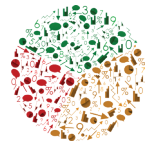

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Agricultural Census within the Integrated Statistical System

Introduction

Census is a complex and extensive statistical operation for each country. The Census provides data for the entire or for a certain part of the country. It entails collecting, processing and distributing data on the structure of agricultural activities, the size of agricultural farms, available and used land, agro-technical measures, number of livestock, labor and other inputs of agricultural production.

In recent years, many efforts have been made to integrate statistical activities, i.e. each statistical collection of data collection is part of the national statistical system, instead of isolated collection. Thus, the Agricultural Census integrates a set of data related to the development of agriculture and food, but also provides data related to the adoption of appropriate decisions and programs for the development of agriculture, rural areas and food over a long period of time in each country.

The following are the advantages of the integrated statistical system:

- Planning and developing a comprehensive statistical program, without the need to duplicate statistical activities, or publishing conflicting statistical activities while ensuring and enabling equitable and balanced use of available statistical resources;
- The concept, definitions and classifications used for research for different purposes may be compatible, thus making it easier to interpret and analyze related data from different sources; and
- Each statistical collection, obtained from different statistical activities – research, such as the Agricultural Census, may be limited to a coherent and manageable set of data, information and items, knowing that other related data from other sources are available in comparable form.

The integrated system of agricultural statistics includes requirements on food and agriculture data such as: structure of agricultural holdings, agricultural production, farm management, food consumption, income and expenditures of the farm, i.e. agricultural household, available labor, undertaken agro-technical measures, measures for rural development as well as agricultural prices. The listed data and information may be part of the Census, statistical research, Population Census, administrative sources or some other sources. Part of the integrated agricultural statistical system are the statistical research programs in the primary sector, including the Census.

The integrated system for agricultural statistics requires good planning and implementation of agricultural activities with efficient organization, coordination, well-trained professionals and budget support. Statistical data are not always collected by a single office. Sometimes, in addition to the bureaus of statistics, the relevant ministry appears as the responsible institution for a certain number of data from the primary sector. Therefore, especially when conducting the Census, it requires a high degree of compatibility and coordination of all involved users and producers of statistical data in the field of agriculture.

Many developing and underdeveloped countries lack qualified/trained staff in statistics or funding for statistical development, so they need time to establish an integrated statistical system. Therefore, it is recommended to

these countries that the development of the statistical system be directed towards long-term goals, to ensure a smooth flow of valid statistical data in a timely and accurate manner, which would cover all aspects of food, agriculture and rural development. In our country, an integrated statistical system has been established, which requires greater coordination and cooperation among the competent institutions. Furthermore, in 2007, the first agricultural census was conducted on the territory of the independent Republic of North Macedonia.

The Agricultural Census and statistical research related to agricultural production are closely related and intertwined. This is because both systems collect data on agricultural production from observed production units. The World Census of Agriculture places emphasis on the development of the agricultural census as part of the overall integrated statistical system for the primary sector. This system contains two key elements:

- The agricultural census as the core of the system; and
- Statistical research program with a sample method based on agricultural census data.

Throughout the world and in our country, the Agricultural Census is not conducted in such a long period of time as the Population Census. The Agricultural Census is a necessity both for the developed and the developing countries. It measures the volume of agricultural activities in a given country, in our case, the Republic of North Macedonia.

Developing countries, where agricultural production has a significant share in the National Gross Domestic Product and the livelihood of the population depends on agricultural activities, the Agricultural Census plays an important role in the development programs of the country.

The implementation of the Agricultural Census contributes to identifying a number of necessary changes to improve the primary sector in developing countries, as well as in our country. The data collected from the Census in the areas of agricultural production, forestry and fishing, as well as data related to rural development and the environment are the basis for building statistical research and development programs. These basic data of the Census, supplemented with statistical and administrative data are the basis for creating short-term, medium-term and long-term programs for the development of the agricultural sector.

Importance of Agricultural Censuses

The importance of the census in agriculture is seen in the fact that it cannot be separated from the agricultural sector as a whole. Thoroughness and speed are important factors in measuring the largest and most important sector in any country. In addition, the importance of the sector imposes and dictates that Censuses be conducted on a regular basis. As they gather more accurate and detailed information, agricultural censuses are of additional importance in any economy for creating programs for agricultural and rural development.

In short, the Agricultural Censuses are most important for the following reasons:

- In addition to data on persons/households/entities directly involved in agricultural production and activities, Censuses collect data on the structure of agriculture and applied agricultural practices in a given country;
- They provide data on the value of production, i.e. revenues, prices and use of inputs, i.e. inputs in agricultural production; and
- Agricultural censuses provide information on crop production, livestock, forestry and fish products, as well as land and water use, degradation and conservation.

All the above information is crucial for policy making, programs for agricultural and rural development, programs for subsidizing agricultural production and informing the private and public sector.

Overview of the World Census of Agriculture

The collection of structural data from agricultural production units (agricultural holding) remains the focus of the Census. However, as an option, the states may collect a larger and wider range of data on agricultural holdings, and on the agricultural sector in general, i.e. the primary sector. Therefore, there are two possible options:

A) The first option is the opportunity together with the agricultural census to conduct a separate census of aquaculture production or as part of the agricultural census. For some countries, aquaculture production is vital.

B) Some countries want to collect additional data on non-agricultural and mixed households living in rural areas. They also want additional income data for employers in agriculture

In order to reduce the costs of conducting the Census and to collect additional data, countries should use a modular approach to the Agricultural Census.

The core module of the Census should be conducted on the basis of an inventory, which will provide a modest amount of structural data. These data are valid for creating a national agricultural policy and international data comparison. They are also sufficient indicators for building sample frameworks, as well as for geographical analysis or other levels of analysis;

One or more statistical surveys based on the Census, conducted by sample, should provide more detailed structural and other data on the lower levels of analysis, comparisons and compatibility with other sources.

Fifure No. 1:Complete Census (population and agriculture)

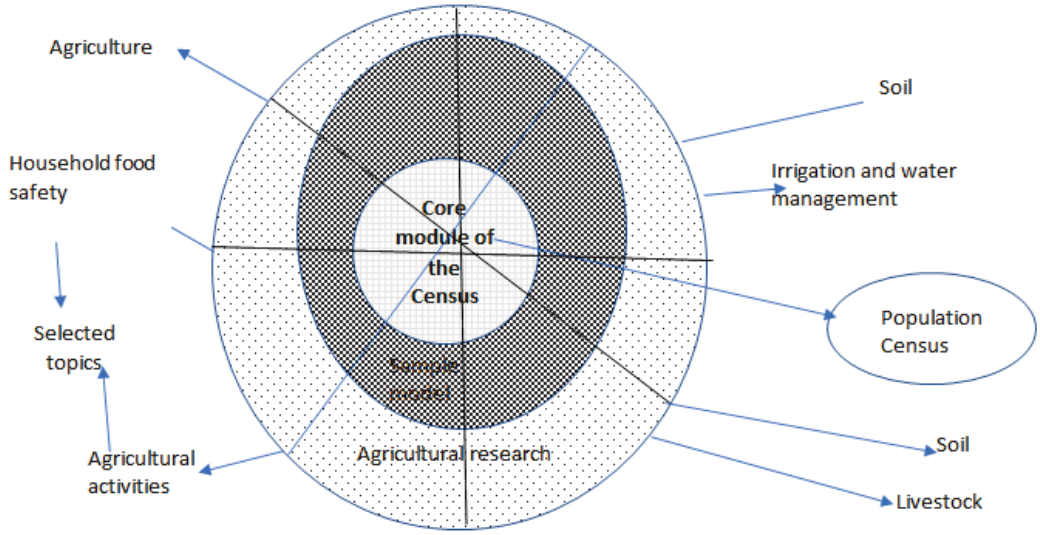


Figure 1 shows a schematic representation of the integral module of the agricultural sector which serves as a basis of the agricultural census. Then there is the possibility of additional censuses for certain areas or topics, complete or by sample or purposive, according to the needs and capabilities of each country. These additional censuses arise from the basic Census. The core statistical surveys arising from the Census are given at the end. Areas or topics covered by these three modules, such as land or irrigated areas, are also provided. As per the World Programme for the Census of Agriculture, 89 topics are given that countries can use in conducting the Census. However, this does not mean that countries are required to use them all because no one expects them to do so. They only need to use the basic and nationally required topics for the Census modules. For many countries, the important information for the collection and preservation is the infrastructure indicators at the local level for the preparation of programs for local and rural development.

The schematic presentation emphasizes the connection between the Agricultural Census and the Population Census as two sources of data. Furthermore, in both Censuses, data are collected that can be linked and provide an illustrative picture of the state of affairs. This is the reason why the integrated statistical system puts emphasis on connecting and coordinating the two Censuses. It follows that certain questions about agriculture can be included in the Population Census as a link between the two Censuses, i.e. a source for the Agricultural Census.

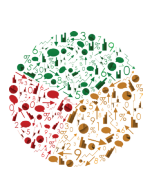
Historical overview of Agricultural Censuses

The Agricultural Census, as well as the Population Census, is conducted every ten years. The first World Census was conducted in 1930, followed by the 1940 Census. These two Censuses were sponsored by the International Institute of Agriculture (IIA). The last six consecutive Censuses - in 1950, 1960, 1970, 1980, 1990, 2000 and 2010 - were promoted by the Food and Agriculture Organization of the United Nations (FAO), which took over the responsibilities of the IIA after its dissolution in 1946.

In order to reduce the gap in the collection of agricultural statistical data, i.e. the diversity of data collected, and to make it uniform at least to a certain extent, agricultural data collection was requested in the same period. Data collection sources in the 30s and 40s of the twentieth century were unreliable and unstable, even in developed countries. At that time, there were widespread difficulties in conducting this complex statistical operation. These difficulties include lack of finances, organizing a large number of people in the field, a limited number of professionals and the like. All this called into question the quality of the information collected from the field. Data processing itself takes a long time in an era without computers and without hiring a large number of people. Therefore, many countries have turned out to lack the capacity to conduct censuses in recent years.

In the fifties and sixties, the basic structural statistical data were requested from the Census, such as: the size of the farm, the agricultural land used, i.e. the land, agricultural areas and the number of livestock. The other Censuses (70,80,90) retain the focus on structural issues of agriculture, but also raise other issues relevant to the primary sector, especially in the field of agriculture. Thus, the 2000 Census focused on aquaculture and employment, as well as environmental issues. This year, data download and exchange was enabled from almost all countries. Thus, in the period 2000-2010, our country conducted the First Agricultural Census.

To help countries implement it and reduce costs, the FAO recommended a modular system for the 2010 Census. With this system, as we have mentioned, 16 items were recommended that each country can choose its priorities from. In addition to the basic structural data, a set of data on national needs may be collected. With these collected data, which serve as a basis, additional purposive censuses may be established for a specific area or group of questions. Furthermore, these modular questions have served as a basis for future



statistical research. Among other things, from the database it obtained, the FAO concluded that all countries are in different stages of development and statistical maturity. It therefore encourages all countries to conduct a Census according to their national needs, but also to keep in mind the international comparison package.

Agricultural Census objectives

From a historical point of view, the main purpose of the Census is to collect data on the structure of agricultural holdings of the lowest administrative units. The Agricultural Census also provides data to improve current statistical surveys, on the one hand, as well as sampling data, on the other. Previous Censuses have focused on collecting data on activities in agricultural units – holdings or other entities engaged in land cultivation or livestock breeding. Rural development issues have been neglected, i.e. not considered as important, especially as they concerned rural households as drivers of rural development.

Given that the Agricultural Census is conducted every ten years, it is expected to collect data that change relatively slowly. Indeed, some countries conduct a Census each year that summarizes structural changes in holdings, such as the size of the holding, agricultural land used, agricultural areas, irrigation and other agro-technical measures, number of livestock, labor, use of agricultural machinery and other agricultural inputs. In essence, the Agricultural Census does not include data with rapidly changing dynamics such as agricultural production and agricultural prices.

The main objectives of the Agricultural Census have been determined by the previously conducted Censuses. Therefore, the following have been recognized as the objectives of the World Agricultural Census:

- Providing data on the structure of agriculture, especially in small administrative units, and providing detailed cross-tabulations
- Providing data that will be used as a benchmark for and reconciliation of current agricultural statistics;
- Providing frameworks for agricultural sample surveys.

Agricultural Census within the Integrated Statistical System

In recent years, great efforts have been made to establish a better integrated systematic module of agricultural statistics in order to improve the collection of statistical data. The activities, therefore, should not be seen as isolated, one-sided, but as an established complete integrated national statistical system.

The requirements for food and agriculture data are broad and include information on the structure of agricultural holdings, agricultural production, farm management, agricultural inputs, food consumption, household income and expenditure, labor, and agricultural prices. These data may be collected from agricultural censuses, surveys on agricultural activities and products by sample, population censuses and surveys, administrative records or other sources. An integrated agricultural statistical system includes a multi-annual program of statistical activities, including an agricultural census and agricultural research, as well as administrative sources, in order to provide all the necessary data.

The main advantages of the integrated statistical system are:

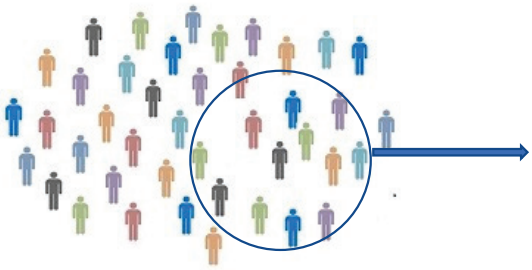
- it is possible to plan and develop a comprehensive statistical program without duplicating statistical activities or publishing conflicting statistics, while ensuring efficient and balanced use of available statistical resources;
- the concepts, definitions and classifications used in different statistical activities may be compatible, making it easier to interpret and analyze related data from different sources;

- any statistical collection, such as the agricultural census, may be limited to a coherent and manageable set of items, knowing that other related data are available from other sources in a comparable form.

The fact that the Census and the statistical surveys collect data on agricultural production units clearly shows why they are closely interlinked. It is, therefore, clear that the Agricultural Census takes the principal place in these surveys. From the above, it follows that this system consists of two elements (i) the core of this system is the Agricultural Census, i.e. its first element is the Agricultural Census and (ii) a sample statistical survey program based on the Agricultural Census, statistical surveys is the second element. Hence, the task of the Agricultural Census in the integrated system consists of: providing data on food and agriculture that are needed to make decisions related to food, agriculture and rural development. It also provides data on the sampling framework – a sample for statistical surveys, which are primarily part of the system and which also provide timely and detailed data.

The establishment of the integrated statistical system requires timely planning and implementation, which requires solid and trained staff at all levels, good organizational set-up and solid financial support provided over the years. Efficient organization implies close cooperation between the producers of statistical data and the users. In some countries, the various agricultural activities are dispersed and fall under the competence of different government institutions. For example, the Census is under the competence of the national statistical body, and the regular statistical surveys are the responsibility of the line ministry. In this context, establishing coordination among different institutions appears as the biggest problem. Another difficulty stems from the fact that different agencies/institutions collect the same data according to their mandate and competence. This only burdens reporting units as producers of statistical data. This problem may be overcome with the integrated statistical system by designating one competent institution/agency to collect data, and others to obtain them according to their domain.

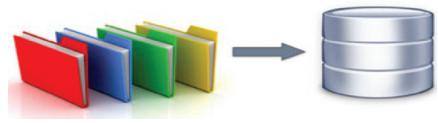
Figure No.2: The established integrated system in the Republic of Macedonia is based



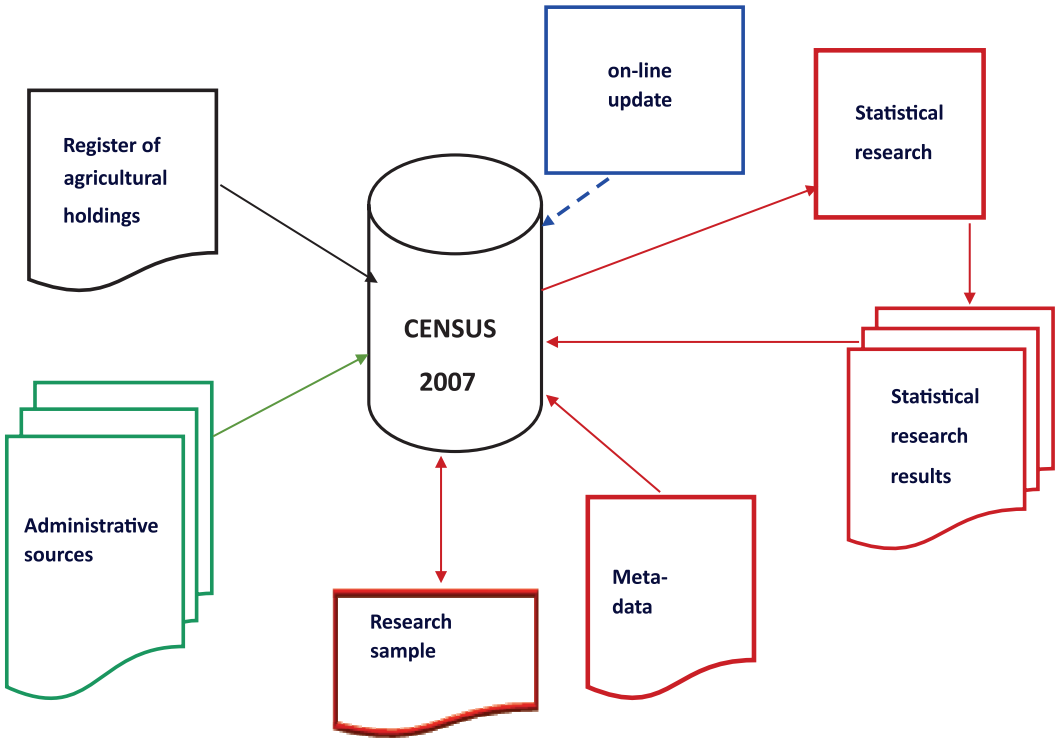
Complete Census (population and agriculture)

Sample selection: Structure of agricultural holdings, Livestock Survey

Administrative data



As can be seen in Figure 2, the basis of the integrated system is the Census, which serves as a basis for sample surveys and other statistical reports, as well as surveys from administrative sources. Figure 3 shows more specifically what the Integrated Statistical System of the Republic of North Macedonia looks like.



Many countries experience a lack of trained staff in statistics and/or insufficient resources for statistical development and will need a longer period of time to achieve an integrated statistical system. Nevertheless, it is recommended that all statistics development efforts support the long-term goal of ensuring a continuous flow of timely and accurate data covering all aspects of food, agriculture and rural development. Implementing an Agricultural Census using a modular approach may be an important step in this direction as the modular approach may be considered a transition to an integrated system of agricultural census and research.

In the 2020 World Census of Agriculture, emphasis is placed on the development of the agricultural census within the overall framework of the system of integrated agricultural censuses and surveys. Countries with an established system of agricultural research may choose the traditional approach to obtaining basic structural data and up-to-date survey frameworks, while countries without such a system and limited budget may choose the modular approach as the first step towards creating a system of integrated agricultural censuses and research.

Major changes to the 2020 World Census of Agriculture

The main changes that will be implemented in this Census are listed below and include:

Observation units

Agricultural holdings continue to be statistical units as in previous censuses and the section on aquaculture also remains the same;

Concepts and definitions

The definition of agricultural owner remains the same as in previous censuses.

Two concepts introduced in the 2010 census program – joint ventures and co-owner – have been omitted, as the approach to measuring the role of household members, especially women, is quite difficult to provide. Dominance of the male population.

Definition of forest and forest land

Forest and other forest land have been redefined to comply with the Central Framework of the System of Environmental Accounting (SEEA), adopted by the United Nations Statistical Commission (UNSC) in 2012.

Labor

Labor concepts have been updated to comply with the resolution adopted by the International Labor Organization (ILO) in 2013 (ILO, 2014).

Data entry

The difference between the 2010 and 2020 Censuses is that the FAO in the 2010 Census introduced two modules - core and supplementary, and in the 2020 Census four modalities were introduced with three categories - core, framework and supplementary. By definition, the core elements are gathered from all countries so that they can be compared. The framework elements refer to the data and information collected in the core module which will further serve for the preparation of additional purposive censuses or regular statistical surveys per sample. The other supplementary elements vary from country to country and each country prescribes them. These data and information are usually collected in other censuses.

Identification and general characteristics: respondent for the agricultural holding (reintroduced); proportion of income from holding's agricultural production; main agricultural activity of the holding; presence of hired manager (re-introduced); sex of hired manager; age of hired manager.

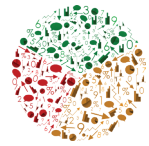
Land: land use by categories.

- Irrigation: area of land actually irrigated (component); area equipped for irrigation in working order.

Crops: presence of nurseries (component); land under protective cover.

Livestock: number of female breeding animals (component).

Agricultural practices: use of genetically modified seeds (component); type of seed for each major crop type; source of seed inputs for each major crop type; types of tillage practices; presence of conservation agriculture; presence of soil conservation practices.



Demographic and social characteristics: agricultural training/education of the owner.

Work on holding: whether working on the holding is the main activity

Intra-household distribution of managerial decisions and ownership: sex of household members making managerial decisions; area of crops by sex of the person managing them; number of livestock by sex of the person managing them; area of land owned by sex of the owner; number of livestock owned by sex of the owner.

Household food security: food insecurity experience scale.

Fishing: a new topic

Environmental emissions/greenhouse gases (greenhouse gases): a new topic

Community-level data: communal area under water used for aquaculture

Some elements of the 2010 program that have been modified in the 2020 program, / comparison /:

- **Identification:** A number of existing items related to the identification and location of the agricultural holding have been combined in this theme.
- **Land**: The item "land tenure types on the holding" has been modified as "area of holding according to land tenure types"; and the item "presence of shifting cultivation change" has been changed to "use of shifting cultivation".
- **Irrigation**: The following items have been reworded: "presence of irrigation on the holding" as "use of irrigation on the holding"; "area of land irrigated according to land use type" as "area of land actually irrigated according to land use type"; "area irrigated according to method of irrigation" as "area of land irrigated according to method of irrigation"; "Area irrigated for each crop type" as "area of crops irrigated for each crop type"; "Other types of water management practices" into "use of other types of irrigation".
- **Crops**: "number of permanent crop trees in compact plantation and scattered plantings" as "number of permanent trees in scattered plantings"
- **Livestock**: "type of livestock production system" as "livestock system".
- **Agricultural practices**: "use of genetically modified crops according to crop type" as "use of genetically modified seeds according to crop type".
- **Services for agriculture**: "sources of agricultural extension services" as "sources of agricultural extension services used"; "travelling time to nearest periodic or permanent agricultural produce market" as "travelling time to nearest periodic or permanent agricultural produce market for selling products".
- **Demographic**: "household size" as "household size by sex and age groups".
- **Work on the holding (formerly "farm labour")** - The item "activity status" was modified as "labour force status" in line with ILO (2013); item "time worked on the holding" as "working time on the holding"; "number of employees on the holding: time worked and sex" as "number and working time of employees on the holding by sex".
- **orestry**: The item "presence of forest and other wooded land on the holding" was modified as "presence of woodland on the holding"; items "area of forest and other wooded land as primary/ secondary land use" were modified as "area of woodland" in line with SEEA 2012; and item "main purpose of forest and other wooded land" as "purposes of woodland".

Several items from the 2010 programme have been omitted from the 2020 programme; namely:

- Agricultural practices: item "use of good agricultural practices" was replaced by a breakdown of items on sustainable agricultural practices (see items above).
- **Demographic and social:** item "whether holding is part of an agricultural household".
- **Work on the holding**: items "occupation of main job" and "time worked in main job".
- **Intra-household distribution of managerial decisions and ownership (formerly "management of the holding")**: items "identification of subholdings"; "identification of subholders"; "sex of subholder"; "age of subholder"; "area of crops managed for each crop group"; and "number of livestock managed for each livestock group". These items were replaced by an improved approach to assess the distribution of decisions and ownership within the household (see items above).
- **Household food security**: food shortage subitems (a) "whether household members could not afford to eat what they normally eat at any time"; (b) "months in which food shortage occurred"; (c) "reasons for food shortage"; (d) "how the household's eating patterns were affected by food shortage"; and (e) "steps taken to alleviate food shortage", as well as items "whether the household fears a food shortage"; "frequency of normally eating selected food products"; and "height and weight". These items were replaced by an innovative approach developed by FAO's "Voices of the Hungry" (VoH) to appraise in a more straightforward way the severity of food insecurity as experienced by individuals in the population (see items above).

Classification

The land use classification has been updated to be consistent with the SEEA Central Framework adopted in 2012 by UNSC.

The areas of economic activity have been updated to be consistent with the International Standard Industrial Classification of all Economic Activities (ISIC and UN, 2008).

The Indicative Crop Classification and Classification of Livestock have been updated to be consistent with the Central Product Classification (CPC) Version 2.1 (UN, 2015a).

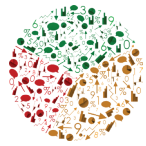
The classification of machinery and equipment (see Annex 7) has been updated based on the Harmonized Commodity Description and Coding System (HS) Edition 2012.

The given differences between the two Censuses are for the sole purpose of showing the impact of the Censuses on the Integrated Statistical System. Indeed, the Censuses are its basic tool to which the other elements are added. If the 2010 Census was the basis for the establishment of the Integrated Statistical System, the 2020 Census is its upgrade and improvement of its position in the world of statistics.

Conclusion

As previously discussed, the Integrated Statistical System is the core of the national statistical system. It is the core around which the other elements revolve, and the Agricultural Census serves as its basis. The data collected from the Census are the building block of the Integrated System. It enables easier ways of collecting, analyzing, processing and storing statistical data. It is used for comparison both nationally, regionally and internationally.

The elements of the Integrated System are quite connected. The data collected in the Census lay the foundation for this system. The Integrated System consists of data from different areas collected in one place by definitions, classifications and according to the same methodological basis. From the additional Censuses



as a second element of the System, data can be collected on specific areas and a set of questions. Additional information is gathered to complete it as a whole. Its third element also stems from the Census, the program for statistical research. Sample statistical surveys are prepared and conducted to obtain rapid data that have a dynamic process of change. Furthermore, the multi-year surveys, for data with a slower pace of change, emerge from the Census as statistical surveys.

The main advantages of the integrated statistical system are:

- it is possible to plan and develop a comprehensive statistical program without duplicating statistical activities or publishing conflicting statistics, while ensuring efficient and balanced use of available statistical resources;
- the concepts, definitions and classifications used in different statistical activities may be compatible, making it easier to interpret and analyze related data from different sources;
- any statistical collection, such as the agricultural census, may be limited to a coherent and manageable set of items, knowing that other related data are available from other sources in a comparable form.

Only a well-conducted, organized and supported Agricultural Census by all stakeholders may lead to an expeditious Integrated Statistical System that is favorable for all countries.

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Brief presentation of the basic methodological solutions for estimating unregistered emigration of entire families from R.N. Macedonia through the number of students enrolled in primary and secondary schools

(Axiomatic approach)

Introduction

The problems with unregistered emigration are becoming increasingly visible in all spheres of society. Chambers of commerce increasingly often appeal to the public that they lack manpower. Problems also arise with the preparation of electoral registers and so on.

This problem will not disappear even after the next census (2021 Census). Until the country takes serious measures to motivate people to register when they go abroad for more than 3 months, unregistered emigration will remain a persistent problem.

The Office does not currently have a methodology in place for estimating unregistered emigrants, yet this does not mean that there are no methodological approaches in the world that may be used.

These methodologies are based on estimating the number of emigrants as members of different groups of citizens, such as age groups, pupils/students, unemployed persons, etc.

The methodological solution presented is based on a combination of statistical data and administrative sources available to the SSO. The administrative registers data are recognized as a realistic picture (axiomatic approach) of the situation on the ground and the model is further developed based on that conclusion. The methodological model is divided into two basic steps; the first step is to identify the emigrated persons in the population aged 5 to 17 years, the second step is to identify their parents and possible siblings.

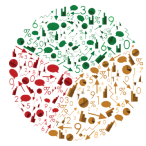
Method of estimation of unregistered migration of primary school pupils

In this experiment, the focus will be on the attempt to estimate the unregistered emigration of children aged 5 to 14 (due to lack of space, the data on secondary school students are not analyzed), i.e. the group of children who are obliged to attend primary school. The main source for the number of children present in the country is the number of students enrolled in the 2018/2019 school year, and this number is compared to the estimated population aged 5 to 14.

Table No. 1: Pupils enrolled in primary school

	2018/2019 School year									
	Total	I grade	II grade	III grade	IV grade	V grade	VI grade	VII grade	VIII grade	IX grade
Pupils	188 102	22 130	21 251	22 628	21 392	20 578	20 339	19 985	19 687	20 112

Source: http://makstat.stat.gov.mk/PXWeb/pxweb/mk/MakStat/?rxid=46ee0f64-2992-4b45-a2d9-cb4e5f7ec5ef



The purpose of using the estimated population by age instead of the number of births by calendar years (from 2004 to 2013) is that the estimated population already incorporates the data on deaths in this age group and immigrants/emigrants. Furthermore, it should be noted that since 2004, only people born in the country have been included in the estimates. Given the full statistical coverage of births and deaths, the change in the number of people in this age group is entirely due to migration. It has already been mentioned that registered migration has been calculated in the estimated population; hence, unregistered migration is the only factor that affects the change in the number of the population.

Table No. 2: Estimated population as of December 31, 2018.

	Age										
	Total	5	6	7	8	9	10	11	12	13	14
Population	228 269	22 858	23 285	22 530	24 030	23 335	22 654	22 362	22 213	22 042	22 960

Source:http://makstat.stat.gov.mk/PXWeb/pxweb/mk/MakStat/?rxid=46ee0f64-2992-4b45-a2d9-cb4e5f7ec5ef

The population estimation prepared by the SSO is calculated according to the year of birth of the persons, i.e. all persons born in one calendar year have the same years of age. In reality, this is not true; therefore, as a methodological hypothesis for overcoming this methodological problem we will assume that the number of births in a calendar month is constant throughout all 12 months of the year. This means that 1/12 of the total number of children born in a period of 12 months is born in one month. Assuming that in a calendar year a total of 1200 children were born, and each month 1/12 are born, it means that each month 100 people are born. That is, in the first six months (January 1 - June 30) 600 people will be born, just like in the second six months when 600 children will be born (July 1 - December 31).

As the school year is spread over two calendar years, there will be pupils of two ages in each class. I will take the pupils in the first grade as an illustrative example. In September, at the beginning of the school year, all children must be 5 years of age to enroll, and before the beginning of the next school year (second grade) all must be 6 years of age. This means that all children in the period from September of the year when they enrolled in the first grade until September of the following year, when they enroll in the second grade, have aged by 1 year. Since the school year is spread over period of two calendar years, yet it lasts 12 months, assuming that 1/12 of the pupils have a birthday in the same month, it can be concluded that half of the students (6/12) are 6 years old on December 31, and the other half is still 5 years old.

The population estimates prepared by the Office are as of June 30 and December 31.

In order to adjust the population to correspond to the real age of the children in each school generation, the initial estimate is as of December 31 given that it is closer to the middle of the school year. The adjustment is made with the following formula:

$$Yo_{x,\,x+1} = (1/2H_x) + (1/2H_{x+1})$$

Where, "$Yo_{x,\,x+1}$" are pupils in "o" grade, in "x, x+1" school year and „H_x" and „H_{x+1}" are the population of the age that corresponds to the grade.

For example, o = first grade, in 2018/2019 school year, "N_x" and "N_{x+1}" are the population aged 5 and 6 on 31.12.2018.

Table 3. Estimated population by grade

	Estimated population by grade									
	Total	I gr.	II gr.	III gr.	IV gr.	V gr.	VI gr.	VII gr.	VIII gr.	IX gr.
Population	182 289	23 072	22 908	23 280	23 683	22 995	22 508	22 288	22 128	22 501

Source: http://makstat.stat.gov.mk/PXWeb/pxweb/mk/MakStat/?rxid=46ee0f64-2992-4b45-a2d9-cb4e5f7ec5ef

Table 4. Difference between enrolled pupils and estimated population by grade

	Difference between enrolled pupils and estimated population by grade									
	Total	I gr.	II gr.	III gr.	IV gr.	V gr.	VI gr.	VII gr.	VIII gr.	IX gr.
Population	17 258	942	1 657	652	2 291	2 417	2 169	2 303	2 441	2 389

Source: http://makstat.stat.gov.mk/PXWeb/pxweb/mk/MakStat/?rxid=46ee0f64-2992-4b45-a2d9-cb4e5f7ec5ef

The result of the comparison between the estimated population which is supposed to be in the process of education and the actual number of students has shown a negative difference of 17,258 persons, i.e. absence of 8.4% of the total number of estimated population that is supposed to be in the process of education, and does not partake. This is an average of about 1,900 people in each school generation. This is a worryingly high number, because assuming that the family consists of only one child and two parents, the total number of emigrated persons would be around 51,000 or 2.5% of the total population (for the purpose of comparison, according to the estimate as of 01.01.2020, Ohrid had 51,349 people). The proposed methodology should identify these 17,258 persons and associate them to their parents and potential siblings.

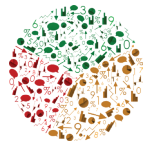
Proposed methodology for associating the emigrated persons aged 5 to 17 with their family

The basic hypothesis in this step assumes that the mother lives with her underage children, and she lives with her husband. The basis of this hypothesis is the sociological definition of a traditional nuclear family[1] according to which both spouses strive to create harmonious family relations together with their children in their mutual home.

Step one

To estimate the number of emigrated persons as family members, the first step in preparing the data is to associate each child aged 5 to 17 who is not in the process of primary and secondary education with their parents. It can be done in the following way: obtain the single identification numbers of all enrolled students in one school year (for example 2018/2019) from the database of the Ministry of Education and Science. These ID numbers are compared with the ID numbers in the database of the Ministry of Interior for all persons born in the age group from 5 to 17 years of age. Once the persons who are not in the process of education are identified, they will be associated with their parents (through their ID number) through the birth database available to the SSO. Based on these data, a database can be created in which for each person aged 5 to 17 three variables are added, namely, the ID numbers of the mother and father and an indicator of whether they attend school.

[1] https://www.csus.edu/indiv/k/kawamoto/downloadable/50jackson1.htm



Step two

The second step is to create a database *Mothers with their children and her spouse* (if any). In fact, a new database is created in which variables consisting of the ID number of each of the children she gave birth to, and a variable for the spouse, i.e. his ID number, are added to the record for each mother. Then, for each of the children (5-17 years old) in the Mothers database, an indicator variable is added whether the child is enrolled in primary or secondary school. The status of the mother and husband is then checked in the Employment Agency database to determine if these people are employed or active job seekers (date of last registration) as well as to establish if any of them is a beneficiary of any social transfers.

Based on a combination of these data, a statistical conclusion is made whether the mother lives in the country or not. If a conclusion is made that the mother does not live in the country, then all her children and her husband (father) do not live in the country.

The perfect example of an emigrated family would be the following: a mother of a 10-year-old child who does not attend school; the mother and husband are unemployed and their last registration at the ESA was more than six months ago and they currently do not receive any social transfers.

The perfect example of a non-emigrant family would be the following: a mother of a 10-year-old child who does not attend school, the mother and husband are employed. In this example, it is clear that this case is not related to migration; instead, it is a case of a child who is simply not in the process of education.

This model may be further developed to encompass adult children until the moment they establish their own family. These persons, in addition to the database of the Ministry of Education and Science, will be checked in the database of enrolled students, master and doctoral studies (SSO), in the database of ESA and MLSP.

It should be noted that due to the lack of quality data sources on the true volume of unregistered emigration of family members, the only sustainable methodological approach for estimating the volume of emigrated persons should be sought in the statistical estimation models developed for the specific population based on the cultural characteristics of the population and its tradition of emigration.

Conclusion

Unfortunately, unregistered emigration, even after the 2021 Census, will remain a methodological challenge for which appropriate statistical solutions need to be found. This statistical model is based on quality data sources and thus the data obtained will be of good quality too. For these reasons, this model is a solid basis for the development of a formal methodology for the estimation of family migration which would be used in the Office in the future.

Therefore, the foundations of this statistical model for the estimation of unregistered emigration of family members, through this paper, are put forward before the professional public and data users.

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ECONOMICS AND SOCIAL ASPECTS OF THE GLOBAL INTERNET USAGE GROWTH IN THE WORLD

1. DEVELOPMENT OF THE INTERNET IN THE GLOBAL FRAMEWORK

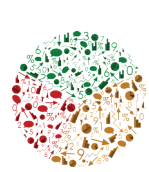
Nowadays the Internet is seen as a symbol of a developed technological era. It has consolidated as a very powerful platform that has changed completely and permanently the way humans work and communicate. Hence, it is rightfully said the Internet, as no other communication medium, has enabled the development of the international, global dimension of businesses and humanity. It has become an universal information source for millions of people in their homes, schools and workplaces. Amazon, Microsoft, and Alibaba are the top three on the global cloud computing market, accounting for 50% of the market share. According to the prediction by the International Data Center (IDC)[1], the compound annual growth rate of the income from artificial intelligence from 2016 to 2020 will be 54.4%, which is expected to boost the market value of trillions of US dollars and to bring about new revolutions in its industry and other industries.

The scrutiny of the process of development of the world in this area can lead to several conclusions. The United States is strengthening its ranks for engagement and allocation of internet potentials for the digital capabilities of the new generation and develop advanced manufacturing and artificial intelligence in technology and industrial leadership. The European Union is making efforts to reduce and avoid barriers to digital business in the Member States and to create unified digital market and marketing. Germany has accepted "Industry 4.0" as a national development strategy so as to demonstrate its industrial power in the world. Russia has issued the "Roadmap for development of the information technology industry" to enhance its overall advantages in the information industry. India is promoting the building of a "digital India" by speeding up its development of optical network, software and cyber security, while China is trying to build itself into an Internet power by promoting the integration of the Internet, big data, artificial intelligence and real economy and by enhancing its economic innovation capacity and competitiveness. It is clear that in addition to the powerful and developed leading nations in the world, the developing countries too are seeking to strengthen their competiveness by developing the Internet. Hence, one can rightly say that Marshall McLuhan's prediction dated decades ago that the world would become a global village through the Internet usage has become real at the present time.

In the beginning the purpose of the Internet was to interconnect government's research projects, and in 1994 its purpose was extended to serving millions of users for a large number of needs and purposes of businesses and in the daily lives of common people throughout the world. Bill Clinton[2], in one of his statements on the Internet, said: "When I took office, only high energy physicists had ever heard if what is called the Worldwide Web... Now even my cat has its own page".

[1] Report of World Internet Development 2017, Pdf, 2017, p.5.

[2] A.Rodriguez, A.Robles, *The History of the Internet*, October 2016, p.6.



In the course of its development the Internet has been changing continuously, and there are two things that mark its evolution: 1) social communication network, and 2) development of mobile technology. People have found a new form of communication via the social networking. This includes the following platforms: Facebook, Twitter, YouTube, My Space, Instagram. Within a short period following its establishment in 2004, Facebook has grown into a global network with more than 2,450 million active users. Mobile technology is also maximizing the number of users throughout the world. The Internet is still the most democratic of all mass media. With just a minor investment, anyone can have his or her own webpage on the Internet. Thus, a huge potential global market is within the reach of any business, notwithstanding the size or location of the business.

Electronic technology is directly linked with the human central nervous system, and quite often "what the public wants" is obtained through manipulation by those who try to benefit by taking a lease on the eyes, ears and nerves of people. The arrangement of the external space is directly influence by the pressure on the human nervous system and the effects of marketing and advertising by various corporations. Archimedes once said:[3] "Give me a place to stand and I will move the world". Today he would have pointed to our electronic media and said: "I will stand on your eyes, your ears, your nerves, and your brain, and the world will move in any tempo or pattern I choose. We have leased these "placed to stand" to private corporations.

The Internet has created and developed new forms and rules in the economy. From the domination of Facebook, Google in browsing and Amazon in online shopping, the biggest Internet platforms are already making great profit out of the most basic human interactions. Such dominance of the Internet is also growing in terms of financial transactions and conquering new market spaces for this type of financial services. The global dimension of the Internet was built on the basis of a complex network, effects, huge database and business and legal regulations and user protection.

The Internet has created brand new industries, new jobs, it has accelerated innovation, helped the diffusion of knowledge and the satisfaction of the new consumer preferences worldwide. The Internet has become the staple of modern living. Nowadays, all activities, the business ones in particular, are carried out through the Internet network and this is why the Internet's impact on the economy and society has been targeted by many researchers. Economic growth could be modelled as a function of capital, labour and technology. Within this model, the Internet could be used as a technology to complete an investment, as well as to employ and engage human capital as a variable of capital and labour force. Many developed countries verify that the development of the state measured by the Gross Domestic Product (GDP) or Gross National Income (GNI) has been matched with the Internet penetration rate.

2. Statistical data and relations of dependency between the number of Internet users and the level of development of the countries

We are starting the analysis of the statistical data on the share of Internet users in the total population of the countries with our hypothesis that: "Developed countries have a greater number of Internet users in the country and there is a high positive correlation with the Internet penetration rate". The parameters used to analyze this correlation are: 1) data on the share of Internet users in the total population of the countries and 2) the Internet penetration rate of the countries.

[3] Marshal McLuhan, Understanding media: The Extensions of Man, Pdf. p.18.

The share of Internet users in the total population is greater in the developed countries than in developing countries. We are also starting by analyzing the data that the developed countries had a greater Internet user penetration rate during the observation period. Many previous researches and statistical data on the development of the Internet claim that there is a "gap" between the developed and developing countries in terms of the share and the number of Internet users. The developed countries have managed to connect to the Internet network much sooner, and thus have been able to receive sooner the benefits of the Internet as opposed to developing countries. The developed countries have built the Internet infrastructure easier and faster and have met much earlier the societal Internet needs of both the general population and the businesses.

Table No. 1 presents the statistical data on the number of Internet users in the world in the period 1995 – 2019. The data indicate that in December 1995 the Internet users had a share of only 0.4% (16 million) in the total world population. In December 2005, this share had grown to 15.7% (1,018 million). In September 2010 this share amounted to 1,971 million, or 28.8%, and in December 2019 the statistical data indicate that 58.8% (4,536 million) people are using Internet.

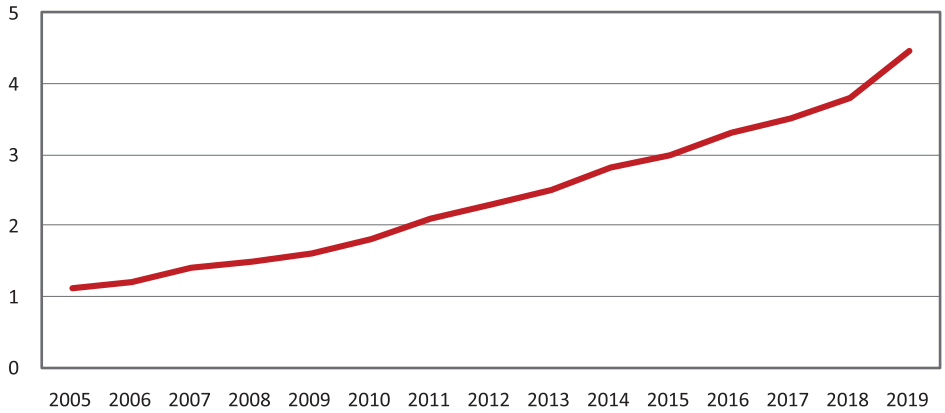
Table No. 1: Number of Internet users in the world 1995 - 2019

No.	Date	Number of users	% of world population	Source
1	December 1995	16 million	0.4%	IDC
2	December 2000	361 million	5.8%	Internet World Stats
3	December 2005	1,018 million	15.7%	Internet World Stats
4	September 2010	1,971 million	28.8%	Internet World Stats
5	December 2015	3,336 million	46.4%	Internet World Stats
6	December 2019	4,536 million	58.8%	Internet World Stats

Source: Internet users stats, 2020.

Chart No. 1 provides a graphic presentation of the number of Internet users in the period 2005-2019 There is an evident tendency of accelerated growth in the last five years of this period.

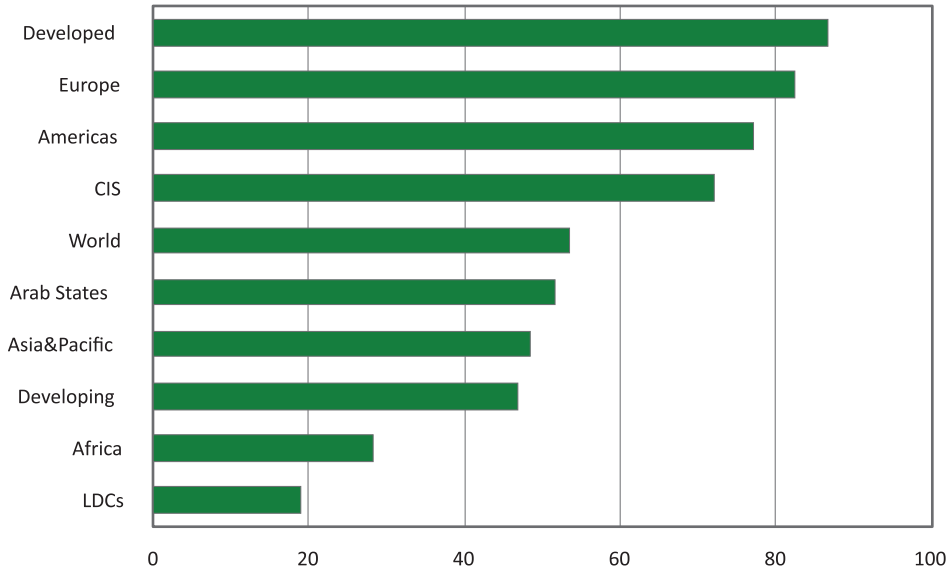
Chart No. 1: Growth of the number of Internet users in the period until 2019



Source: ITU publications, Facts and Figures, *Measuring Digital Development*, 2019, Pdf, p.12.

The next Chart No. 2 presents statistical data on the number of Internet users by regions: Europe, the Americas, Commonwealth States, Asian and Pacific, Arab States and Africa.

Chart No. 2: Internet users by region and development status, 2019, in %



Source: ITU publications, Facts and Figures, *Measuring Digital Development*, 2019, Pdf, p.12.

Table No. 2 presents the top 20 countries that have been listed in 2020 as the countries with the greatest number of Internet uses and which achieved the greatest growth in this are in the period 2000-2020. Those are the following countries: China, India, USA, Indonesia, Brazil, Nigeria, Japan, Russia, Bangladesh, Mexico, etc.

Table No. 2: Top 20 countries in the world by the number of Internet users, 2020.

No.	Country	Internet growth 2000-2020, %	No.	Country	Internet growth 2000-2020, %
1.	China	3.796	11.	Germany	329
2.	India	11.200	12.	Philippines	3.960
3.	USA	328	13.	Turkey	3.455
4.	Indonesia	8.560	14.	Vietnam	34.250
5.	Brazil	2.980	15.	Great Britain	413
6.	Nigeria	63.000	16.	Iran	27.040
7.	Japan	252	17.	France	710
8.	Russia	3.751	18.	Thailand	2.473
9.	Bangladesh	94.199	19.	Italy	415
10.	Mexico	3.144	20.	Egypt	10.940

Source: Internet World Stats, 2020.

The next Table No. 3 presents data on Internet users and the penetration rate of the Western Balkans countries and data of developed European Union Member States.

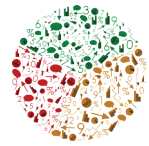
Table No. 3: Internet users – Western Balkans and developed European countries

No.	Country	Population (2019)	GNI/per capita World Bank-2018	Internet users, December 2019	Penetration rate
Western Balkans					
1.	Macedonia	2,086,720	$14,590	1,583,315	75.9 %
2.	Serbia	8,733,407	$14,040	6,325,816	72.4 %
3.	Bosnia and Herzegovina	3,501,774	$4,910	2,828,846	80.8 %
4.	Montenegro	629,355	$19,150	439,624	69.9 %
5.	Albania	2,938,428	$4,320	2,160,000	73.5 %
6.	Croatia	4,105,267	$14,909	3.787,838	92,3%
7.	Slovenia	2,081,900	$26,124	1,663,795	79.9%
EU - Developed countries					
8.	Norway	5,400,916	$75,990	5,311,892	98.4 %
9.	Italy	60,461,826	$34,483	54,798,299	92.5 %
10.	Germany	83,783,942	$47,603	79,127,551	96.0%
11.	France	65,273,511	$41,463	60,421,689	92.3%

Source: Internet World Stats, 2020.

The following conclusions may be drawn from the data presented in charts no. 1 and 2 and tables no. 1 and 2:

- The greatest number of Internet users has been recorded in the last five years, from 2014 to 2020, where this figure reached 58.8% of the total population, i.e. 4,536 million Internet users. In the period from 2005 to 2014 the number of Internet users was growing at a much slower rate (chart no. 1 and table no. 1).
- The share of Internet users in the European countries is 82.5%, followed by 82.5% in the Americas and 72.2% in the Commonwealth states. These states have a higher share of individuals using Internet compared to the states in Asia and the Pacific (48.4%), the Arab states (51.6%) and Africa (28.2%). According to the data on the classification of countries by the level of development (developed, developing and least developed countries), the developed countries have the greatest share in the number of Internet users - 86.6%, followed by developing countries – 47.0%, while the least developed countries have the lowest share with 19.1% (chart no. 2).
- The Western Balkans countries that have been covered by the present analysis are: RN Macedonia, Serbia, Bosnia and Herzegovina, Montenegro, Albania, as well as Croatia and Slovenia, which are European Union Member States. The statistical data on the number of population, Internet users, Gross National Income (per capita) and the penetration rate are evidently parameters that reflect the situation within a specific country. In these countries the Internet user penetration rate is lower when compared to such rate in the EU Member States. Croatia with 92.3% and Slovenia with 79.9% have greater penetration rates than the other countries in the Western Balkans. Norway has a penetration rate of 98.4%, Germany – 96.0%, France – 92.3%, and Italy – 92.5%. Our country has a penetration rate of 75.9% , while Serbia and Montenegro have rates of 72.4% and 69.9%, respectively. This confirms our hypothesis that the share of the number of users in the total population and the penetration rate are in positive correlation with the level of development of the country. Developed countries have higher penetration rates compared to developing and least developed countries (table no. 3).



The conclusions drawn based on the statistical data confirm the interdependence of the comparison parameters, the share of Internet users in the total population and the Internet user penetration rate, i.e. there is a positive correlation between those variables. It also confirms the positive correlation between the level of development of a country and the greater Internet user penetration rates in the EU Member States and countries in the world. All of the above verifies the hypothesis that we have set in the research for the paper.

Conclusion:

The data presented above lead to the conclusion that the Internet, as no other communication medium, has enabled the development of the global economic and social dimension of businesses and humanity. It has become a universal information source for millions of people in their homes, schools and workplaces. There is a clear and evident difference in the usage of the digital and information technology between developed and developing countries within the reference period. The most developed countries (China, India, USA, Brazil, Russia) have the greatest shares of Internet users in the total population, and this, combined with the levels of the Internet penetration rate, verifies the positive correlation between the two parameters. The Americas, Asia and the European Union remain the most developed regions in the world. Western Balkans countries, including our country, as developing countries are seeking to follow the trends of changes in the information technology by increasing the number of Internet users and the Internet penetration rate.

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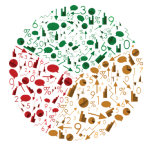
The role of Statistics on innovation, science and technologies in the making of the national innovation policies in the Republic of North Macedonia

Introduction

The modern societies of the present day a far more complex than the societies of the past. Their complexity is owing to the dynamics and heterogeneity arising from technological development, innovation, digitization and the ever accelerating globalization process. These processes increase the linking and interdependence of national economies, facilitate the exchange of information and know-how, stimulate the external trade, etc., but they also create challenges immanent in contemporary national economies, the major ones among which are: pollution of the environment, realizing economic growth and its sustainability, and the rising overload by information and data on various phenomena and from various sources. Since the changes are very fast and unpredictable, the national statistical institutions are facing serious challenges in terms of producing data that would capture adequately such dynamic trends. The data produced by statistical institutions should be timely, relevant and of good quality, should meet the national needs, but also be internationally comparable. Statistical institutions are facing the challenge of establishing appropriate methodologies to measure and produce data on complex phenomena. On the other hand, statistical institutions are facing the challenge of establishing a methodology for adequate presentation and publication of data. Without available methodology and comprehensible presentation of data the users are often not able to understand and interpret properly the complex statistical data, which inevitably leads to their reduced utility. Furthermore, national statistical institutions are facing the need to produce an increasing volume of statistical data in various domains, which are, on one hand, very complex to monitor, while, on the other, their monitoring is necessary, since they constitute an input to the development, implementation and monitoring of national policies, strategies, and analyses.

Macedonia, as a relatively small economy, is striving to realize economic growth and sustainable economic development by advancing and promoting the competitiveness of the business sector and developing new knowledge and innovations. This imposes the need for continued measurement of innovativeness of the business sector in the country, the conditions of the environment for its development and the basic characteristics of the process. Recognizing all of these elements is key for the development of strategic documents and measures to promote and support innovation. The State Statistical Office (SSO) of the Republic of North Macedonia, as the official implementer and coordinator of the statistical system in the country is facing the challenge of producing statistical data in this complex domain, which would provide the input to the development, implementation and monitoring of national policies and to the development of analyses and studies by the academic community or other beneficiaries.

One of the strategic goals of the innovation policy of the RN Macedonia is to build an effective national



innovation system, co-created by all stakeholders and open to the world, where the exchange of knowledge and ideas among all stakeholders would be the primary resource in the innovation process. This goal is of particular importance for the promotion of innovation in national economies with relatively limited resources and knowledge.

Starting from this strategic goal, the subject matter of the present paper is an analysis of the application of open innovations, i.e. the flow of knowledge in the Macedonian economy. The analysis is based on the data from the Statistical survey on innovations and innovation activities of business entities conducted by the SSO for the period 2014 – 2016. The paper aims to examine the level of realization of the goal defined in the national Innovation Strategy and its share by sectors. The theoretical part of the paper presents the methodological fundaments of the research on innovations and the changes and challenges in terms of establishing an adequate methodology for measurement of the contemporary characteristics of innovations. Furthermore, it presents the theoretical postulates on open innovations, as well as the methodological base for measurement thereof, as the most sophisticated practice of innovation and one of the key objectives set forth in the National Innovation Strategy of the Republic of North Macedonia. The next sections of the paper present the analysis of the presence of open innovation in the country and cluster the sectors and departments according to the characteristics exhibited by the business entities in the innovation process. The end of the paper provides conclusions and presents opinions and recommendations in view of improving these statistics.

1. Theoretical basis

Methodological basis for measurement and collection of data on innovations – contemporary challenges under conditions of digitization, globalization and flow of knowledge as a basis of the innovation process

It is a widely recognized fact the creation, diffusion and use of knowledge is crucial for economic growth and development and promotion of the wellbeing of the national economies. Taking this fact into account, the proper measurement of innovations and the characteristics relating to the innovation process are of key significance. The nature and character of innovations have changed with time, and monitoring such changes and producing the required data and indicators for the policy makers and other data users is becoming a necessity. The beginning of 1990s has seen the emergence of the first surveys on innovations as a result of the need to measure innovations and their constituent components and process actors. The first methodological manual for measurement of innovations has been developed in parallel with the first surveys on innovations.

The methodological manual is known as the Oslo Manual[1] , and it has been developed by Eurostat and OECD. Taking into account the permanent monitoring of the weaknesses identified in the surveys conducted, the changing needs of the data users, in particular of the policy makers, as well as the changes of the very nature of innovation, the manual, from its initial formulation to the present day, has been a subject of three revisions, of which the most recent, fourth edition has been published in 2018[2].

The latest edition of the Oslo Manual has introduced significant changes and advancements in the definition and measurement of innovations compared to the previous editions. One of the key changes made in the most recent, fourth edition of the Manual is the change in the definition of innovation. The third edition has defined innovation as "...the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organisation or external relations"(OECD and Eurostat, 2005, p. 46). The fourth edition, on the other hand, defines innovation

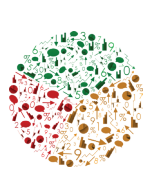
as "...new or improved product or process (or combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process)" (OECD and Eurostat 2018, p. 32).

The change in the definition of innovation arises from the previously identified weaknesses in the conducted surveys on innovations, and from the impact of technological innovations (product and process innovations) in improving the dynamics of the economic growth and the rising attention dedicated to the promotion of these types of innovations by the policy makers. Taking into account the fact that implementing innovations is not characteristic solely for the business sector, in the latest edition of the manual the concept of innovation is applicable to all four sectors (business sector, general government, non-profit institutions and households). Major improvements have also been made in terms of adjusting the usability of the methodology both in developed and developing countries, in order to expand the application of the methodology at a global level and enable comparability of the data gathered, as a result of the undoubtedly significant role of innovation in developed countries and in developing countries.

One of the main changes and improvements introduced in the most recent revision of the Oslo Manual in terms of defining and measuring the innovation models in the perspective of the global challenges is: measuring and monitoring open innovations as one of the most important innovation models in the modern worlds, where the primary role in the innovation process is assigned to the flow of innovation-relevant knowledge within national and international frames; digitization of economy and societies, i.e. measuring innovations in digital products, as well as the role of digital platforms and databases in promotion of innovation and in presenting the data, as well as monitoring innovation in terms of globalization.

Digitalization is transformation of the current business models or development of new business models by using digital technology, which contributes to improved performance of the enterprises and to their improved competitiveness. Due to the fact that digitalization is no longer an option, but an integral part of the operation of the enterprises, it is necessary to monitor and measure it and recognize its characteristics. The new edition of the Oslo Manual enables the measurement and monitoring of digitalization as an innovation process, but also as a key factor driving innovation. Digitalization is monitored and measured in terms of: recognition of the role of information in implementing product and business-process innovations; classification and monitoring of activities for development of software, databases and data analysis as innovation activities; the role of digitalization in the creation of new knowledge and in the flow of knowledge, and finally, measurement of the role of digitalization as an external factor driving the promotion and stimulation of innovation. On the other hand, digitalization promotes the measurement of innovation, i.e. collection and processing of innovation data. Digitalization enables the collection of data and information on innovation outside the business sector, even though initially such data and information were not developed for statistical purposes. Collecting such information and data by virtue of digitalization leads to a reduced burden on the respondents (reporting units). The introduction of sophisticated electronic data collection methods and the replacement of the old methods promote the data collection process and reduce the recall and data processing errors. And, naturally, digitalization enables advancement of the methods for data presentation, analysis and visualization, which is particularly important for innovation data due to their frequent use and owing to the fact that the innovation surveys produce a large volume of data and indicators.

The process of globalization, and within its framework the digitalization, which contributes significantly to the acceleration of globalization, opens opportunities for the flow of information, diffusion and exchange of new knowledge developed in the enterprises outside of enterprises, and even out of national borders and implementation thereof at micro level, i.e. at enterprise level. In other words, globalization and digitalization contribute significantly to the development of new types of innovations, better known as open innovations



that enable the promotion of innovation through the flow of new ideas and knowledge. As opposed to the third edition of the Oslo Manual, which enabled analyzing the constituent components of open innovations, the new Oslo Manual includes theoretical postulates and provides guidelines not only for the measurement of the constituent components of open innovations, but also enables distinction and measuring of the different types of open innovations.

Taking into account the new global trends and the increasing inter-connection of national economies through the flow of knowledge, diffusion and absorption of new technologies, the new methodological basis, i.e. the most recent Oslo Manual enables the analysis of innovation in a global context, that is, including the global component in the innovation processes. In the previous, third edition of the Oslo Manual, innovation is analyzed from a global aspect, by measuring and monitoring the knowledge flows and their role in the creation of innovations in global frames. However, in the new methodology the global component has been strengthened by identifying the role of the multinational enterprises in the innovation processes, the knowledge flow in global frameworks and identification of the role of enterprises in the global value chain.

The methodology on innovation, on the other hand, is the basis for conducting surveys on innovation and analyses on the various aspects of the innovation process. The most widely used innovation survey which provides for international comparability of data is the Community Innovation Survey. This survey has been conducted for the first time in 1992, in parallel with the drafting of the Oslo Manual. The survey is applied not only in the EU Member States, but also in other countries in Europe and the world. The survey is conducted every two years and it covers a three-year reporting period, and the definitions and concepts of the survey are aligned with the Oslo Manual. The Survey collects a wide set of data on various aspects of the innovation process, such as: innovation types, cooperation in the innovation process, innovation activities and related costs, factors driving the promotion of innovation, environment conditions and government support in implementing innovation.

Application of open innovation and knowledge flows practices - new challenges faced by the national economies

The Republic of North Macedonia, as a country with relatively limited resources, is striving to stimulate economic growth and sustain economic development by improving the competitiveness based on knowledge and innovation. Taking into account this strategic goal, the Government of R. Macedonia adopted the first Innovation Strategy 2012 – 2020, which complemented the existing documents of the government, such as: Industrial Policy, Small and Medium Enterprise Strategy, Research and Development Programme of the Government, and other current government policies. The innovation strategy aims to "to initiate the transformation of the country into a knowledge-based economy able to compete on international markets through its skilled labour force and innovative companies" (MoES, 2012, p. 4). The Innovation Strategy was complemented in view of promoting the innovation capacity of the country by the Smart Specialization Strategy, which under development, and the primary objective of which is to detect key areas, i.e. sectors where the country has comparative advantages, and where research and development and innovation are the key factor driving the strengthening of capacities and promoting the competitiveness of the business sector in the global market.

One of the four objectives of the Innovation Strategy is to increase knowledge flows and interactions between the innovation actors. Another significant aspect in RN Macedonia in view of promotion of innovation is the flow of knowledge, ideas and information and the cooperation within the business sector, between the business sector and the government and between the business sector and the academic community. Knowledge

is the most important strategic resource for the enterprises, in particular within the innovation process. Knowledge is generated and used by various actors of the national innovation system, such as: enterprises, universities, research institutes, consumers, etc. The enterprises could use the knowledge generated within the frames of the organization, or external knowledge, such as the knowledge of consumers, investors, experts or other new potential sources of knowledge (Enkel, 2010). The knowledge flows have changed significantly as a result of the development of new technologies and new business models. The digitalization and the development of the information and communication technologies have led to acceleration of the knowledge flows, enabled their simplified transformation into innovation and facilitated the use of new sources of knowledge. Knowledge is transformed into innovation. Innovation diffusion, on the other hand, is a process of input of knowledge that is transformed into innovation and adoption of the innovations by other enterprises (innovation output).

The importance of input and output knowledge flows for the improvement of the efficiency of innovation has been recognized in the past decades (Kline and Rosenberg, 1986; Teece, 1986). Knowledge flows are essential in the development of open innovation practices, i.e. open innovations. The open innovation concept (Chesbrough, 2003) emphasizes the advantages of the use of knowledge inflows and outflows in accelerating innovation and expanding the markets for commercialization of innovations. Open innovations have increased the need for knowledge flows among the actors of the innovation processes and the need for access to knowledge through specialized networks and markets (Arora, Fosfuri and Gambardella, 2001).

Open innovation have identified the following knowledge flows (OECD and Eurostat, 2018):

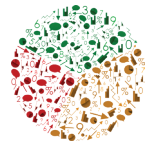
- Inward (inbound) knowledge flows, when a firm acquires and absorbs externally sourced knowledge in its innovation activities.
- Outward (outbound) knowledge flows, when a firm intentionally enables other firms or organizations to use, combine, or further develop its knowledge or ideas for their own innovation activities.

Enterprises can concurrently use both inbound and outbound knowledge flows in their innovation activities (Cosh and Zhang, 2011). An example of inbound and outbound knowledge flows is the cooperation in the innovation process, which involves both inward and outward flow of knowledge. The data on the implementation of various types of open innovations depending on the knowledge flows may be used to identify the position of the enterprise in the innovation networks.

The open innovation model has several key dimensions (Ebersberger et al. 2011)

- Identification of external knowledge and ideas (search)
- Interactive process of development and transfer of knowledge (collaboration)
- Market-oriented sources (innovation costs)
- External commercialization of knowledge.

Presently the statistical institutions are faced with a serious challenge in measuring and monitoring complex knowledge flows, in particular in the modern global world which fails to recognize national boundaries. The data on the knowledge flows are used by both policy makers and managers of enterprises to identify opportunities and barriers to the free flow of knowledge and its utilization in the business processes, as well in the examination of factors that assist the absorption of external source knowledge by the enterprises.



2. Analysis of the application of open innovation models and knowledge flows in the Macedonian business sector by using the data from the Statistical survey on innovations and innovation activities of business entities

Measuring the innovativeness of the Macedonian business sector

Since 2010, SSO has conducted and published the data of four surveys on innovation and innovation activities of the business entities in the RN Macedonia:

- Innovative business entities 2010-2012;
- Innovative business entities 2012-2014;
- Innovative business entities 2014-2016; and
- Innovative business entities 2016-2018.

According to the SSO data, the share of innovative business entities in the total number of business entities, as part of the surveyed population for the reference period 2014-2016 amounts to 37.4% (Table 1). The innovativeness of the Macedonian business sector is lagging behind by more than 10 percent points compared to the European Union average (51 %) (Eurostat, 2019). According to the size of the enterprises, the large enterprises are the most innnovative (55.3 %), followed my medium enterprises (42 %) and the small enterprises are the least innovative (35,6 %) (SSO, 2018).

Table No.1: Innovative business entities by size, RN Macedonia, 2014-2016

Business entities by size	**Total**	**Innovative (number)**	**%**	**Non-innovative (number)**	**%**
Total	**3·114**	**1·166**	**37,4**	**1·949**	**62,6**
Small	2.448	871	35,6	1·577	64,4
Medium	552	232	42	321	58,2
Large	114	63	55,3	51	44,7

Source: SSO, 2018

In terms of sector distribution, the enterprises in the sector of modern activities – Information and communications and Financial and insurance activities have been assessed as the most innovative (SSO, 2018). Within these two sectors, 56.3% and 52.1% of the business entities, respectively, are innovative. The lowest innovation in the reporting period has been exhibited by the business entities in the sector - Water supply; sewerage, waste management and remediation activities, where the innovative business entities have a share of only 22.1% in the total number of business entities (SSO, 2018).

The data obtained in the survey for the penultimate reporting period, 2014-2016[3] were used for the purposes of analysis of the knowledge flows and open innovation practices in the Macedonian business sector. The data were used to analyze the presence of the above mentioned key dimensions of the open innovation model.

[3] The analysis has not used the data on the last reporting period since at the time of drafting of the present analysis no data have been available at a lower aggregation level that would be suitable for the analysis.

In this regard we would like to emphasize that the survey of the last reporting period (2016-2018), in addition to the data on the presence of the key dimensions of open innovations in the Macedonian business sector, also provides data on the implementation of the two types of knowledge flows defined by open innovations, the inward (inbound) knowledge flows and the outward (outbound) knowledge flows in the Macedonian business sector, which is essential for making analyses of this type.

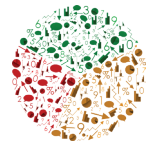
Analysis of the implementation of open innovation in the Macedonian business sector

We have taken out from the survey those data that may be used to identify the extent of implementation of open innovations by the Macedonian business sector, measured through the presence of the key dimensions of open innovations referred to above in the present paper. The main principle of open innovation is the wide distribution of useful knowledge. Even the highly competitive enterprises and the enterprises equipped with high quality human resources and research and development (R&D) activities have to be linked with external sources of knowledge, since the meaningful and extensive research efforts are often too complex to be carried out in a single enterprise. The text below presents the analysis by the presence of the key dimensions of open innovations in the Macedonian business sector.

Identification of external knowledge and ideas (search)

The first dimension/component of open innovation refers to *identification of external knowledge and ideas*, i.e. information screening. External knowledge, i.e. information that are new to the enterprises are, by definition, not known in advance and have to be identified through the search process (Ebersberger and Herstad, 2010). This renders the innovation process uncertain, since the enterprises cannot define and select in advance which ideas and information would be useful. The enterprises are seeking out in order to find new inspiration, new ideas and unrealized development opportunities. The systematic search of information may lead to discovering solutions to an existing problem or to obtaining information on the consumer preferences regarding some new products. The enterprises should not search for information solely outside of the enterprise and with the existing clients, within the frames of the sector and with the cooperation partners, but also out of the organizational and sectoral boundaries, because the development of innovation requires extending the search out of the already established links and contacts. Within the framework of open innovation, enterprises are systematically exploring new opportunities, for instance by using publicly available databases, scientific publications or market researches. Searching the demand side of the market may provide the enterprise with vital information about preferences and future trends (von Hippel, 1988, 2005), while searching among competitors can yield information about technological opportunities not previously perceived (Lukas and Ferrell, 2000). Suppliers are important sources not only for the technology, but they indirectly provide information on competitors, research communities and the market (Hauknes and Knell, 2009). Using information from product development and consultancy firms provides the enterprise with insights into technological opportunities existing outside their own value chain or their sectoral boundaries (Tether and Tajar, 2008). Publications may provide information about not only cutting edge technologies, but also of paths not worth pursuing (Asheim and Gertler, 2005). Different information sources serve complementary functions in the innovation process. The diversity of information sources used can therefore be interpreted as an indicator of overall openness toward external information. The existing empirical analyses verify that the search for information has been found conducive to innovation (Laursen and Salter, 2006).

The SSO Statistical survey on innovations and innovation activities of business entities includes a question to



obtain data on the use of information in the course of the innovation activities. The question lists 11 sources of information to be ranked by the respondents according to their degree of utility and relevance for initiation of innovation activities using a 4-point Likert-type scale. The previously defined sources of information are classified in four groups: internal sources, market sources, scientific and research sources and other sources of information. With the exception of the first group of sources, all other groups are external and may be used as indicators to measure the presence of the first dimension of open innovation.

The information sources can be categorized primarily into two groups, searching in the industry and searching in the scientific sector. According to the data of the Statistical survey on innovations and innovation activities of business entities, out of the total number of product and/or process innovative business entities from the business sector in RN Macedonia (861 business entities), for 47% the use of internal sources of information from different sectors within the enterprise are of great importance for the successful performance of the innovation activities (Table 2). In terms of external sources of information, the enterprises in the Macedonian business sector are predominantly using information from suppliers (30.5%) and from private sector clients (26.6%). A relatively small share of the enterprises are searching for information within the scientific sector, i.e. use information from consultants, laboratories and universities (5.7%) and from higher education institutions (3.1%) (Eurostat, 2018). The dominant share of the use of external sources of information within the industry is expected in RN Macedonia, since the use of such sources of information is distinctive for enterprises in national economies which absorb and accommodate to the existing cutting edge technology developed outside of the national boundaries. On the other hand, the use of information originating in the scientific and research sector is distinctive for those national economies with a relatively large share of large enterprises and with well-developed R&D sectors. The data on RN Macedonia are undoubtedly indicating a poor utilization of external information and ideas in the innovation process.

Table No.2: Enterprises which assessed the use of information sources of great relevance for the realization of innovation activities, 2014-2016

	Number of enterprises	%
Within the enterprise or group of enterprises	406	47,2
Suppliers of equipment, materials, components, software or services	263	30,5
Private sector clients or consumers	229	26,6
Public sector clients or consumers	59	6,9
Competitors or enterprises within the sector	91	10,6
Consultants or commercial laboratories	49	5,7
Universities and other higher education institutions	27	3,1
Conferences, fairs, exhibitions	157	18,2
Scientific literature and technical science magazines	121	14,1
Associations, chambers	55	6,4

Source: Eurostat, 2018

Interactive process of development and transfer of knowledge (collaboration)

The process of searching for information can result in a deeper interaction with the external parties (enterprises or institutions). Information can be exchanged, but they will not be useful unless they are transformed into knowledge. The enterprise may find out that it does not possess sufficient knowledge to realize an idea, or it could face unexpected problems when realizing the ideas. If such problems and challenges could not be overcome and resolved internally, the enterprise could actively engage in collaboration with other external actors. The second dimension of open innovations includes *collaboration*, i.e. *the interactive process of knowledge development and transfer.* The collaborating parties take part in active exchange of knowledge. Collaboration may include two parties, or entire teams involving a large number of actors. Different types of collaboration may have different significance in different stages of the innovation process (Kessler et al., 2000; Roper et al., 2008). The collaboration with the clients may provide complementary knowledge that would reduce the market uncertainty. On the other hand, the collaboration with the research sector may contribute to the realization of basic research necessary for the development of a product or machine component as part of the new product or process development. With regard to the collaboration within the national boundaries our outside of them, the collaboration with external actors of the national economy could contribute for the diffusion and recombination of the knowledge among the parties involved in the exchange, while the collaboration with actors out of the national economy could lead to transfer of technology and knowledge from other national economies. There are different types of cooperation, ranging from binary collaboration in limited project to network collaboration at industry level. Nevertheless, in general there are three types of collaboration: horizontal, among enterprises within the same sector of activities; vertical, among entities at different levels of the supply chain, e.g. between suppliers and clients, and lateral collaboration, which connects the business sector with the academic community.

The Statistical survey on innovations and innovation activities of business entities included a question providing data on the active cooperation of the enterprise in the innovation process with other institutions or organizations, according to the geographical location of the collaboration partner. The question list 8 collaboration partners and different locations of the partners. In terms of cooperation, it has been emphasized that innovation cooperation means only active participation in joint innovation activities with other enterprises or institutions, excluding pure contracting out of work where there is no active collaboration (OECD and Eurostat, 2005).

The survey data indicated that out of the enterprises that have implemented product or process innovations within the reporting period (2014-2016), most of them have implemented innovations independently (75%) without engaging into active collaboration with other enterprises or institutions. Analyzed by types of collaboration, the Macedonian business sector is dominated by vertical collaboration, i.e. collaboration among different actors in the value chain. More than 81% of the enterprises are collaborating with suppliers of equipment and materials in the innovation process, and nearly 55% of the enterprises are cooperating with the private sector clients. As in the case of use of information, once again the data indicate a low level of lateral collaboration, i.e. poor collaboration between the business community and the academic community. The collaboration with actors in the value chain is more directly related to resolving specific problems, while the collaboration with the research sector is more directed toward research activities and basic research.

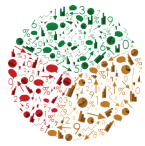


Table 3. Innovative enterprises that collaborated in implementing innovations, by collaboration partner type, 2014-2016

	Number of enterprises	%
Product and/or process innovative enterprises	861	
Type of collaboration	210	24,4
Other enterprises within the enterprise group	82	39,0
Suppliers of equipment, materials, components, software or services	171	81,4
Private sector clients or users	115	54,8
Public sector clients or users	51	24,3
Competitors or enterprises within the sector	62	29,5
Consultants or commercial laboratories	47	22,4
Universities or other higher education institutions	48	22,9

Source: Eurostat, 2018

Market-oriented sources (innovation costs)

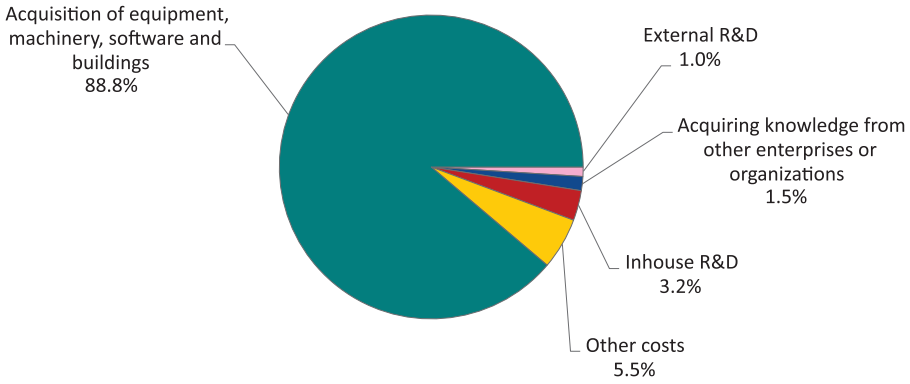
Enterprises often do not have the necessary resources and knowledge to develop innovations and innovation activities. As an alternative to, or to complement the internal development of innovations, the enterprises may decide to implement innovation activities by procuring machines, equipment, knowledge and services required to implement the innovation activities. *The market-oriented sources,* i.e., *external innovation costs* constitute the third component of open innovation. By virtue of external costs for innovation activities, the enterprises are reducing the internal costs and the risk in the innovation process. An example for external innovation costs are the R&D contracts out of the enterprises, which are entered into under agreed terms and conditions. The contracts on the implementation of external R&D activities are different from searching, since these activities involve an actual transfer of technology, but they are also different in terms of cooperation, because these contracts do not imply active collaboration between the enterprises and an external partner for the purposes of resolving problems or basic research, and they do not produce flows of knowledge in the form of positive externalities resulting from the active collaboration. Entering into research and innovation activity contracts is particularly important and current in the recent years since it enables access to cutting edge technologies, equipment and specialized knowledge, while it requires engaging less organizational resources and lesser fixed costs for maintenance of R&D departments in comparison to active collaboration.

The examination of the third dimension of open innovation, which relates to market-oriented sources, utilized the data obtained from the question on the types of costs incurred to implement innovations. This question provides data on the following types of costs of innovation activities: in-house R&D; external R&D; acquisition of equipment, machinery; knowledge; designs, etc.

As noted in Chart No.1, the greatest part of the costs of innovation activities of the enterprises within the Macedonian business sector amount to external costs (96.8%), while only 3.2% of the costs incurred relate to in-house R&D activities. The acquisition of new equipment, machinery and software has the greatest share (88.8%) in the external costs, while the share of the external R&D costs is the lowest one (1.5%). These data point out to the fact that innovation activities, i.e. development of innovations in the country is mostly based

on procurement of sophisticated technological equipment, and only to a lesser extent on basic or applied research, i.e. R&D activities carried out within the enterprises. The recent years have seen a notable increase of external costs for innovation activities, not only in RN Macedonia, but also in other European countries.

Chart No.1: Costs for innovation activities in 2016



Source: SSO, 2018

External commercialization of technologies

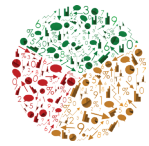
Intellectual property is considered to be a product of classical innovation and its role is mainly a defensive one. Without intellectual property rights the innovator shall be deprived of any financial gains due to potential copycats and shall have no motivation to innovate in the future. Nevertheless, in the open innovation model, too, intellectual property is one of the central elements, because intellectual property flows from and to the enterprises, which enables exchange of knowledge, i.e. the knowledge acquired within one enterprise can be used and combined further to develop new ideas, knowledge and innovations.

The data relating to the last dimension – *external commercialization of technologies* indicate a low utilization of the intellectual property rights. Only 14% if the innovators have commercialized their innovations, i.e. registered their intellectual property rights within the reporting period. The data presented in Table 4 indicate that the most used form of intellectual property by the enterprises in Macedonia are trademarks (77.1%), while the least used are patents (12.9%) and utility models (4.3%).

Table No.4: Enterprises of the Macedonian business sector using intellectual property rights, 2014-2016

	Number of enterprises	%
Enterprises using intellectual property rights	140	14,1
Patents	18	12,9
European utility model	6	4,3
Industrial designs	45	32,1
Trademarks	108	77,1
Trade secrets	32	22,9
Copyright	22	15,7

Source: Eurostat, 2018



Clusters of sectors and departments by the application of open and closed innovation models

Based on the shares of the previously analyzed key dimensions of open innovations, the following part contains a cluster analysis of the sectors and departments in the Macedonian business sector depending on their characteristics exhibited in the innovation process. As in the preceding part of the paper, the sources of data are once again Eurostat and the State Statistical Office, Statistical survey on innovations and innovation activities of business entities in RN Macedonia, reporting period 2014-2016. The cluster analysis is of the K-Means type cluster analysis with a predefined fixed number of groups (clusters), i.e. two groups of clusters have been defined for the purposes of the analysis (cluster of sectors implementing open innovations and cluster of sectors implementing traditional innovations). The indicators used by dimensions were previously analyzed in greater detail.

Table 4 presents the results of the cluster analysis. Based on the indicators used, one may draw a conclusion that only a single sector from the Macedonian economy, in particular the Manufacturing sector, implements the open innovation model. All other sectors and departments implement closed innovations, i.e. in the innovation process they rely mostly upon their own resources, knowledge, and capacities. The enterprises from the manufacturing sector does not rely solely in the innovation process on their own contacts, resources, and knowledge, but are directed toward searching new ideas and knowledge from external sources, are collaborating actively in the innovation process, are using external technology, researching the market and implementing market-oriented innovations. The application of the open innovation practices leads to greater efficiency in innovation of the enterprises from this sector.

Table No.5: Results of the cluster analysis – distribution of sectors and departments of the Macedonian business sector into clusters

Sector/Department	Cluster
B Mining and quarrying	1
C Manufacturing	2
D Electricity, gas, steam and air conditioning supply	1
E Water supply, sewerage, waste management and remediation activities	1
46 Wholesale trade; except of motor vehicles and motorcycles	1
H Transportation and storage	1
J Information and communication	1
K Financial and insurance activities	1
71 Architectural and engineering activities; technical testing and analysis	1
72 Scientific research and development	1
73 Advertising and market research	1

Source: Calculations by the authors

Conclusions and recommendations

Taking into account the fact that today's economic growth and development worldwide is based on the development of innovations, new knowledge and technology, the primary objective of each national economy is to draft strategic documents and develop measures to support innovation, technological development and development of new knowledge.

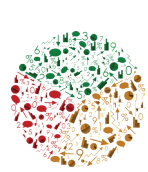
The emerging relevance of such global trends, on the other hand, poses a great challenge for the statistical institutions to produce the data that would drive the process of development of strategies, but would also enable the monitoring of the progress in the realization of the strategic objectives and monitoring the efficiency of the introduced measures.

In view of developing an economy based on innovation and knowledge, RN Macedonia has drafted the first National Innovation Strategy 2012-2020. At the time of the drafting of the Strategy, there were still no official statistical data available to measure innovation and identify the main weaknesses and the comparative advantages of the country in this domain. The State Statistical Office had published the first official data on innovation and innovation activities of the business sector in RN Macedonia in 2014 for the reporting period 2010-2012, and since it was monitoring innovation regularly, in accordance with Eurostat's methodology, thus providing for international comparability of the data. As it may be noted from the analysis above, the official statistics on innovation are of great importance also for monitoring the progress in the realization of the objectives laid down in the Innovation Strategy 2012-2020, as one of the key strategic documents of the Macedonian national innovation system. We have selected open innovation as a subject matter of analysis due to its undisputed great importance for the flow of knowledge, networking and collaboration in the development of innovations, in particular in today's global world of interconnections and interdependency of all actors in the innovation system, not only at national, but also at global level.

Taking into account the fact that the first National Innovation Strategy expires in 2020, the State Statistical Office of RN Macedonia is facing a serious challenge in terms of producing statistics that would drive the process of drafting of the new Innovation Strategy. In addition to the Innovation Strategy, the development of a Smart Specialization Strategy is also under way, which is particularly important and which should define the priority departments/sectors of activity where RN Macedonia has comparative advantages. However, data and indicators will have to be produced to enable the monitoring of the progress in the realization of the defined objectives within the priority areas laid down in this strategy. In the forthcoming period these strategy will be complemented by other strategic documents in this domain, the drafting of which shall once again depend on the production of official statistics. The data produced by SSO are also used in the assessments made by external experts in the field of innovation, competition, technological development and promotion of entrepreneurship.

Having regard to the exceptional importance of official statistical data produced by the SSO, which support the drafting of the key strategic documents in the country and present the basis for the conducting fundamental and basic research on matters of great significance for RN Macedonia, we are issuing the following recommendations:

- Micro enterprises, at least those coming from some of the priority sectors and departments, should be covered by the future innovation surveys. Despite the fact that their inclusion is not mandatory in line with the international recommendations, it is still an undisputed fact that micro enterprises are the supporting pillar of our economy and that the greatest portion of the resources aimed at supporting innovation refer exactly to this category of enterprises.



- In terms of production of statistics, SSO should dedicate its attention further to improving the qualitative component of the data. It is not important just to produce data; it is by far more important to produce high quality data. The quality of the data should be assured throughout the process, starting from the development of data collection instruments, establishing adequate methodologies, collecting the data, controlling and analyzing and publishing the data, etc. The response rates have great impact on the quality component of the data. Therefore, it is necessary to strike a balance, i.e. to work on improving the response rate on one hand, and on reducing the burden of the reporting units, on the other. This requires following the international experience and practices and obtaining data from alternative sources. In addition to the reporting units, sources of data could also be the web pages of the enterprises, specialized web pages with readily available data and information on innovative enterprises, as well as facilities and institutions intended to support innovation and technological development.
- In terms of data presentation, following the contemporary trends and opportunities made possible by the digitalization, i.e. the introduction of interactive charts and visualizations of data would mean a step forward to the modernization of the data production process. So as to meet the users' requirements relating to the data and provide for its proper reading and interpreting, it has to be accompanied by methodological notes and clarifications, since their absence could lead to misinterpreting of the data and could limit their utility.
- Since innovations and other related components are very complex matters, a serious analytical approach and commitment is required by the academia and the expert staff in the analysis of the innovation data and indicators. The analysis of the data obtained is inevitable, but such data should also be regularly examined and matched with other indicators and data used to measure innovation that are available in national and international reports and rankings of the country in this domain, so as to overcome any potential or identified contradictions. If these aspects are not taken into account, the data may provide a distorted image of the extent of innovation and the characteristics of the innovation process, which, in return, will have detrimental effects and will limit the usability of the data in the policy making process and in monitoring their realization and effects.

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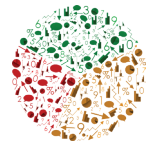

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Bosnia and Herzegovina's digital transformation

1. Introduction

In 2018, the European Commission presented the Digital Agenda for the Western Balkans, one of the 6 key policy initiatives of the European Union in the Western Balkans. The goal of the agenda is to contribute to the region's transition to a digital economy and bring added value in the process of digital transformation, such as economic growth, job creation and better digital services.

The Digital Agenda for the Western Balkans commits the Commission and Western Balkan countries to: Investing in digital infrastructure, Improving digital security, trust and strengthening the digital economy and digital society by developing tools for electronic services, Encouraging research and innovation by establishing national research institutions.

The Council of Ministers of Bosnia and Herzegovina adopted a "*Policy for the Development of the Information Society of Bosnia and Herzegovina for the period 2017-2021*", which defines activities that will increase the social and economic potential of ICT. The development policy of the information society of BiH for the period 2017 - 2021 is harmonized with the seven strategic pillars of ICT development from the Digital Agenda for Europe. The policy defines the development goals of the electronic communications sector in BiH, as well as, measures and activities that will lead to the realization of the defined goals. However, no Action Plan has been developed that will contain concrete implementation steps, development programs and projects with appropriate descriptions, stakeholders, deadlines and necessary resources. The Framework Strategy for the Development of Broadband Access in Bosnia and Herzegovina for the period 2019-2023 was also adopted and Action Plan. The strategy aims to identify the key priorities needed for the development of broadband access in Bosnia and Herzegovina.

Recognizing the importance of introducing digital technologies in the entire BiH society, the Foreign Trade Chamber of Bosnia and Herzegovina prepared the edition *Digital Transformation of Bosnia and Herzegovina*. The edition consists of 13 studies for certain areas, these are:

- BOOK 1- Benchmarking indicators and performance indices
- BOOK 2- Agriculture in Bosnia and Herzegovina
- BOOK 3- Smart and green eMobility of citizens, goods and services of Bosnia and Herzegovina
- BOOK 4- Union of Small eEconomy in Bosnia and Herzegovina
- BOOK 5- Finance 4.0 in Bosnia and Herzegovina - Fintech, Regtech, Insurtech, eBAM
- BOOK 6- eHealth of Bosnia and Herzegovina - theses for new guidelines on health
- BOOK 7- eFrame for self-sustainable environment and energy efficiency in Bosnia and Herzegovina
- BOOK 8- Human Capital - Bosnia and Herzegovina for a New Age
- BOOK 9- Education, proffesion education and eInfrastructure in Bosnia and Herzegovina
- BOOK 10- Bosnia and Herzegovina Dialogue on eSecurity and eSafety

- BOOK 11- Legal framework of the information society of Bosnia and Herzegovina - eJustice as a paradigm of the new arrangement
- BOOK 12- eGovernment of Bosnia and Herzegovina - for the last place in the corruption index
- BOOK 13- Cultural heritage of Bosnia and Herzegovina in the digital world

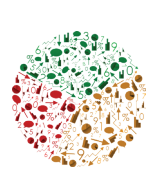
Through these studies, the literature on appropriate technological impacts in the EU and in the world was considered, with special reference to BiH; concepts are proposed, necessary steps and actors for overcoming the digital gap are identified; a draft plan is presented that competent institutions should be accept. The preparation of these 13 studies is the result of the work of a large number of BiH experts, and the comprehensive process / program launched by the Foreign Trade Chamber of BiH in early 2019, which will take place in three phases:

- The first phase of the process / program is to make a cross-section of the state of digital transformation by identifying the most relevant areas of development as a pillar of information society development or digital transformation of BiH society; understanding the main challenges to be overcome and implementing solutions harmonized with those at the EU level; defining monitoring indicators for each of the identified development pillars; bring key actors and stakeholders, especially micro, small and medium-sized enterprises, representatives of the administration and academia into committees; organize conferences and panel discussions on topics to introduce to the general public.
- The second phase of the process / program is the establishment of operational units / committees at the level of BiH, as well as at lower administrative levels; enable the work of operational units, as well as the collection of relevant data for the development of indicators; Analyze in detail the purpose of indicators, actors, data providers and potential users of indicators / stakeholders; identify the pillars of development for which investment cycles will be designed and define potential actions to be reported.
- In the third phase, additional development pillars will be defined and target values will be determined and compared with international trends; The third phase of the process / program is update and interpret indicators and report on them (detailed metadata describing each indicator and how it is designed); a mechanisms will be established or processes for revising indicators that would enable the creation of new indicators, as well as, the revision of existing ones; point out the steps by which it is possible to overcome the delays on the path of digital transformation; open consultations with all stakeholders, technical and subject matter experts, data providers, target audience for indicators, other stakeholders and the community.

The Foreign Trade Chamber of Bosnia and Herzegovina has launched this process, which is oriented towards an interactive approach, bringing together key actors and stakeholders to understand the challenges and expectations with whom they face. The first phase of this process has been initiated and completed, and a special focus has been developed on micro-companies, farmers, crafts and their needs, because most of BiH businessesare from this segment. On the other hand, the need for additional education of MS companies on the process of digital transformation has been recognized.

2. Study "Benchmarking indicators and performance indices"- Setting up a monitoring System

In the development areas, indicators are increasingly used to monitor progress at the national, regional and local levels. In order to be able to use indicators in the right way, it is necessary to carefully consider their nature, purpose and role they have in different processes, as well as, the methodology for their definition and selection.



One of the studies from the edition *Digital Transformation of Bosnia and Herzegovina* is the study "*Benchmarking indicators and performance indices*".

In order to successfully monitor the process of digital transformation of society, it is necessary to establish a conceptual framework with relevant indicators, which will follow changes of technologies market and services. The study presents a comprehensive approach and systematic selection of a set of indicators for monitoring the situation of different segments digital transformation of society. The benchmarking study considers digital transformation at all levels through a quality set of indicators. A quality set of indicators provides a comprehensive picture of the change being measured and contains an appropriate mix of individual indicators at different levels of monitoring. A quality set of indicators requires good individual indicators, the study shows a reasonable number of individual indicators for each context. The study emphasizes the importance of using indicators to monitor and assess the situation in all areas and the importance of professional definition and selection of indicators in order to ensure objectivity in making important decisions for development. In the process of selecting indicators for monitoring, the experiences of the countries of the European Union and the region were also considered, taking into account the specifics of national needs.

There is no clear-cut rule on the appropriate level of numbers and detail for indicators – this depends on the type of initiative, the complexity of the particular intervention . The Benchmarking study used the SMART principle (specific, measurable, available, relevant, time-available) to define new indicators, and the CREAM principle used to select good performance indicators (clear, relevant, economical, adequate, monitorable).

The benchmarking study considers digital transformation at all levels of monitoring, quantitative and qualitative indicators are presented, standard indicators at the level of input values and impacts, key and composite indicators, proxy indicators are presented.

In the first phase of the benchmarking study process, a large number of indicators could not meet the RACER principle "*Accepted by staff, stakeholders*" and "*Robust against manipulation*". The Better Regulation recommends that to the extent possible, all indicators should be 'RACER:

- Relevant, i.e. closely linked to the objectives to be reached. They should not be overambitious and should measure the right thing ,
- Easy to monitor (e.g. data collection should be possible at low cost. As far as possible in practice, that they will be based on available data, that each measurement does not represent too much of a burden for users, businesses or citizens),
- Accepted (e.g. by staff, stakeholders). The role and responsibilities for the indicator need to be well defined,
- Robust against manipulation (e.g. administrative burden: If the target is to reduce administrative burdens to businesses, the burdens might not be reduced, but just shifted from businesses to public administration; The data are reliable, statistically and analytically validated, harmonized with internationally recognized standards and methodology).
- Credible for non-experts (unambiguous and easy to interpret. Indicators should be simple and robust as possible. If necessary, composite indicators might need to be used instead – such as country ratings, well-being indicators, but also ratings of financial institutions and instruments).

It is necessary to make additional efforts through the second and third phase of process / program implementation in achieving the RACER principle for all indicators.

3. Conclusion

Defining individual indicators should be a collective activity, the target group depends on the topic and intervention to be measured, it can be government, academia, civil society, businesses, small and medium enterprises, various other governmental and non-governmental agencies and organizations, private companies

To successfully monitor the digital transformation of society, it is necessary to establish a sustainable conceptual framework that will systematically define a set of indicators for monitoring different segments of the digital transformation of society and comparison with other countries. When defining monitoring arrangements, it needs to assess whether the ones serve their purpose, i.e. whether provide valuable and timely information for the policymaking process. It is necessary to ensure that the monitoring system works from the start and that legal provisions are in place to ensure that data will be collected reliably and smoothly because data and statistics are not always easy to get from the beginning.

Ensuring the integrity, quality and transparency of indicators requires the creation of a stable system of collection, processing, analysis and interpretation of statistical data and other relevant information used for the development of indicators. For this system to work properly, it is necessary to involve relevant people, allocate resources, develop a methodology, but the most important thing is that everyone understand the importance of using the right indicators.

From a statistical point of view, in the second and third phase of process / program implementation, the study *Benchmarking indicators and performance indices* should provide clear answers:

- Does the indicator have clearly defined all elements? (name and definition, purpose and explanation, measurement method, data collection method, measurement frequency, classification, interpretation of changes, strengths and weaknesses, additional sources of information)
- Is there a sustainable system and mechanisms for collecting statistical data? How and by whom are data used?
- Are financial and human resources available for the development of indicators and are they profitable?
- Whether the indicators show the effects of the policy intervention within a reasonable time and excludes other impacts

The Foreign Trade Chamber of Bosnia and Herzegovina in process of digital transformation cannot generate social progress on its own, without the role of the wider community, economy and decision makers. It is necessary comprehensive response from BiH decision-makers to the complexity of the digital transformation process, that affects citizens and all sectors of the economy, it is also means a change of management forms and processes in which employees interact with its users.

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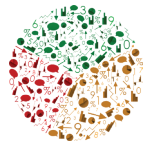

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An impact of digital transformation on production of official statistics data: the perspective of Bosnia and Herzegovina

1. Introduction

Statistical institutions represent producers of official statistics. Most of the scientists would define the role of statistical institutions in the production of official statistics as institutions which use scientific statistical methods, collect data directly from primary data sources or use of data from secondary data sources, calculate aggregated data (at appropriate aggregation level) and disseminate them. The ultimate purpose of this process is to secure data users with accurate, timely and high-quality data. In this sense, the official statistics represent "universal language for all kinds of societal interactions and decision-making" (Radermacher, 2017). Also, in order for official statistics to find its place in the social processes and decision making as an unavoidable factor, the quality of statistics must be in the spotlight and observed from several different angles. Completely new trends and flows in data production require the official statistics to abandon the traditional methods of collecting, processing and publishing of statistical data, and to: rely on other data sources, use of modern techniques and technologies, establish partnership with private data producers, use of new concepts such as 'Big Data', 'Artificial Intelligence', 'Machine Learning', etc. Also, it should be noted that most of the statistical systems in countries around the world operates on the basis of the country's established administrative structure. The budgets of statistical institutions are relatively limited, therefore, in most of the cases, the capacity and power of statistical institutions is connected with the country's economic and financial power. The budgets of statistical institutions mostly consist of financial resources aimed for institution's fixed costs; costs of conducting regular activities (conducting already established statistical surveys which are of interest to the country); or conducting new surveys; investments in hardware and software; and innovations in statistical production process. On the other hand, private data producers have the interest of capital owners in mind and their financial capabilities, and in this sense, they possess certain degree of independence.

When comparing the smaller statistical systems with larger (more developed and more advanced) the question arises in what way the smaller systems can keep up with the changes made by digital transformation. Statistical system of Bosnia and Herzegovina is regarded as smaller statistical system within the European continent. Having in mind the complexity of statistical system of B&H and current development status, the question arises in which way the statistical system of B&H can respond to modern challenges of statistical data production, and keep up with developed statistical systems, mainly EU countries, and worldwide as well.

2. Data and digital transformation

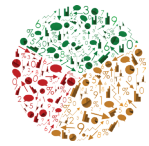
Data represent key source and basis for appropriate decision making and planning. Regarding the segment of private business, it is considered that the use of data-driven model in business and planning has many comparative advantages. The term "digital transformation" has become an unavoidable concept in the business environment. Digitalization represents creation of digital solutions (instead of analogue ones) in doing business activities, and represents significant activity in digital transformation. Digitization is of crucial importance to data processing, storage and transmission, because it "allows information of all kinds in all formats to be carried with the same efficiency and also intermingled" (McQuail, 2000). Digital transformation can be defined as fundamental change in the way of doing business, through introduction of digital technologies (replacement of traditional way of doing business) as well as application of completely new dynamic model aiming at easier and faster adjustment to constant changes in the society. However, it has to be kept in mind that digital transformation does not only mean business informatization. The importance of digital transformation is best presented by the data of International Data Corporation (IDC). According to the latest available data (IDC, 2019) for the period 2020 – 2023, direct Digital transformation (DX) investment is growing and is expected to approach $7.1 trillion.

From the perspective of private businesses, digital transformation will imply defining the strategy on data usage and management, data processing and analysis (by using unified tools) in order to support business decision making. Digital transformation requires from companies and organisations to adjust to changes resulting from technological revolution and the new rules for doing business. In the context of data collection and processing in business operations, the informatization of these processes is required, which led to new concept – so called digital economy. It's considered that the Internet has changed the way of doing business (Tapscott, 1997) and the data is the key feature of the digital economy. In other words, digital transformation is followed by need to apply data science which aids in predicting future outcomes and enables transformation of business. The maximum benefits must be used from data, keeping in mind the data quality, comparability, etc.

The European Strategy for data (European Commision, 2020) and a White Paper On Artificial Intelligence - A European approach to excellence and trust (European Commision, 2020) are adopted by European Commission in 2020 and they will represent two pillars of new digital strategy. Their aim is to create single market for data at the EU level and to use Artificial Intelligence (AI) solutions for solving problems in society by using new technologies and solutions.

Official statistics face major challenges, but chances as well, in order to keep up with whole new concepts regarding the collection, processing and dissemination of data. Official statistics still play a key role in creation of public policies, decision making (evidence-based policy) and providing as much internationally comparable data as possible. Faced with a number of different data sources, especially data from private sources, official statistics must inspire confidence, not suspicion. They must convince, not pressurise. They must aid, not enslave. They must emancipate, not subjugate. They must reveal, not mislead (Radermacher, 2017). Consequently, this means confrontation of two concepts: modern (digitally oriented) and traditional, which is still present in the official statistics. The needs for new data sets arise, such as monitoring of climate changes, SDG indicators, etc. We witness the tightening and clearer defining of rules regarding the protection of data privacy (e.g. GDPR – General Data Protection Regulation[1]) which also have to be followed by the

[1] https://gdpr-info.eu/



statistics; obligation to apply the appropriate statistical principles for production of official statistics (e.g. EU Code of Practice[2]). Official statistics insists on: credible application of official methodologies, standards for data collection, processing and publishing, ensuring international comparability, application of scientific approach and cooperation with academic community. Official statistics is mainly focused on production of data on macro level (for example GDP indicators, employment, unemployment, inflation, etc.). Statistics will still have to insist on application of unique methodology which will have to be innovated, in accordance with flows and changes in society, innovate the data dissemination and visualization, work on confidentiality protection, etc. Digital transformation of society also requires digital transformation of statistical production process in national statistical systems. It represents a big challenge for official statistics, having in mind the financial sources which are, in most cases, limited. These requirements are reflected in the need for constant investment in IT infrastructure, modern software solutions for data collection, processing and publication, constant education of statisticians, etc. However, the level of digitalization transformation of a country as a whole should be considered, and consequently the digital transformation of official statistics. It should be a parallel process. Without significant digital transformation of private sector, households, government institutions etc., digital transformation of official statistics will give only partial positive effects. Official statistics have key advantage in relation to all other data producers – they are authorised producer of official statistics which often cooperate with other statistics producers.

OECD has defined a roadmap (OECD, 2019) for digital transformation measurement by using the existing indicators from the wide range of areas (education, trade, economic and social outcomes, etc.) by statistical institutions, through their interaction with stakeholders. According to this roadmap, there are three basic challenges: "in the shorter term, the challenge is to improve the international comparability of current indicators and make statistical systems more flexible and responsive to the introduction of new and rapidly evolving concepts driven by the digital transformation; in the longer term, the challenge for the statistical community will be to design new and interdisciplinary approaches to data collection and to leverage the information captured by digital systems; the next generation of data infrastructure for policy making in the digital era needs to build partnerships with the private sector and engage with stakeholders to bring publicly available, reliable data into the policy-making process".

3. Big Data and Official Statistics

Statistical institutions in Europe and worldwide are faced with increasing demands for providing fast and sophisticated statistical services of high quality. Potential solution regarding the fulfillment of the above requirements (made by users of statistical services) should be sought in using data sources of Big Data. This is a new concept which originated as a result of enormous increase in the volume of data. This concept implies the use of huge, mixed datasets from various data sources. It often contains structured and unstructured data such as mobile data, social media data, search engines (i.e. Google, Firefox, etc.), remote sensing imagery, etc. Volume, Variety and Velocity (3Vs) are often listed as main characteristics of Big Data (Laney (2001). 3Vs characteristics are also adopted by United Nations Statistical Commission (2014). Large companies, with the help of modern software solutions, collect, manage and use large quantities of data which are used for implementation of certain business model. By using huge amounts of data, large global companies such as Booking, AirBnB, Netflix etc directly affect on business performances, such as generating revenue growth, optimization of sales channels, operations efficiency, etc. However, these data were not primarily collected

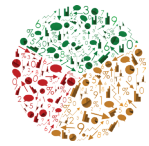
[2] https://ec.europa.eu/eurostat/documents/4031688/8971242/KS-02-18-142-EN-N.pdf/e7f85f07-91db-4312-8118-f729c75878c7

for statistical purposes, therefore the question on their usefulness arises. In literature, it is often stated that Big Data represents collection of 'by-product' data by using modern technologies (MacFeely, 2019). Although administrative data are large in their size (i.e. they have high volume - one of the three "V"), the other two characteristics of Big Data (Velocity and Volatility) are low, and cannot be considered as Big Data. It should be noted that, from statistics' point of view, Big Data still differs conceptually (as well as administrative data) from data collected by statistics (through surveys based on samples or census surveys). The role of official statistics is to provide reliable data of good quality for government, economy and public (citizens). With increased technology development, everything we do is recorded somewhere, and represents a potential data source. From official statistics' point of view, the question on such data quality arises, as well as the question of methodology used for collection. In any case, Big Data represent a large potential for use in the production of official statistics in the future. Currently, official statistics places the largest focus on web scraping and use of mobile data. There are other active projects around the world on introduction of Big Data for production of official statistics. Big Data enable, potentially, cost-effective and timely compilation of statistics and offer data on more detailed aggregation level. The following can be stated as the main potential benefits of using Big Data in official statistics: better timeliness, possibility of access to global data, better coverage of data which can be used for improvement of statistical survey coverage (from sample to full coverage), in certain cases a better quality, etc. Besides all stated potential benefits, Big Data concept raises question on the future of official statistics and its production using traditional methods. Big Data carries certain risks and challenges for official statistics. The question arises whether official statistics is able to respond to Big Data requirements using its available resources (hardware, software, intellectual). Also, one of the questions is to what extent official statistics can respond to increasing restrictions regarding the access to individual data (confidentiality protection issue), with application of current legislation. It is highly likely that in the future, access to Big Data sources will require change/adjustment of legislation. Data sensitivity especially comes to fore if the data is available at the most detailed level (for example, data on all bank transactions for private persons). Data stability within Big Data is very questionable, especially if the Big Data is used during longer period where change of data often occurs. Change the owner of Big Data source can represent a challenge for official statistics if official statistics rely on that source (partially or completely) for production of statistical indicators. As in the case of administrative data sources, official statistics does not have direct influence on creation of Big Data collection methodology, which can be a constrain for the production of statistical indicators.

4. B&H'S OFFICIAL STATISTICS POINT OF VIEW

This part of paper will describe current situation in statistical system of B&H as well as difficulties in statistics development in B&H, especially from digital transformation point of view. Statistical system n B&H consists of three statistical institutions, one at the state level and two at the entity. This is a very complex system established as a consequence of complex administrative structure of the country. In the past several years, official statistics in B&H has made a progress, primarily in development of new statistical indicators in accordance with EU and other international regulations, standards and methodologies. In the context of digital transformation, DESI index (Digital Economy and Society Index), which is produced by European Commission, is used to monitor progress in digitalisation, in area of connectivity, human capital, use of internet services, integration of digital technologies, and digital public services. According to DESI index data for 2019[3], countries with the most advanced digital economies are: Finland, Sweden, Netherlands and Denmark. Regarding

[3] https://ec.europa.eu/digital-single-market/en/desi



measuring the impact of digital transformation on the Western Balkans (Barbić et al., 2018) study shows that the region lags considerably behind EU averages with respect to all key indicators of digital transformation. When it comes to Bosnia and Herzegovina, for most indicators used for measurement of digital transformation (such as households with an internet access, fixed broadband subscriptions per 100 inhabitants, mobile subscriptions per 100 inhabitants, use of social networks and many others), BiH considerably lags behind EU average or is ahead of Albania and Kosovo. Other countries (Macedonia, Montenegro and Serbia) have better performances. The results clearly show that BiH is late with implementation of digital transformation, which consequently affects the potential of digital transformation of B&H's statistical system. Foreign Trade Chamber of Bosnia and Herzegovina has started the Programme of digital transformation of B&H through 13 pillars of development of B&H's society and economy[4]. Indicators intended for digital transformation measurement of each development pillar tell us that most indicators do not exist in the required form for B&H. In this sense, official statistics of B&H is expected to be actively involved and to make contributions to measurement of digital transformation of B&H's society and economy, by providing appropriate data as well as to use digital transformation in the statistics production for B&H[5]. For example, Agency for statistics of Bosnia and Herzegovina publishes data on number of internet connections for private and business users, number of landline and mobile phone connections, etc. However, it should be noted that a digital transformation isn't defined only by, for example, number of internet connections, number of mobile phones or computer purchases. Digital transformation is so much more than that, primarily means the change in way of life and business, application of appropriate models and the use of technological solutions. All three statistical institutions in B&H still use the traditional method of data collection by using paper questionnaires, in almost all of their surveys, which burdens and slows the statistical production process. A large burden is put on reporting units but on the subject matter statisticians as well. In 2013, statistical institutions in B&H have carried the Population and Housing Census by using traditional method. This mass survey was used for collection of large number of data, as well as significant investments in IT infrastructure (computer equipment – PC, laptops, tablets, server lease, purchase of OCR readers, etc). Also, licences for certain statistical software were leased, however, in insufficient number. CATI centre for data collection via telephone was established in Agency for statistics of B&H. Unfortunately, CAWI method for data collection is still not developed, which would significantly decrease the burden on reporting units and subject matter statisticians, improve the speed of data collection and their quality. Activities on making frequent contact with users have intensified (social networks, preparing of monthly infographics), modern tools for data dissemination and visualisation are used, Agency's new web site has been launched, etc. All three statistical institutions in B&H have a separate organisation unit within their organisational structure – IT sector, which employs software developers. Given the decentralized organisation of work, their number is insufficient in all three statistical institutions for development of large IT solutions. Work on most established statistical surveys is supported by appropriate IT solutions (IT applications), primarily through modules with basic data on reporting units (address list), for data entry by subject matter statisticians, calculations of output results (output tables). For most of surveys, IT applications do not allow automatic imputations. Therefore, a systematic, single IT solution is not used in all three statistical institutions and this is one of prerequisites for digital transformation of statistical production process in B&H. Administrative data are not sufficiently used for regular statistical surveys. One of the reasons for this is the country's complex administrative structure whereas the different administrative data sources are available on different administrative levels. The implementation of Generic Statistics Business Process Model (GSBPM)[6], which was started in Agency for statistics of B&H two years ago, will significantly contribute to the

[4] http://www.komorabih.ba/digitalna_transformacija/

[5] http://www.komorabih.ba/wp-content/uploads/2020/02/Infokom-76_web-26.pdf

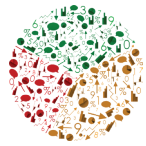
[6] https://ec.europa.eu/eurostat/cros/content/gsbpm-generic-statistical-business-process-model-theme_en

process of digital transformation of statistical production process. Mapping of processes for each statistical survey is in progress. Also, Agency for statistics of B&H has implemented Common Assessment Framework (CAF)[7], with aim to assess and manage quality in the institution, to determine advantages and disadvantages, and to determine measures and priorities for making progress. Regarding the number of employees in all three statistical institutions (approximately 500), official statistics of B&H could be compared with statistical institutions of developed EU countries. However, all three statistical institutions have very limited number of professional statisticians and mathematicians (most of employees are economists, lawyers, political scientists, etc.). There is no program of internal trainings (within statistical institutions) aimed at providing required theoretical and practical knowledge for certain statistical domains. Cooperation between official statistics in B&H and academic community is still not at desired level. On the other hand, there are very useful external training programs, traineeship programs, study visits to national statistical offices of the EU countries, which are supported by various development programs (IPA Multi beneficiary, IPA Twinning Projects, etc.), and they enable professional education of B&H's statisticians. Official statistics in B&H has a great potential for further development and improvement which is currently not sufficiently used. B&H as a country, but statistical institutions as well, should keep up with digital transformation, by using new technologies and data according aforementioned documents adopted by European Commission.

5. Conclusion

Regarding digital transformation, B&H society lags behind the neighboring countries and EU countries. This is long-term process where each segment of society and economy must give its own contribution in order to achieve digital transformation in B&H, primarily through application of new technologies, application of appropriate models, way of doing business, and constant investments in human capital. Identical rule has to be applied to official statistics in B&H which has a great potential, but insufficiently used. Official statistics has started digital transformation process: a partial informatization of official statistics was done, application of appropriate model in the statistical production process started (GSBPM), CAF model for self-assessment the quality of processes in the Agency for statistics of B&H is applied. The official statistics in B&H has to strengthen its IT capacities (human and technical), an implementation of single IT solution is necessary which will support the web collection of data, automatic imputations, use of data from administrative sources or Big Data, etc. The use of Big Data sources in B&H should also be in focus in the future. Work on increase the statistical literacy of data users in B&H should be increased. Awareness on the role and importance of official statistics in B&H for policy making and strategical decision making should be raised. The work on building trust in official statistics and its data should be continued. Digital transformation of official statistics in B&H would ease the following relationship data provider – data compiler – data user. The main challenges for official statistics in B&H are: increased technological development and its influence on production environment of official statistics in B&H, the consequential need for digital transformation of society and statistics, fluctuation of employees, limited financial capabilities and the complexity of statistical system in B&H. The future of official statistics in B&H is reflected through: further work and investment in digital transformation of statistical system, securing access to larger number of administrative data sources and Big Data sources, continued investment in human capital.

[7] http://caf.eipa.eu/3/98/



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Empowering External Statistic - How to deal with blurred data sources?

1. Introduction

The globalization process has been intensive in the last three decades, implying rising and diverse cross – border flows. The challenges for national compilers of external statistics for proper capturing the occurrence and the nature of the rising flows have been mounting as well. In the recent years, a massive process of digitalization came on board, creating hybrid types of financial instruments, and allowing for new types of assets based on cryptography, which can be easily traded across borders. This opens an entirely new field, where statisticians have to understand the nature, the purpose and the functions of the innovative instruments and provide for a proper statistical coverage and classification.

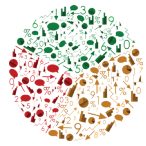
Apart from the new challenges posed by the globalization and digitalization, some "traditional" challenges are lingering, as well. One of them are the informal cross – border flows, which are difficult to be properly measured and captured. They require an extra efforts in devising the most suitable and stable data source, which will allow for continuity, consistency and comparability. In this paper we will shed some light on this matter, on a country specific case – the Macedonian case. Macedonian economy is featured with relatively strong presence of informal economy in the overall economic activities. This holds for some of the cross border activities as well, and can be noted by the large amount of foreign currency cash exchanged.

As the source of the cash inflows is difficult to be pinpointed, very often prior assumptions are made. Given the profile of our economy, the assumption reveals possibility that the main source is related to cash remittances, informal trade, and money flowing in and out of the "mattresses". These assumptions point to the necessity to devise alternative data sources that cannot be based on the conventional sources, such as the payment transactions platforms or direct reporting. They rather require alternatives such as survey data, cross checking with micro data, and thus provide for estimates, and no precise statistical measurement.

The importance of these estimates does not have statistical relevance, only. For a small economy, with tight trade and financial integration with the rest of a world, the external statistics is the main tool for scrutinizing the sources of strengths and potential vulnerabilities. Hence, it is one of the pivotal platforms for the policymakers in the decision-making process, thus requiring a well ordered external statistics as possible.

The paper is organised as follows. The first part discusses the literature through the lenses of the approaches used for statistical estimation. The second one provides stylised facts. The third one gives an overview of a survey, its design and results, envisaged to be used as a source for estimating part of the cross –border flows through informal channels. In the fourth section, we simulate alternative statistical data on remittances, after applying the new source and estimates. The last sections concludes.

[1] The views expressed in this paper are those of the authors and do not necessarily represent the views of the National Bank of Republic of North Macedonia (NBRNM).



2. Review of literature

Globalisation and international migration in the last decades has been intensifying enlisting remittances as one of the main financial flows in developing countries. The latest WB estimates for 2019 indicate that they are likely to reach $550 billion, thus outperforming FDI inflows and official development assistance (WB, 2019). Having in mind their importance, in terms of volume and spill - overs to the economy, the issue of their measurement has been put to the fore on the international organizations and national statistical authorities' agenda. Besides the constant increase of remittances over time, still the general perception of the economists is that they are underestimated (Centre for Latin American monetary statistics) and that there is space for further improvement in the methods of statistical compilation. The reasons behind this thinking is the heterogeneous nature of these flows, with many transactions that have small value, channelled through formal and informal channels.

The compilation practices evolved with time, as a result of international initiatives, improved legal and institutional arrangements and continuous work on financial literacy of the individuals. However, there are still challenges that compilers of external statistics face. Having in mind the transaction channels could be formal, but informal as well, the main difficulty is to obtain accurate source data for remittances. This hindrance poses a need for statisticians to review current data sources, to assess potential sources and alternative methods for estimation, as well as to construct data strategy for a combined approach in collection of data for remittances. So where do we stand now in terms of methodologies used? Is the use of combined methods a common tool and way forward?

The typical way of capturing remittances for the BOP collection purposes is the ITRS system, which represents a formal channel containing resident-nonresident transactions routed through the banking system. The biggest advantage of this system is its simplicity, low cost and timeliness, as well as accuracy (especially for the ITRS without a threshold). It should be noted, that in most cases this system was designed and kept in countries with some kind of foreign exchange controls. However, the liberalization and reporting thresholds led to abandoning or a need to complement this data source with other methods and data sources. This is the case for many EU countries. The decision of the EU of reporting exception of cross border settlements below 50.000[2] euros directly influenced the quality of this data source, as most of these transactions are small and cannot be captured. This, together with the disadvantages of ITRS that is recording only the formal channel, and in some cases, net amounts instead of gross flows, misclassification, as well as lack of information for the time of economic ownership transfer led to finding alternative ways of data collection models, at least in the EU. However this system is still core data source in the Western Balkan countries (North Macedonia, Montenegro, Serbia) and in some forms in other EU countries (integrated or for cross checking in Greece, Portugal and Estonia, as a starting point and base for estimation of remittances in Belgium and Sweden etc.).

One of the alternative solutions is direct reporting, in which case the information is collected directly from the Money Transfer Operators (MTOs) and not through the banks. In practice, this means obtaining data from reports declared by numerous operators, of large or small scale, depending on the country. Italy, is one of the examples where the main source for remittances is the data from Money Transfer Operators, while information from MTOs, combined with other sources, are also used in the Czech Republic, Romania and France. However, this data collection channel has disadvantages also. Direct reporting requires a lot of

[2] Regulation (EU) 2019/518 of the European Parliament and of the Council of 19 March 2019 amending Regulation (EC) No 924/2009 as regards certain charges on cross-border payments in the Union and currency conversion charges.

resources and in many cases, data compilers are not interested in individual transactions, but only in total. Often, an obstacle for distinguishing remittance from non-remittance are the "poor financial records" of the MTOs and the "netting" principle applied in the MTOs internal records instead recording the transactions on a gross basis, which is required for appropriate compilation.

The ITRS and direct reporting are capturing transactions through formal channels. However, in economies suffering from domination of informal cross-border flow transactions these collection methods are not optimal and are not effective. Maybe to a lesser extent, but this also holds for the more developed economies. Household surveys are viewed as a potential and valuable data source that can alleviate some of the constraints in data gathering. In many economies, "household surveys are most commonly used to estimate personal transfers" (International Monetary Fund, 2009). In some cases, central banks conduct specialised remittances survey, while more often they use existing surveys conducted by statistical offices[3], in which variables for remittances are incorporated. The main advantage of the specialised household survey conducted by the Central Bank is the focus on households that receive remittances, getting important granular information and insights in the nature of the flows, which cannot be extracted from the formal channel information's. There are many countries that apply this method, such as the case of Albania (conducts specialized Remittance Survey), Philippines (Rider to a Labour force Survey), also Ireland and Poland that conduct specific households survey for remittances. However, it is important to stress that household surveys do not measure current transactions in the financial system, but instead they register stories about amounts, frequency and channels of transaction in a given reference period. Survey data indicate the remittance behaviour instead of actual cash flows as credits or debits through the financial system and provide auxiliary information for indirect estimation of the inflows. Thus, the results are prone to underreporting and misclassifications. These features are quite important in designing an integrated system based on combined data sources.

In some countries where data collection systems are weak, with insufficient quality, or it is too expensive to set up a system or conduct a survey, an econometric models for estimation of remittances are applied. This is called use of "indirect data sources", or use of "secondary data" (IMF, 2009). In these cases, data compilers make estimations based on demographic models, econometric models, or residual modelling. The demographic models could be quite straightforward, deriving personal transfers as a product of remittances senders by an average amount sent, even though different modalities can be applied. Setting a model in which remittances are an explanatory variable dependant on the behaviour of other variables, such as, income, migration, transaction costs and etc. is the essence of the econometric modelling approach. And finally, residual estimation – approach by which remittances are estimated as a residual of all recorded flows that generate inflows and outflows, indicating that the eventual discrepancies are unobservable remittances (IMF, 2009). Different countries are using specific indirect data methods. In most of the European countries, estimation models based on available data sources are used. This approach is followed in Austria, Bosnia and Hercegovina, Belgium, Switzerland, Denmark, Estonia, Finland, Hungary, Latvia, Netherland, Norway and Poland. However, this method also has drawbacks. The models heavily depend on the data used and the assumptions made, which are difficult to be verified in practice. The residual method may overestimate remittances as it can include other items etc.

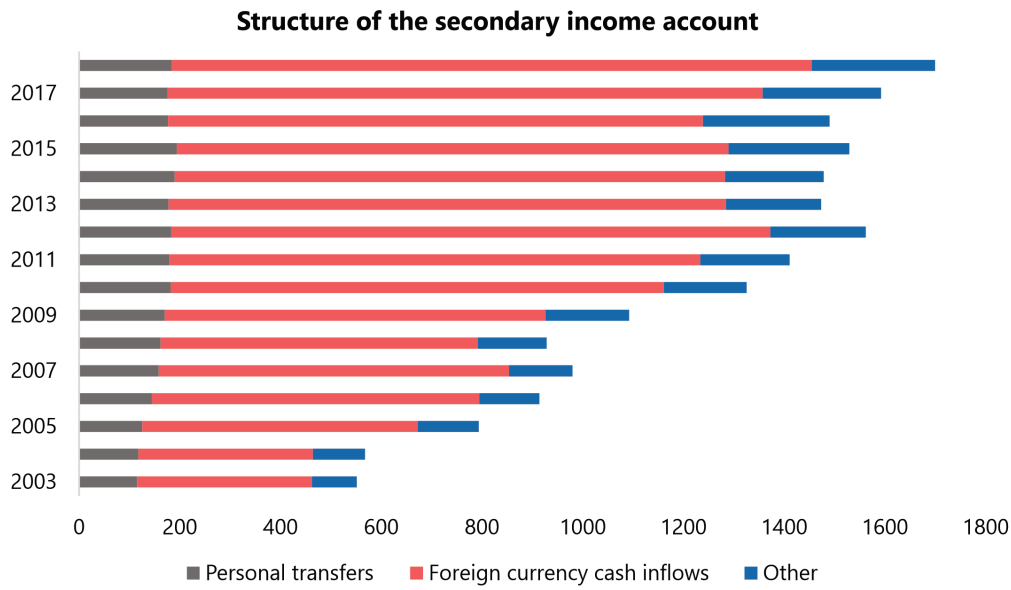
Scrutinizing all methods one can conclude that remittances are heterogeneous and no single data source can ensure adequate reporting of all transactions. This is why blending statistical sources and setting up an integrated system that is based on deep understanding of the system, data collection practices, alternative sources and prioritization of data is essential. Or as Reinke states, for significant improvement of the quality of the remittances data, innovative combination of the data sources is crucial (Reinke, J. 2006).

[3] Labour Force Survey, Survey of Income and Living Conditions, Household Budget Survey, Demographic Surveys etc.

3. Stylised facts

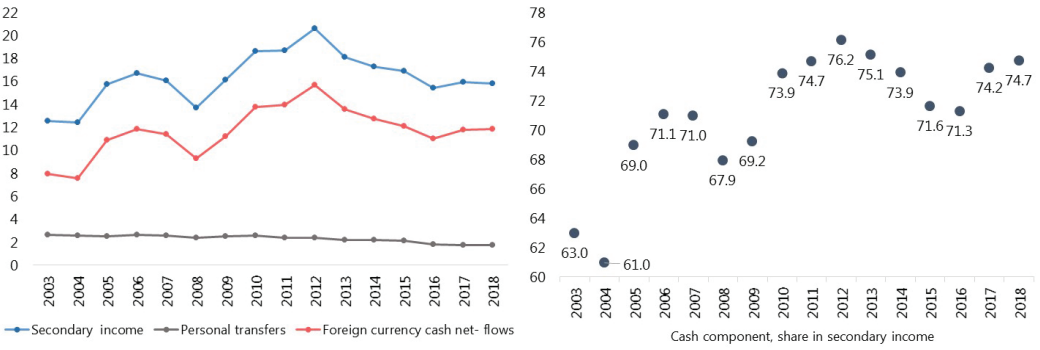
The balance of payments position of the Macedonian economy has a very specific feature, related to a sizeable amount of foreign currency cash net - inflows. Under a prior assumption that the bulk of them relate to current transactions, they are recorded as part of the current account balance. The main data source are the banks that record all the transactions routed through the banking system. Through the ITRS they provide data on personal transfers and embed the information from the MTOs. They also provide data on the amount of foreign currency cash bought and sold with households (banks foreign exchange transactions) and the net amount bought from the exchange offices on a standalone basis. Given the difficulties in identifying the exact sources of the foreign currency cash inflows, most of the net – inflows are recorded as "other current transfers - foreign currency cash flows".

Chart No.1: Structure of private secondary income, net in Euro million



The size of the net–inflows for the cash component only in a longer time span (2013 -2018) averaged close to 12% of GDP. At the same time the deficit in the trade of good and services averaged close to 19% of GDP, indicating that above 60% of it was covered with unidentified inflows in foreign currency. The scrutiny of the overall structure of the secondary income reveals rising share of the cash component. The average share in 2003-2009 period equalled around 67%, while afterwards it averaged close to 74%, with no major deviations from the mean along the years. Hence, the importance of this component relative to the others in the secondary income gained significant weight.

Chart No.2: Cash component, share in GDP and in the secondary income, in %

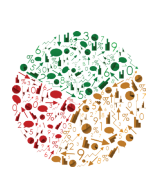


Observing the dynamics of the foreign currency cash net – inflows, it is visible that in general it was rising until 2012, while its share to GDP started to decline afterwards and stabilized in the last three years to slightly below 12% of GDP. Despite the notable trend, there are few turning points in the path of the foreign currency cash net – inflows, which could indicate one of the potential causes and sources of the foreign cash component. The first one is the occurrence of the global crisis at end 2008 and 2009, when amidst the uncertainty economic agents started to convert domestic into foreign currency cash, which translated into lower net – inflows. The second one of a same nature, but smaller impact was the Greek crisis in 2015 and internal political crisis in 2016. An event with an opposite effect that yielded in significant inflow of foreign currency was the Euro Zone crisis at end 2011, when the future of the Euro currency was questioned.

These turning points in the dynamics of the foreign currency cash component reveal the impact of the confidence effect on the dynamics of this BOP component. Given the anecdotal and survey evidence for foreign currency in circulation being present in the economy, these flows indicate that foreign currency coming in and out of the mattresses is probably one of the sources which adds to the overall cash inflows. As the history of macroeconomic instability was replaced with a longstanding stability of the prices, currency and stability of the banking system, the strong confidence and interest rate differentials enabled foreign currency to come into the system. These flows cannot be measured statistically, and capturing them in the external statistics poses challenges.

The first potential source of the foreign currency cash net –inflows in the BOP sheds light on the extraordinary complexity of the component. The two other important potential sources increase it and pose significant challenges for compilers of statistics. Namely, the second source relates to possible cash flows underpinning informal trade of goods and services, which cannot be captured in the official statistics. The presence of the informal economy in general, has been specific for the Macedonian economy as well. Wide range of estimates exist, including an official estimates from the National Statistics Office, used as a correction factor in the compilation of the national accounts. They range from 16% to 40%, indicating large potential of informal economy to generate flows that are not statistically captured.

The third source, which we will put emphasis on in the paper, refers to net – inflows based on remittances. Formal remittances, personal transfers sent from migrants to their home country are relatively modest. They gravitate around 2% of GDP, with a declining trend. Yet, besides the formal channel, presumable large amount of remittances come in cash, through informal channels. This last component is in fact not pertinent to the



Macedonian case only. It is widely – recognized matter in the external statistics, because "remittances are diverse (e.g. cash and non-cash; channelled through formal and informal routes)... there is no single data source that can guarantee accurate estimates. Countries use a variety of data sources based on the patterns and the channels employed in their countries" (World Bank, 2009).

Shedding light on the three possible source of the net –inflows of foreign currency cash in the external statistics reveals their different nature, as well as the need for different approaches for their statistical coverage. The difference in their essence also indicate that different factors can drive their dynamics, they may point to different sources of vulnerabilities and strengths, and may indicate susceptibility of the economy to different types of shocks. Given the size and the importance of the inflows, identifying and allocating these inflows in the appropriate BOP position is of a crucial statistical, but policy relevance, as well.

Given the focus of the paper, which is providing for alternative approach to the identification of the informal remittances, we will focus on this matter mostly. In the statistical perimeter, many countries use reporting from commercial banks, which may not include informal flows or flows through money transfer operators. The existence of an effective and appropriate international transactions reporting system (ITRS), in some countries is combined with household surveys in order to capture informal transfers (47 per cent of all countries use this method, according to the World Bank survey of Central Banks). Our approach is similar to this one, as it combines ITRS (assuming that this channel fully captures formal remittances) and Survey data to estimate the amount of informal remittances.

4. The Design and results for the remittances survey

Estimation of personal transfers in cash received through informal channels has been a significant challenge for the NBRNM. Recognizing the need for quality improvement several surveys were conducted (in 2007, 2011 and 2016[4]). Besides the main aim, to obtain additional information for estimation the informal inflows that are part of private transfers, the Survey provided answers on the channels through which the inflows come to the country, the geographical distribution, seasonality, purpose of the funds sent, its sustainability etc.

In this section we will focus on the Survey from 2016 and will present some of the main results that can be used to estimate the value of personal transfers received through informal channels i.e. in cash. The 2016 survey was conducted by an outsourcing independent agency on a sample of 1,500 households that receive remittances from abroad. Snowball technique was used to select the sample. The sample of households receiving personal transfers from abroad was selected from each of the eight regions of North Macedonia, based on their population and additional information:

- on households that receive private transfers from abroad from the household consumption survey;
- the turnover of fast money transfers operators (FMO) by regions;
- the turnover of exchange bureaus offices (FXO) by regions; and
- Marriages of residents abroad and children born abroad from the State Statistical Office.

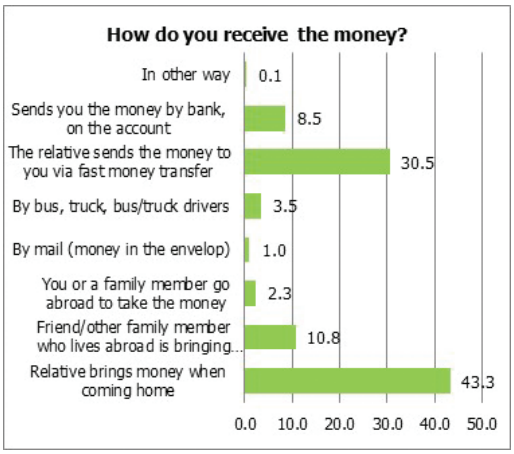
As noted before, one of the main aims of the 2016 survey was to estimate the share of the personal transfers received through informal channels, taking into account that remittances (personal transfers and compensation of employees) received through formal channels are already covered by the ITRS. In order to determine the share of formal and informal channels in the total personal transfers, we use the answer

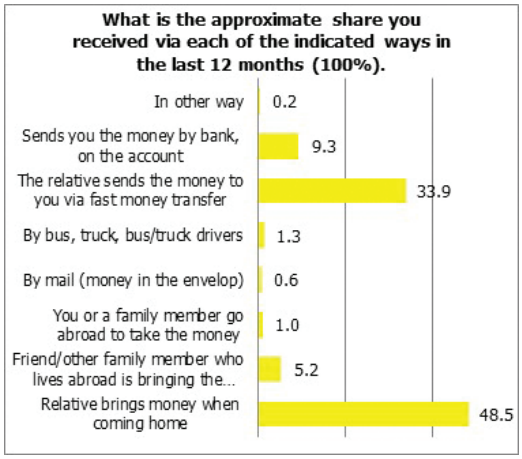
[4] It should be noted that the Surveys are not fully consistent in terms of coverage, sample, response rates, etc. and for these reasons biases can occur.

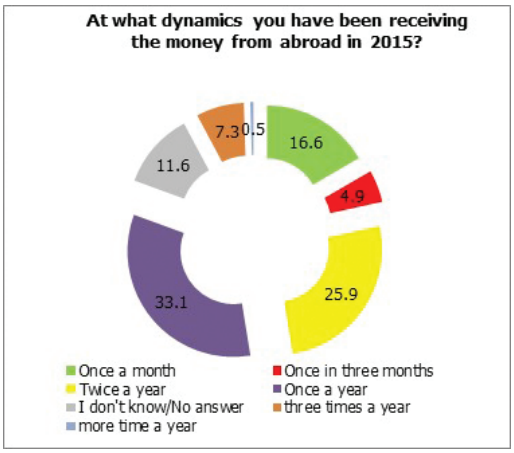
provided on the question "How do you receive the money?". From total survey respondents, 61% answered that they receive funds through informal channels. More specifically, 43.3% from the respondents answered that relatives bring them cash when they come home, 10.8% answered that a friend or other family member who lives abroad is bringing the money on behalf of the sender, 3.5% of the respondents answered that the money has been sent by bus, 2.3 of the receivers went abroad to receive the money, and 1% of the respondents receive the money by mail. Concerning formal channels, 30.5% of the survey respondents receive the money by MTOs and only 8.5% by the bank. The reason for these results (high share of remittances send "on-hand", or through informal channel) probably rest in costs for sending the money, demographic characteristics of the population receiving the money and employment status of the receivers and the senders.

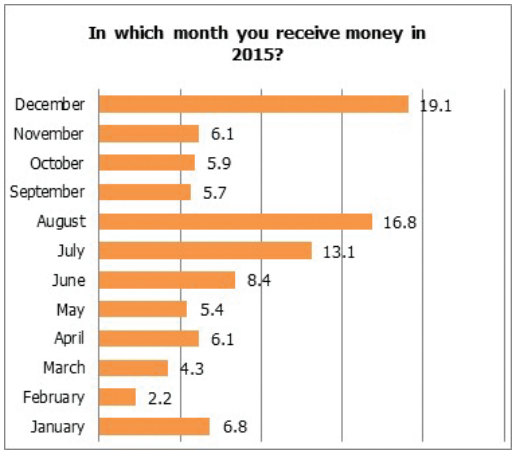
The survey results for the share of formal and informal channels were compared with the data received from ITRS (ITRS cover the data from FMOs) and verified that the responses provided were generally consistent. Furthermore, results from the 2016 survey are also consistent with the results from 2011 survey.

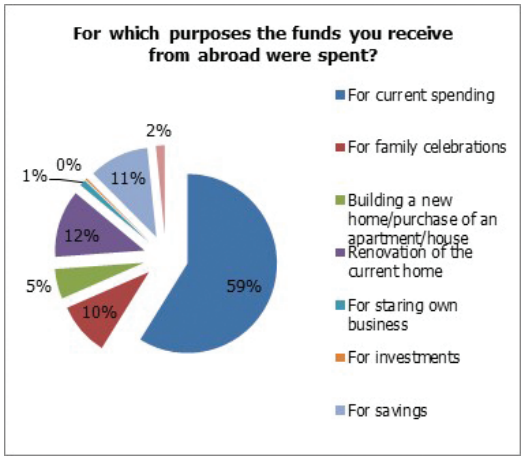
Chart No.3: Survey results from 2016

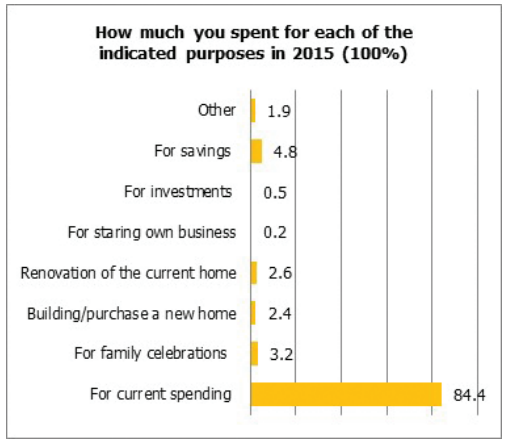


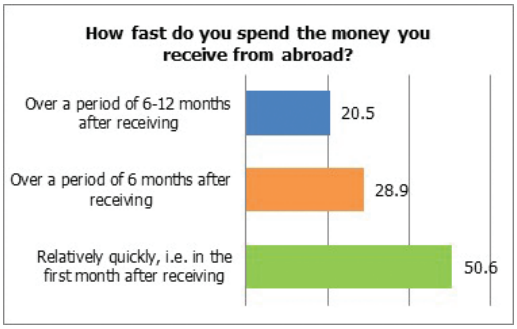


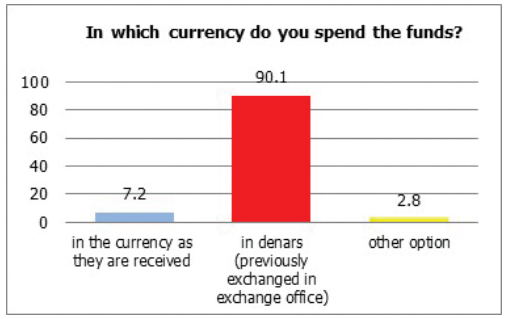












Most of the households reported that they receive remittances once (33.1%) or twice (25.9%) a year. These responses are logical given the previous question where in the most cases relatives brings the money when they come in North Macedonia, usually once or twice a year. With respect to seasonality, larger amounts of remittances are received in July, August, and December, during the holidays when most migrants visit the country.

Analyzed for which purposes the funds received from abroad were spent, the largest part of the received funds, around 60%, is used for current spending, while 10% is spent for a family celebration. Part of the received funds, 12% of the households spent the money for the renovation of the current home, while only around 5%, are invested in real estates. Around 11% of the personal transfers are kept for savings.

Having in mind that most of the inflows are used for current spending it is not surprising that half of the households spend the money relatively quickly, i.e. in the first month after receiving. Around 30% of the households spend money over a period of 6 months after receiving. About 90% of the funds, the households spend in Macedonian denars which previously exchanged on the exchange market. A certain amount, around 7%, are kept in the currency as they are received.

The survey embeds evidence on the geographical origin of the funds, and their currency structure as well. These are also important information, which can be further utilized in the statistics in defining the geographical and currency profile of remittances.

5. SIMULATION

In this section we provide for a simple simulation[5], where the results of the survey are used to identify the amount of remittances which come through informal channels. The estimated informal remittances should be reallocated from the net cash inflows (other transfers) to "personal transfers". The simulations include assessment only on the credit side. The method we use is carried out in two steps. The first one is improving the data on remittances received through formal channel by using alternative source. Namely, the ITRS data included in the BOP are on a net basis (foreign currency bought minus foreign currency sold). As we need data on gross amounts to estimate the value of unrecorded credit and debit transactions we include data that are collected from direct reporting of the MTOs (for regulatory purposes) collected on a gross basis. We should mention that the two sources provide net values that are quite similar, however we treat this as a direct and more comprehensive source and we believe that its use will provide slight improvement in the overall current account balance. In the second step we apply shares derived from the previous surveys on remittances i.e. the percentage of remittances that is received through formal channel. The weights, combined with expert judgment are applied to the amount of remittances received through formal channel (ITRS) to obtain the total amount of remittances received. The remittances received in cash (informal channel) will be derived as a residual (the rest to 100 percent).

We conduct two approaches for setting the weights. In the first approach, for estimation of the formal channels, different coefficients for different years were applied. As previously stated, the available data for formal remittances and assumption for the share of official channels in the total amount of remittances are the starting point for the estimation and serve as a base for residual calculation of the informal remittances.

Table No.1: Coefficient applied for formal channels

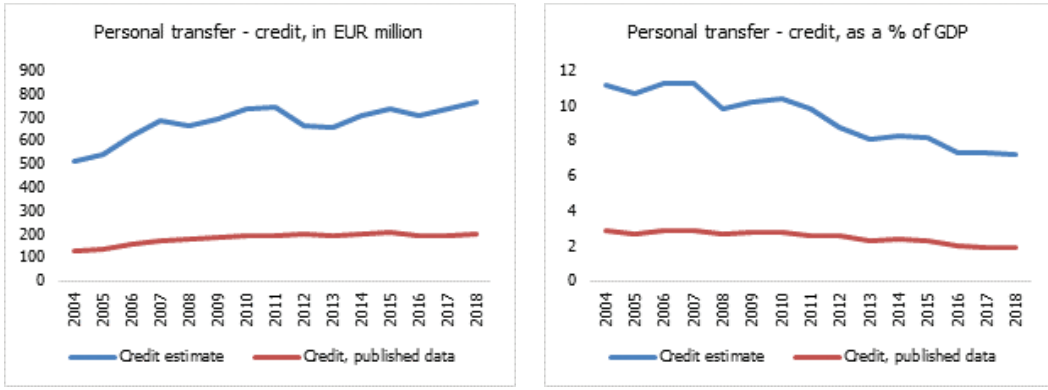
In percent of total remittances			
Survey (year)	Period for which the appropriate surveys coefficient is applied	Coefficient applied for formal channels (Scenario 1)	Coefficient applied for formal channels (Scenario 2)
2002	2003-2007	27%	27%
2007	2008-2011	32%	27%
2011	2012-2016	37%	27%
2016	2017-2019	40%	27%

Sources: Dzaferi Survey (2002), NBRNM Surveys and expert judgment (2007, 2011, 2016)

The results of the survey indicate that the weights increase over time, i.e. the share of the remittances sent through official channels increases over time from 27% in 2004 to 40% in 2018. Second, these estimations show significant undervaluation of the amounts recorded under personal transfers, or remittances that should be reported in BOP statistics including the inflows through the informal channel. The difference between published and estimated value of personal transfers is significant and in nominal terms is in an interval from Euro 383 million in 2004 to Euro 570 million in 2018. In relative terms (as percent of GDP) the personal transfers on average in the analysed period should be higher by 7 p.p..

[5] Simulations presented in this paper are only illustrations on the impact of adding additional sources and do not represent definitive calculations that will be included in official statistics.

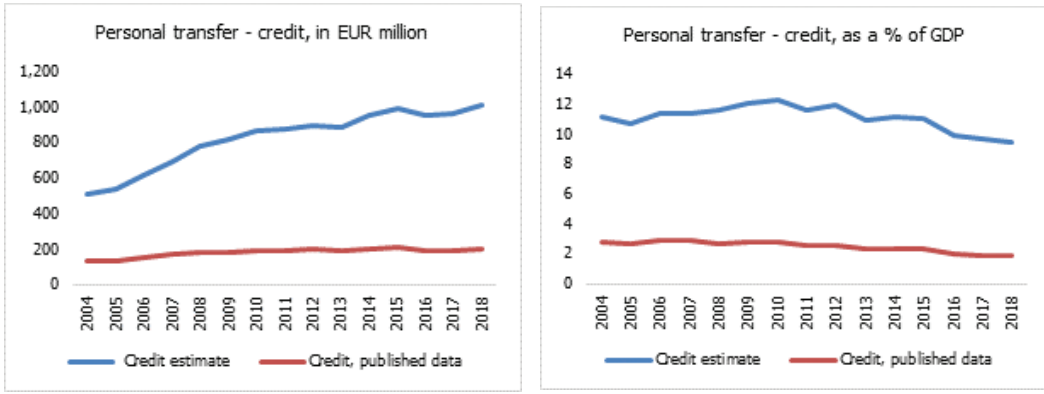
Chart No.4: Personal transfers, credit estimates using varying coefficients



Source: NBRNM, BOP statistics.

In the second approach, a coefficient of 27% for all of the years was applied. By using constant share we assume that the weight of the formal channel in the total amount of remittances has not changed through the years, which is probably less realistic scenario. By this approach we assume higher level of the cash remittances – in nominal terms they reach Euro 1,010 million in 2018. As percent of GDP, the estimated personal transfers are on average around 11% in the analysed period.

Chart No.5: Personal transfers, credit estimates using constant coefficient



Source: NBRNM, BOP statistics.

The simulation presented above, reveals quite different role and importance of the remittances in the economy, in comparison to what the official data suggest. It illustrates the importance of having an estimate of the origin of cross – border flows, for proper diagnostics and policy calibration. Yet, even after the estimates of the informal remittances, there is a necessity to address the rest of the cash net – inflows that could be attributed to capital account, the informal trade or the confidence effect. Hence, besides the estimation of personal transfers, other challenges arise in the period ahead. Capital transfers received in cash are still

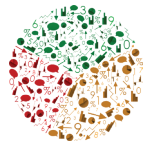
not estimated. The survey results showed that around 10% of the received remittances are invested in real estate. The appropriate amount should be deducted from other current transfers and reclassified to the capital account of the nongovernment sector. With respect to the current account, the survey results could be used for estimation of the unrecorded salaries received from non-residents thus improving the data on compensation of employees, even though this is not a significant component of the Balance of payments. Furthermore, part of the inflows and outflows arise from the tourism activities, which is in line with the tourism statistics. This flows will affect the credit and debit side of the travel services. The high turnover on the foreign exchange market could imply an underestimation of the export of goods and services. Some countries already make adjustments to include any goods where there is a change of ownership not recorded in customs data such as shuttle trade. Appropriate method to estimate the values of unrecorded goods and services based on the incorporation of additional data sources and assumptions is a challenge as well.

6. Conclusion

The aim of the paper was to illustrate the importance of the foreign currency cash flows underlying cross – border activities in the Macedonian economy and the need for proper identification of their origin. This implies a need for devising alternative data sources in the external statistics for proper capturing and allocation of these flows within the balance of payments statistics.

In the paper we have opted for depicting one of the steps, which is using survey data to estimate the amount of remittances coming into the economy through informal channels. The simulation, using combined survey and ITRS data, reveals much larger amount compared to the data in the official statistics. It demonstrates the need for combining different data sources and employing estimates, when the flows are connected with informal activities, or informal channels.

In the forthcoming period, efforts are needed to validate the results, and to proceed with estimates on the flows related to informal trade and the confidence effect in the economy. It will require cross – checking of different sources, and estimations methods as well. The whole process will allow for a more precise coverage in the statistics, but also a clearer picture on the sources of the flows in the balance of payments and their sustainability.



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ANNEX TABLES

Table No.2: Secondary income - estimates using varying coefficients

as a % of GDP, estimated data

BPM6 Concept	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Secondary income	14.0	16.6	17.8	16.3	14.3	17.1	19.3	20.3	22.0	19.4	19.0	18.0	16.9	17.5	17.5
Credit	15.0	17.5	18.7	17.7	15.2	17.9	20.2	21.2	23.0	20.4	20.1	19.0	18.0	18.8	18.8
Debit	1.0	0.9	0.9	1.3	0.9	0.9	0.9	0.8	0.9	0.9	1.0	1.0	1.0	1.3	1.3
1. General government	1.2	1.1	1.1	0.4	0.7	0.5	0.4	1.0	0.8	0.9	1.3	0.6	0.9	1.1	1.0
Credit	1.3	1.2	1.2	1.0	0.9	0.6	0.5	1.1	0.9	1.0	1.4	0.8	1.1	1.4	1.3
Debit	0.1	0.2	0.1	0.6	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.3	0.2
2. Financial corporations, nonfinancial corporations, households, and NPISHs	12.8	15.6	16.7	15.9	13.6	16.5	18.9	19.3	21.2	18.5	17.8	17.4	16.0	16.4	16.5
Credit	13.7	16.3	17.5	16.7	14.3	17.3	19.7	20.1	22.1	19.3	18.6	18.2	16.9	17.4	17.5
Debit	0.9	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.9	0.8	0.9	1.0	1.0
2.1. Personal transfers	10.9	10.5	11.1	11.1	11.3	11.8	12.0	11.4	11.7	10.7	11.0	10.8	9.7	9.4	9.3
2.1. Personal transfers - published	2.6	2.5	2.6	2.6	2.4	2.5	2.6	2.4	2.4	2.2	2.2	2.1	1.8	1.7	1.7
Credit	11.2	10.7	11.3	11.3	11.6	12.1	12.2	11.6	11.9	10.9	11.1	11.0	9.9	9.6	9.4
Credit - published	2.8	2.7	2.9	2.9	2.7	2.8	2.8	2.6	2.6	2.3	2.4	2.3	2.0	1.9	1.9
Debit	0.3	0.2	0.2	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1
Of which: Workers' remittances	10.9	10.5	11.1	11.1	11.3	11.8	12.0	11.4	11.7	10.7	11.0	10.8	9.7	9.4	9.3
Credit	11.2	10.7	11.3	11.3	11.6	12.1	12.2	11.6	11.9	10.9	11.1	11.0	9.9	9.6	9.4
Debit	0.3	0.2	0.2	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1
2.2. Other current transfers	1.9	5.1	5.6	4.9	2.3	4.7	6.8	7.9	9.5	7.8	6.8	6.5	6.3	6.9	7.2
2.2. Other current transfers - published	9.8	13.3	14.1	13.5	11.3	13.6	16.1	16.3	18.2	15.9	15.1	14.7	13.6	14.1	14.2
Credit	2.5	5.6	6.1	5.3	2.7	5.3	7.5	8.5	10.2	8.4	7.5	7.2	7.0	7.8	8.1
Credit - published	10.4	13.8	14.6	13.9	11.7	14.2	16.7	16.9	18.8	16.5	15.8	15.4	14.3	14.9	15.1
Of which: Cash exchange, net	-0.4	2.7	3.5	2.8	0.3	2.3	4.5	5.6	7.0	5.5	4.5	3.9	3.7	4.6	4.9
Of which: Cash exchange, net - published	7.6	10.9	11.9	11.4	9.3	11.2	13.8	14.0	15.7	13.6	12.8	12.1	11.0	11.8	11.9
Debit	0.6	0.5	0.5	0.5	0.4	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.9

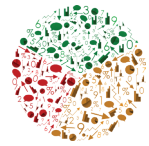

Table No.3: Secondary income - estimates using constant coefficient

as a % of GDP, estimated data

BPM6 Concept	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Secondary income	14.0	16.6	17.8	16.3	14.3	17.1	19.3	20.3	22.0	19.4	19.0	18.0	16.9	17.5	17.5
Credit	15.0	17.5	18.7	17.7	15.2	17.9	20.2	21.2	23.0	20.4	20.1	19.0	18.0	18.8	18.8
Debit	1.0	0.9	0.9	1.3	0.9	0.9	0.9	0.8	0.9	0.9	1.0	1.0	1.0	1.3	1.3
1. General government	1.2	1.1	1.1	0.4	0.7	0.5	0.4	1.0	0.8	0.9	1.3	0.6	0.9	1.1	1.0
Credit	1.3	1.2	1.2	1.0	0.9	0.6	0.5	1.1	0.9	1.0	1.4	0.8	1.1	1.4	1.3
Debit	0.1	0.2	0.1	0.6	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.3	0.2
2. Financial corporations, nonfinancial corporations, households, and NPISHs	12.8	15.6	16.7	15.9	13.6	16.5	18.9	19.3	21.2	18.5	17.8	17.4	16.0	16.4	16.5
Credit	13.7	16.3	17.5	16.7	14.3	17.3	19.7	20.1	22.1	19.3	18.6	18.2	16.9	17.4	17.5
Debit	0.9	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.9	0.8	0.9	1.0	1.0
2.1. Personal transfers	10.9	10.5	11.1	11.1	11.3	11.8	12.0	11.4	11.7	10.7	11.0	10.8	9.7	9.4	9.3
2.1. Personal transfers - published	2.6	2.5	2.6	2.6	2.4	2.5	2.6	2.4	2.4	2.2	2.2	2.1	1.8	1.7	1.7
Credit	11.2	10.7	11.3	11.3	11.6	12.1	12.2	11.6	11.9	10.9	11.1	11.0	9.9	9.6	9.4
Credit - published	2.8	2.7	2.9	2.9	2.7	2.8	2.8	2.6	2.6	2.3	2.4	2.3	2.0	1.9	1.9
Debit	0.3	0.2	0.2	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1
Of which: Workers' remittances	10.9	10.5	11.1	11.1	11.3	11.8	12.0	11.4	11.7	10.7	11.0	10.8	9.7	9.4	9.3
Credit	11.2	10.7	11.3	11.3	11.6	12.1	12.2	11.6	11.9	10.9	11.1	11.0	9.9	9.6	9.4
Debit	0.3	0.2	0.2	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1
2.2. Other current transfers	1.9	5.1	5.6	4.9	2.3	4.7	6.8	7.9	9.5	7.8	6.8	6.5	6.3	6.9	7.2
2.2. Other current transfers - published	9.8	13.3	14.1	13.5	11.3	13.6	16.1	16.3	18.2	15.9	15.1	14.7	13.6	14.1	14.2
Credit	2.5	5.6	6.1	5.3	2.7	5.3	7.5	8.5	10.2	8.4	7.5	7.2	7.0	7.8	8.1
Credit - published	10.4	13.8	14.6	13.9	11.7	14.2	16.7	16.9	18.8	16.5	15.8	15.4	14.3	14.9	15.1
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Of which: Cash exchange, net - published	7.6	10.9	11.9	11.4	9.3	11.2	13.8	14.0	15.7	13.6	12.8	12.1	11.0	11.8	11.9
Debit	0.6	0.5	0.5	0.5	0.4	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.9

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The ethical aspect of statistical research in the Republic of North Macedonia

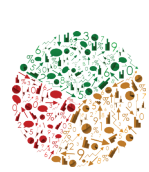
1. Introduction

The process of globalization and the development of new technologies have provided access to enormous amounts of data for processing. The rapid growth of these amounts will not slow down the near future. In fact, recent studies suggest that worldwide data creation will grow to 163 zettabytes by 2025. This is ten times the amount of data produced in 2017 (Seagate, 2020).

As a consequence of this, a plethora of new challenges in the field of statistics have arisen. In particular, novel mathematical methodologies are continuously being developed as a way to tackle the heterogeneous nature of the collected data. Similarly, distinct data collection procedures are restructured for the purpose of easing the process of data gathering. This growing body of statistical methodologies and collection procedures, in turn, lead to the emergence of the basic issue of provision of privacy in data collection and the establishment of fair methods for data analysis. Data privacy, as a concept, describes the relationship between the collection and dissemination of data, technology, the public expectation of privacy, legal and political issues surrounding them (Michael, 2013). Fairness, on the other hand, describes the concerns related to data analytics that can cause societal harm by preventing unbiased and consistent interpretation of the patterns within the data (Sokolovska & Kocarev, 2018).

To address the resulting ethical issue, the European Union (EU) together with its major statistical office, Eurostat, developed a set of regulations which capture the required procedures for collecting and analyzing data on various phenomena. Emerging economies, whose goal is to eventually be part of the Union should adequately accommodate their regulatives to be in accordance with the ones used by the EU. One such country is the Republic of North Macedonia (MKD). Over the past few decades the State Statistical Office (SSO) of MKD not only reviewed a large amount of its methodologies, but also introduced new ones that are exactly rooted in the principles of the new EU regulatives.

Despite an abundance of studies which describe the extent to which the SSO methodologies are in accordance with the EU ones, their relation with the concepts of privacy and fairness remains largely unexplored. To bridge this gap, here we give a critical overview of some of the methodologies and regulations developed, and describe their correspondence to the concept of privacy. Moreover, we conduct an empirical analysis and examine the performance of both the SSO data and statistical methodologies in the ability to produce fair results.



By performing a broad overview of the statistical methodologies and privacy regulations implemented by SSO we find that the office has made a great improvement in standardizing these methodologies to the ones developed by the EU. However, by analyzing these methodologies in more detail we argue that there is still room for their improvement, especially in the context of promotion of ethics. Privacy regulations are appropriate, but they do have some weaknesses, such as size and complexity, which often stem from a gap in different principles and interpretations. In addition, by comparing exports data gathered by the National Bank of the Republic of Macedonia (NBRM) with the same data gathered by SSO, we discover that both data yield the same empirical conclusions. In other words, even though SSO and NBRM implement different data collection procedures, we end up with the same interpretation, thus suggesting that, in this case, the fairness concept is satisfied. Finally, we investigate the performance of two clustering methods, PCA and k-means, in grouping of the Macedonian production industries via data from the input-output tables. When compared to a baseline hierarchical clustering model, PCA yields similar results, whereas K-Means offers different interpretations. This may suggest that K-Means does not satisfy the fairness concept when evaluating the Macedonian input-output tables. However, we emphasize that both fairness and privacy, as concepts, have only an abstract meaning and their formal definition may vary from one situation to another. Therefore, every discussion of these concepts requires a careful interpretation.

The rest of the paper is organized as follows. In Section 2, we give a detailed overview of the developed SSO methodologies that aim at improving and promoting compliance with internationally accepted statistical rules, and relate them to the concept of privacy. In Section 3, we examine the accuracy and fairness of the methods for processing and analysis of data. Finally, in Section 4 we summarize our findings.

2. Overview of Statistical Methodologies and Privacy Regulations

The statistical research in the Republic of North Macedonia is constantly changing, through proper implementation of laws, policies, statistical research programs and strategies, in order to ensure, harmonization of its methodologies and operations with those in the developed countries, as well as, approximation of the statistical system to that of the European Union.

Some of these transformations in the operation of the SSO, which we would like to comment on, are:

a. Adoption of System of National Accounts (SNA)

b. Implementation of European System of Accounts (ESA 2010)

c. Statistical confidentiality and personal data protection

a. Adoption of System of National Accounts (SNA)

The system of national accounts (SNA), is the internationally agreed standard set of recommendations on how to compile measures of economic activity in accordance with established accounting conventions based on economic principles. The recommendations are expressed in terms of a set of concepts, definitions, classifications and accounting rules that comprise the internationally agreed standard for measuring such items as gross domestic product (GDP), the most frequently quoted indicator of economic performance. The accounting framework of the SNA allows economic data to be compiled and presented in a format that is designed for purposes of economic analysis, decision and policy-making (European Commission Organisation for Economic Co-operation and Development United Nations and World Bank, 2009). This international standard statistical framework, due to the efforts for harmonization and compliance of statistics in our country with international standards, is entirely applied in the SSO operations.

B. Implementation of European System of Accounts

On the other hand, EU Member States were required to implement European System of Accounts (ESA 2010). The ESA 2010 exists alongside the SNA (2008) because of the uses of national accounts measures in the EU. ESA 2010 is broadly consistent with the SNA (2008) with regard to definitions, accounting rules and classifications. It nevertheless incorporates certain differences, particularly in its presentation, which is more in line with its specific use within the Union. Actually, the ESA 2010 concepts are in several instances more specific and precise than those of the SNA (2008) in order to ensure as much consistency as possible between Member States measures derived from the national accounts (Eurostat E. , 2013). Aiming for membership in the European Union, and in order to ensure comparability of data with other countries and declaring harmonization as the highest priority, our country has also implemented the European System of Accounts (2010).

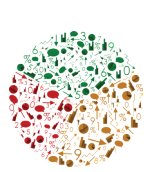
The implementation of both of these systems gives us the opportunity to elaborate briefly their structure. SNA (2008) and ESA (2010) methodologies are complex and offer concrete and essential guidance for proper and precise measurement and presentation of national accounts. However, there are implications which suggest that the treatment of data in these systems that would have impact on estimating the GDP. Namely, in the existing SNA (2008), data are treated as a non-produced asset, and are only valued when a monetary transaction for the data took place. Such an approach means that the current accounting framework is not well equipped to reveal the current data revolution that is driving many new digitally related business models (Ahmad & van de Ven, 2018). The literature suggests that data should be treated as produced assets, which will lead to changes in GDP measurement. By treating data as produced assets, it will include the real value of data (especially behavioral data) into the national accounts but also will rise challenges of proper calculation. Analogously, the ethics and fairness of the statistics used for purposes like research, policymaking etc. will be on a proper level.

Furthermore, making changes in the treatment of data in the accounts will increase the importance of the privacy of such data, especially of the so-called footprint data, which has great value and is used by many modern business models while is subject of exchange without monetary transaction-barter transactions (e.g. social media platforms offer their services in exchange for personal data, which value raises exponentially). Currently, both SNA 2008 and ESA 2010 do not cover the privacy aspect of data, which is expected, because these are frameworks whose focus is on national accounts. However, from a statistical point of view, there are regulations that focus on statistical confidentiality as well as data protection.

C. Statistical confidentiality and personal data protection

Protection of data is an obligatory requirement for every entity participating in creating, collecting, analyzing, processing and disseminating the data. In this sense, and from the context of statistics, we should distinguish personal and confidential data. **'Personal data'** means any information relating to an identified or identifiable natural person or "Data Subject". On the other hand, '**Confidential data'** means data which allow statistical units to be identified, either directly or indirectly, thereby disclosing individual information (Eurostat, 2020). In other words, confidential data can include a lot of information, and not all of it can be personal information. Their protection means providing data privacy. Statistical data are subject to two data protection frameworks:

- The specific framework for the protection of data collected for statistical purposes.
- The general personal data protection framework which applies every time information about individual persons is collected no matter for what purpose



The protection of data collected for statistical purposes "statistical confidentiality" is a fundamental principle of official statistics. Statistical confidentiality means that the collected data may only be used for statistical purposes (Eurostat, 2020). On the other hand, General Data Protection Regulation (GDPR) is the legal framework for personal data protection. The GDPR substantially expands the territorial reach of the EU data protection regime and also applies to non-EU companies if they are selling products or services within the EU or if they are obtaining personal data in the EU and transferring it outside the EU (Georgievski, 2018). Such extended reach, generates the necessity to compare these regulations with those implemented in the rest of the world.

Therefore, compared to the regulation in the U.S. there are some crucial differences between key terms and principles. For example, U.S. lawyers may refer broadly to 'privacy' or to 'information privacy', European law discusses information privacy as 'data protection' (Schwartz & Solove, 2013). In Europe, data protection is increasingly seen as separate from the right to privacy. Data protection focuses on whether data is used fairly and with due process (Fuster, 2014) while privacy preserves the Athenian ideal of private life (Hoofnagle, van der Sloot, & Borgesius, 2019). Second, laws such as the EU's GDPR differ in construction from most U.S. regulatory Text. The GDPR's text is vague in some places and speaks at the level of aspirational principle. Parts of the GDPR could be characterized as 'principles-based regulation' (Baldwin, Cave, & Lodge, 2012). The GDPR's provisions are supplemented with even more indeterminate 'recitals' (Klimas & Vaiciukaite, 2008). Such text flummoxes U.S. lawyers because of its lack of specificity. Third, the difference in construction leads to a practical consequence: whereas in the U.S., interactions with regulators typically mean that enforcement is afoot, in the E.U. context, colloquy with regulators is a routine rite in the compliance process. U.S. Lawyers have fretted about perfect compliance, but in reality, European regulators rarely expect such compliance, nor will they impose 8-figure liability for small imperfections. Thus, massive liability will also be keyed to serious wrongdoing rather than accident or simple noncompliance. The GDPR covers a huge landscape of data activities; no U.S. information law is as broad and ambitious (Hoofnagle, van der Sloot, & Borgesius, 2019). At the same time, it is essential in protection of personal data but also described as long and complex to implement and comply.

Thus, the methodologies are correct, but there is still room for improvement, i.e. for the promotion of ethics. Privacy regulations are appropriate, but they do have some weaknesses, such as size and complexity, which often stem from a gap in different principles and interpretations. Therefore, we believe that the application of fair and accurate statistical methods in all concerns of data will contribute to greater ethics and privacy.

3. Data analysis

To analyze the concept of fairness within the SSO data, we conduct two investigations. First, we compare the performance of the exports data collected by the NBRM with the same data collected by SSO, in explaining the variations of the macedonian GDP. This allows us to infer whether both export collection methodologies are able to provide consistent interpretation of the data. Second, we compare the ability of two clustering methods, PCA and k-means, in classifying the industries from the macedonian input-output tables, and examine whether different estimation methodologies yield fair comparison in the analysis of SSO data.

3.1 Comparison of collection methodologies

The main motivation behind this analysis stems from the fact that there is a difference in the methodologies for recording foreign trade in the trade statistics, by the SSO and in the Balance of payments of NBRM (Gockov,

2013). In other words, if researchers are trying to deal with some empirical analysis on macroeconomic variables in North Macedonia and want to include the export of goods and services, they will face a dilemma which source for exports data to use, because of the different measurement methodologies.

The reason why this difference occurs is that the State Statistical Office adds to the exports the non-resident purchases in the country, contrary to the data in the Balance of payments. Non-resident purchases in the country cover the purchases by international organizations, embassies and diplomatic missions, as well as tourism purchases by non-residents. Non-resident consumption is calculated on the basis of data from the non-resident consumption survey that is conducted by the State Statistical Office (SSO, 2016).

In Charts No. 1 and 2 we show the trends and annual growth rates of GDP and exports from data of State Statistical Office (Ex1 line) and National bank of Republic of North Macedonia (Ex2 line) spanning from 2003 until 2018.

Chart No. 1: Trends of GDP and exports

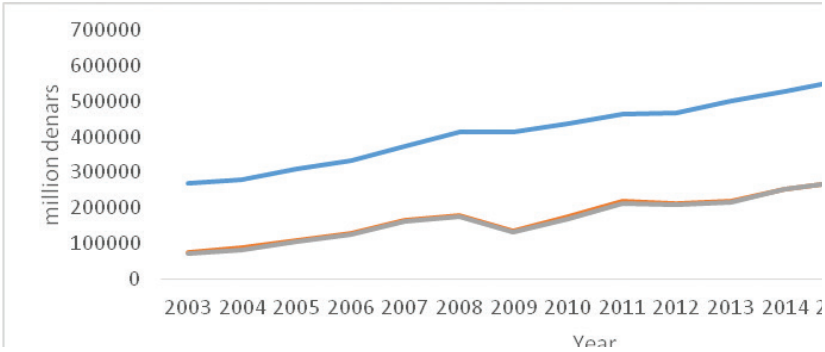
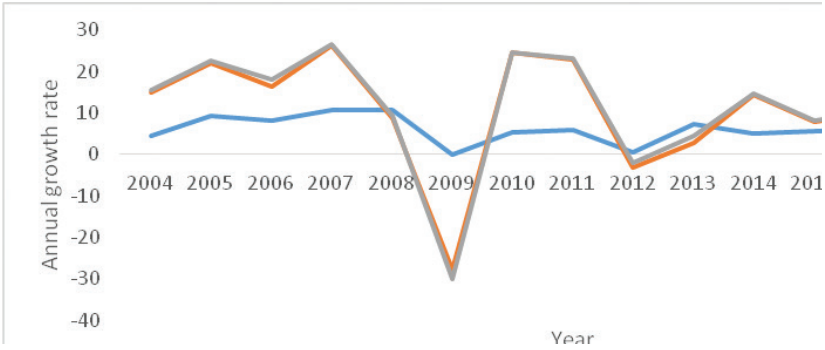


Chart No.2: Annual growth rates of GDP and exports



To investigate whether the two different data also lead to different results, we will use them in an empirical examination of the effect of export on economic growth. Concretely, we estimate a linear regression model,

$$\gamma_i = \beta_0 + \beta_1 \mathrm{X}_i + u_i$$

where γ_i is the dependent variable which is annual growth rate of GDP; X_i is the explanatory variable, which is annual growth rate of export (taken from either the SSO data or the NBRM data); β_0 is the intercept; β_1 represent the slope coefficient of the regressor variable; u_i is the error term (Turan & Karamanaj, 2014).

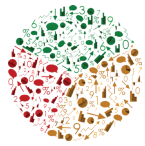


Table 1 presents the estimated results of both regressions. Model 1, which includes the database of export from the State Statistical office indicates that export is statistically significant at 1% significance level. Specifically, the export has a statistically positive impact on economic growth (β_1 is 0.154645). In model 2, where we are using the data from Balance of payments of NBRM, the regression coefficient remains the same as the Model 1, i.e. it shows the same positive relation with almost the same magnitude at the same level of significance (β_1 is 0.152188).

Table No.1: Estimation output from the regression models

Variables	Model (1)	Model (2)
Constant	4.239606***	4.215033***
	(5.102737)	(5.102737)
Export	0.154645***	0.152188***
	(3.194155)	(3.295393)
R^2	0.439719	0.455146
Adjusted R^2	0.396620	0.413234
Observations	16	16

*** / ** / * denotes significance at 1%, 5% and 10% level of significance, respectively.

Thus, the estimated comparison points out that, regardless which database for export we are employing, there would not appear any significant difference in the regression coefficients. Despite the fact that the methodologies for collecting the data of export in the State Statistical office and National bank are different, they lead to the same result when used for empirical investigations.

3.2. Comparison of estimation methodologies

The goal of the second analysis is to decompose the latest symmetric input-output table, consisting of 63 products, and find whether different estimation methodologies yield different clusters. For this purpose, we use two simple methods – Principal Component Analysis (PCA) and K-means classification (Ding & He, 2004) (Ben-Hur & Guyon, 2003) (Alrabea, Senthilkumar, Al-Shalabi, & Bader, 2013) (Liang, Balcan, & Kanchanapally, 2013). Moreover, as a baseline clustering procedure we use the Hierarchical cluster analysis (Field, 2013) (Hair, Black, Babin, Anderson, & Tatham, 1998) (Stevens, 2012). This is the simplest clustering analysis. Its methodology builds upon a "hierarchy" of clusters and allows for easy visualizations of genetic distances and relatedness between products. As such it allows for efficient comparison of the performance of other cluster estimation methodologies (Aggarwal, 2015) (Han, Pei, & Kamber, 2011).

PCA: The PCA operation can be thought of as revealing the internal structure of the data by decomposing it into principal components that best explain the variance in the data (Golub & Reinsch, 1971). Using PCA, we find that the normalized input-output table is explained by 16 components, i.e. the initial 63 products are compressed into 16 linear combinations of them. To associate the concept of fairness in PCA's with the baseline model of hierarchical clustering, in Table 2 we compare the top 7 industries that belong to the first three PCA's with two stable algorithms of hierarchical cluster analysis: Average Between Groups Linkage (as I) and Furthest neighbor (as II).

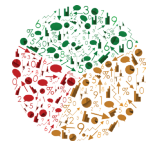
Table No.2: Comparing top 7 industries in and between components in the first three PCA's

PCA1	I	II	PCA2	I	II	PCA3	I	II
(1) Architectural and engineering services; technical testing and analysis services	+	+	**(3)** Basic metals	+	+	**(3)** Repair and installation services of machinery and equipment	+	+
(1) Wholesale trade services, except of motor vehicles and motorcycles	+	+	**(3)** Other transport equipment	+	+	**(3)** Machinery and equipment n.e.c	+	+
(1) Other professional, scientific and technical services; veterinary services	+	+	**(3)** Fabricated metal products, except machinery and equipment	+	+	**(3)** Other transport equipment	+	+
(1) Publishing services	+	+	**(2)** Accommodation and food services	-	-	**(3)** Fabricated metal products, except machinery and equipment	+	+
(1) Security and investigation services; services to buildings and landscape; office administrative, office support and other business support services	+	+	**(2)** Products of forestry, logging and related services	-	-	**(2)** Food products, beverages and tobacco products	-	-
(1) Wholesale and retail trade and repair services of motor vehicles and motorcycles	+	+	**(3)** Repair and installation services of machinery and equipment	+	+	**(3)** Electrical equipment	+	+
(1) Sporting services and amusement and recreation services	+	+	**(2)** Products of agriculture, hunting and related services	-	-	**(2)** Products of agriculture, hunting and related services	-	-

The findings suggest that the concept of fairness in these analyses is fulfilled. Namely, the top 7 industries of PCA1 are members in the same cluster in both algorithms of hierarchical cluster analysis (I and II). Also, the 4 of top 7, and 5 of top 7 industries of PCA2 and PCA3, respectively are in the same clusters in both algorithms of hierarchical cluster analysis (I and II).

K-Means: The K-Means cluster analysis is a tool designed to classify data into a number of (clusters) groups whose characteristics are not yet known, but we know that they are based on a set of previously specified variables (in our case the industries) (Trebuňa & Halčinová, 2012) (Trebuňa & Halčinová, 2013) (Kanungo, et al., 2002).

We applied the K-means cluster analysis on the top 5 industries in the first 5 components of the PCA which are presented in Table 3. Contrary to the PCA's groups, 18 of these 23 unique industries are clustered in



one group by K-means. The two industries: Warehousing and support services for transportation and Land transport services and transport services via pipelines are clustered in one group, and the rest three industries: Constructions and construction works, other non-metallic mineral products and Basic metals are in a cluster of their own. This indicates that K-means does not provide consistent interpretation of the patterns within the data.

Table No.3: K-means cluster algorithm on top 5 industries in the first 5 components of the PCA's

K-means (the significant cluster of 18 industries)	
Architectural and engineering services; technical testing and analysis services	Repair and installation services of machinery and equipment
Wholesale trade services, except of motor vehicles and motorcycles	Machinery and equipment n.e.c
Other professional, scientific and technical services; veterinary services	Food products, beverages and tobacco products
Publishing services	Postal and courier services
Security and investigation services; services to buildings and landscape; office administrative, office support and other business support services	Water transport services
Other transport equipment	Air transport services
Fabricated metal products, except machinery and equipment	Imputed rents of owner-occupied dwellings
Accommodation and food services	Real estate services (excluding imputed rent)
Products of forestry, logging and related services	Rental and leasing services

4. Conclusion

In short summary, in this paper we evaluated the extent to which the ethical concepts of privacy and fairness are satisfied within the SSO data. We found out that the privacy regulations justify the meaning of the context, but may nevertheless lead to complex interpretation. Regarding the concept of fairness, we performed two analyses. First, by comparing the data collection methodologies for exports by NBRM and SSO, we showed that they yield consistent interpretation of the results, i.e. it is irrelevant which data is used. Second, by analyzing the structure of the input-output methods through two different estimation methodologies we discovered that not every methodology may present the same interpretation of the results.

The main question which arises from our investigation is how privacy and fairness can be evaluated in a consistent manner. A growing body of literature suggests that there is no ideal framework in which both concepts are given a clear meaning. Instead, the research so far has focused on discussing the degree to which one individual can make a trade-off, i.e. facilitate a strict meaning of one concept, while abstracting the other one to describe a broader notion. Undoubtedly, the examination of this degree in studies using data from SSO represents a fruitful subject for future research.

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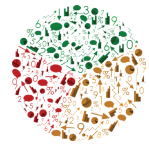

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Statistics for all: analyses of attitudes and anxiety towards learning statistics in undergraduate and postgraduate students in medical and management sciences

Introduction

Statistical anxiety has been long reported and discussed in the scientific literature. However, as the need to know and use statistics increases, it becomes more important to understand the difficulties that students are facing in their statistics courses (Vigil-Colet, A., Lorenzo-Seva, U. and Condon, 2008). Empirical evidence has suggested that the difficulties related to statistical literacy are more pronounced among students enrolled in nonmathematical disciplines, thus these students often report negative experiences in statistical courses (Utts, 2003; Chew and Dillon, 2014). On this note, Zeidner (Zeidner, 1991) suggested that over 70% of the students experienced statistics anxiety while Onwuegbuzie (Onwuegbuzie, 2008) estimated that approximately 75% of graduate students experience high levels of statistics anxiety.

It was for a long time that statistical anxiety was not recognized as a separate from, but treated as "mathematical anxiety". It was first identified by a group of researchers (Cruise, R. J., Cash, R. W., & Bolton, 1985) in the 1980s, however initially it was viewed as same with mathematical anxiety. One of the reasons for such views was not the lack of definition of statistics. In fact, this was already provide five decades earlier by Willcox (Willcox, 1936), who documented more than one hundred definitions of statistics. However, one main definition prevailed which defined statistics as simply higher mathematics (Wilson, 1927). In addition, mathematical anxiety was better known and understood, which made researchers more viable to classify them as one.

Today, the distinction between the two is well known. Statistical anxiety has been defined in the literature as "the feelings of anxiety encountered when taking a statistics course or doing statistical analyses; that is, gathering, processing, and interpret[ing] (Cruise, R. J., Cash, R. W., & Bolton, 1985). In line with this, Zeidner defined it as extensive worry, intrusive thoughts, mental disorganization, tension, and physiological arousal when exposed to statistics content, problems, instructional situations, or evaluative contexts, and it is commonly claimed to debilitate performance in a wide variety of academic situations by interfering with the manipulation of statistics data and solution of statistics problems. This last author conducted interesting studies that revealed parallels between statistics and mathematics. More specifically, his study results suggests inverse correlation reported for mathematics anxiety and math course performance, and a negative correlation of statistics anxiety with high school matriculation scores in math as well as self-perceptions of math abilities. The results from his study confirmed what has already been anticipated - prior negative experiences and poor achievement in mathematics, as well as a low math self-efficacy are meaningful antecedent correlates of statistics anxiety (Zeidner, 1991).

Another psychological barrier towards statistical literacy and understanding, is the attitude towards statistics. Research done in the past has found that statistical anxiety and attitudes are related to the students

performance in statistical exams (Dempster and McCorry, 2009; Nielsen and Kreiner, 2018). These attitudes are multidimensional and defined by affect, difficulty, cognitive competence, value, interest, and effort (Schau and Emmioglu, 2012). Literature suggests that a reliable and valid measure of statistics anxiety and attitudes will allow researchers to identify students who are high in statistics anxiety, to predict scores on a statistics examination, and to evaluate the relative effectiveness of interventions designed to reduce statistics anxiety. The present study has the goal to measure of statistical anxiety and attitudes toward statistics of undergraduate students and provide recommendations on how to teach in order to relieve or avoid students' statistical anxiety and develop positive attitudes.

Methodology

Participants

A total of 117 undergraduate students were recruited in the sample (68 female, M(age)=20.3 years, SD=8.3; 49 Male, M(age)=21.1, SD=7.1). The participants in the research were students that came from undergraduate courses from two universities in the Republic of North Macedonia: University American College Skopje (N=51) and Faculty of Medicine, University St.Cyril and Methodius (N=66). All of the participants in the survey have completed a course in statistics (N=117). The response rate was 63.93%.

Procedure

All potential participates in the survey were invited to fill in an online questionnaire by one of their professors. The participants consent form was on the first page of the online version of the questionnaire. It explicitly stated the goal of the survey, its anonymity, voluntary participation as well as that their responses would be used solely in scientific purposes.

Instrument

The questionnaire that was administered for the purpose of this research was consisted of three main sections. The first section included the 51 items from the STARS instrument with the intention to measure statistical anxiety of students. The second section aimed to assess the students' attitude towards statistics using the 28 items from the SATS questionnaire. The third section collected demographic data from the survey participants.

Prior to being administered, the instrument underwent pilot testing. A group of 8 students were invited to complete the final version of the questionnaire and discuss their impressions. The first version of the questionnaire was consisted of the Attitudes Towards Statistics Scale (ATS) which provided a negative attitude of statistics. Since this was not preferred by the focus group, the scale was replaced with the SATS which reflect more positive views towards statistics. Afterwards, a second focus group was conducted and the feedback allowed for this version to be administered to the potential participants. The scores of the focus group participants were not included in the final calculations.

Description and psychometric properties of STARS

The STARS (Cruise and Wilkins, 1980) consists of 51items organized in six subscales that aim to assess and measure feelings of anxiety encountered when taking a statistical course or doing statistical analysis. The responses are recorded on a 5-point Likert-type scale which for the first 23 items ranges from 1=No Anxiety

to 5=Strong Anxiety, while for the remaining 28 items participants were asked to rate their level of agreement on 5-point Likert-type scale ranging from 1=Strongly Agree to 5=Strongly Disagree. For the first 23 items higher scores indicate higher anxiety, while for items 24-51 higher scores indicate more positive attitudes.

Consequently, a high score on the STARS indicates a high level of anxiety and/or a negative attitude towards statistics. The instrument level Cronbach's alpha was estimated to be .91.

STARS Subscale 1 - Worth of Statistics. This subscale is comprised of 16 items that collect responses related to the perceived importance of statistics. A higher score indicates a lower level of personal importance of statistics to the respondent. Cronbach's alpha = .89.

STARS Subscale 2 - Interpretation Anxiety. This subscale is comprised of 11 items designed to measure anxiety as a result of interpreting or making a decision utilizing statistical data. A high score on this subscale indicates an inability to effectively use statistical procedures and strategies in the course of daily life. Cronbach's alpha = .86.

STARS Subscale 3 - Test and Class Anxiety. The scale has 8 items that focus on anxiety resulting of class or test participation. A high score is synonymous with increased levels of anxiety. Cronbach's alpha = .92.

STARS Subscale 4 - Computational Self-Concept . This subscale has seven items that are related to the perceived knowledge and ability to use statistics and to complete computations of mathematical procedures. A high score reflects a greater level of anxiety related to performing mathematical computations within statistical procedures as opposed to statistics itself. Cronbach's alpha = .88.

STARS Subscale 5 - Fear of Asking for Help. These 4 items relate to anxiety for asking for help. High scores reflect greater amounts ofanxiety when an individual has to seek help from teacher or classmate. Cronbach's alpha = .79.

STARS Subscale 6 - Fear of Statistical Teachers. These five items address the perception of the statistics teacher. High scores correspond to an individual's perception that the instructor lacks sufficient understanding to relate to the individual's predicament and as a result the instructor should be feared. Cronbach's alpha = .74.

Description and psychometric properties of ATS

The SATS questionnaire (Schau *et al.*, 1995)is consisted of 28 items organized in four subscales. All responses are recorded on a seven – point Likert type scale in which higher score reflects a positive attitude or view towards statistics. The instruments' Cronbach's alpha was assessed to be .93.

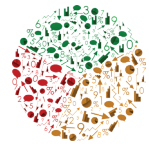
SATS Subscale 1 - Affect. The six items in this subscale contains and its focus is on feelingstowards statistics. A high score reflects a positive view of statistics. Cronbach's alpha was estimated to be .88.

SATS Subscale 2 -Cognitive Competence. This subscale consists of 6 items and evaluates attitudes and intellectual knowledge relating to statistics. A high scorereflects a positive attitude and knowledge level. Cronbach's alpha =.83.

SATS Subscale 3 -Value. The nine items focus on the relevance and utility of statistics. Cronbach's alpha = .82.

SATS Subscale 4 -Difficulty. The seven items in this subscale asses the perception of difficulty of statistics materials. Higher scores reflect a more positive attitude towards the difficulty of the material. Cronbach's alpha =.71.

The final part of the questionnaire contained additional subscales. Past course in mathematics: This subscale gathered information on whether the participants had previous experience in mathematical courses at university level. Cronbach's alpha was estimated to be .79. Past course in statistics: This subscale collected information on whether the participants had previous enrollment in statistical courses at university level.



Cronbach's alpha was estimated to be .81. The end of the questionnaire contained two open ended questions that covered two main areas: (1) awareness on statistical anxiety (personal and classmates) and (2) reasons nd solutions for statistical anxiety. The survey also comprised a series of demographic questions, including gender, age, university (private/state), year of study and field of study.

RESULTS

The first part of the part of the analyses of the gathered data was to explore the relationship between the demographic characteristics of the participants and their scores on the STARS and SATS questionnaires, as well as between the subscales of the two instruments. The results are presented in Table 1 and Table 2. Moderately positive relationships were observed for the Past course in mathematics and Past course in statistics (r=0.51) as well as for Past course in statistics and SATS score (r=0.43). In addition, a negative correlation is observed between the SATS and STARS scores (r=-0.85), as well as between the STARS and Part course in mathematics (r=-0.66). The large negative correlation (r = -.85) between the STARS and SATS scores is in line with the theoretical expectation from the literature, since a high score on the SATS reflects a positive attitude towards statistics while a high score on the STARS reflects a negative attitude towards statistics. The moderate and large correlations between STARS and SATS instruments and their subscales, indicates convergent validity. This is also in line with the theoretical considerations.

Table No.1: - Correlations between STARS and SATS Subscales and Demographic Variables

	Statistical Anxiety Rating Scale (STARS)	Survey of Attitudes Toward Statistics (SATS)	Past course in mathematics	Part course in statistics	Age	GPA (self-reported)
Statistical Anxiety Rating Scale (STARS)	1	-0.85	-0.66	-0.47	0.31	0.25
Survey of Attitudes Toward Statistics (SATS)	-0.85	1	0.37	0.43	-0.14	-0.19
Past course in mathematics	-0.66	0.37	1	0.51	-0.12	0.09
Part course in statistics	-0.47	0.43	0.51	1	-0.07	0.17
Age	0.31	-0.14	-0.12	-0.07	1	0.28
GPA (self-reported)	0.25	-0.19	0.09	0.17	0.28	1

Table No.2:- Correlations between STARS and SATS Subscales

	STARS	SATS	Worth of Statistics	Interpretation Anxiety	Test and Class Anxiety	Computational Self-Concept	Fear of Asking for Help	Fear of Statistical Teachers	Affect	Cognitive Competence	Value	Difficulty
STARS	1	-0.85	0.91	0.86	0.89	0.88	0.74	0.41	-0.78	-0.74	-0.57	-0.64
SATS	-0.85	1	-0.81	-0.58	-0.74	-0.73	-0.32	-0.48	0.9	0.81	0.75	0.8
Worth of Statistics	0.91	-0.81	1	0.55	0.61	0.81	0.41	63	-0.68	-0.66	-0.71	-0.64
Interpretation Anxiety	0.86	-0.58	0.55	1	0.74	0.54	0.61	0.33	-0.54	-0.44	-0.29	-0.71
Test and Class Anxiety	0.89	-0.74	0.61	0.74	1	0.63	0.54	0.37	-0.79	-0.58	-0.47	-0.65
Computational Self-Concept	0.78	-0.73	0.81	0.54	0.63	1	0.48	0.64	-0.72	-0.75	-0.27	-0.41
Fear of Asking for Help	0.74	-0.32	0.41	0.61	0.54	0.48	1	0.4	-0.34	-0.19	-0.27	-0.31
Fear of Statistical Teachers	0.41	-0.48	0.63	0.33	0.37	0.64	0.4	1	-0.41	-0.45	-0.21	-0.24
Affect	-0.78	0.9	-0.68	-0.54	-0.79	-0.72	-0.34	-0.41	1	0.41	0.57	0.34
Cognitive Competence	-0.74	0.81	-0.66	-0.44	-0.58	-0.75	-0.19	-0.45	0.41	1	0.34	0.39
Value	-0.57	0.75	-0.71	-0.29	-0.47	-0.27	-0.27	-0.21	0.57	0.34	1	0.57
Difficulty	-0.64	0.8	-0.64	-0.71	-0.65	-0.41	-0.31	-0.24	0.34	0.39	0.57	1
Mean	2.51	4.31	3.59	4.21	4.47	2.87	3.41	3.72	2.01	2.36	3.17	2.18
SD	0.64	0.84	1.32	1.2	1.14	0.95	0.61	1.17	0.95	0.84	1.05	1.12

The gender differences were explored by independent means t-tests. The results indicated that no statistical differences between males and females were found for SATS (t(117)=.87), p<.47). For males, $\overline{X}$=4.21, SD=0.87; for females $\overline{X}$=3.89, SD=0.98. In line with this, no statistical significant difference between males and females was found in STARS (t(117)=-.35), p<.68). For males, $\overline{X}$=2.45, SD=0.75; for females $\overline{X}$=2.41, SD=0.74. In addition, no gender differences were found regarding past mathematics courses (t(117)=.0.45), p<.74). For males, $\overline{X}$=3.47, SD=0.97; for females $\overline{X}$=3.67, SD=0.78.

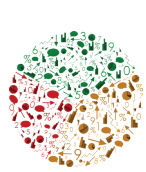
The analyses of the STARS instrument revealed no significant statistical differences between students coming from private and public universities (t(117)=-.61), p<.35); for private, $\overline{X}$=2.21, SD=1.01; for public $\overline{X}$=2.45, SD=0.78.Similary, no significant statistical differences between students coming from private and public universities were found for the SATS instrument (t(117)=.77), p<.52); for private, $\overline{X}$=4.01, SD=.82; for public $\overline{X}$=3.97, SD=0.77.

Discussion

The main goal of this paper was to provide knowledge and understanding of the perceptions and attitudes of students towards statistics. For the purpose of the analyses, two main instruments were used – STARS (Statistics Anxiety Rating Scale) and SATS (Survey of Attitudes Toward Statistics). The analyses suggested that the two instruments demonstrated excellent internal consistency and reliability

In addition, the analyses demonstrated correlations between subscales of the instrument and multidimensional construct of the factors, which is in line with the theoretical expectation that both instrument measure overlapping areas. An additional investigation found that STARS and SATS scores were not related to gender of the students, or the type of university. This was in line with previous findings in the literature (Baloğlu, 2003).

Two main open questions were posed to students at the end of the questionnaire. The data from the open ended question was thematically analyzed and showed that students were aware whether or not they have statistical anxiety. Although the majority were speaking openly about it and were also aware that their classmates shared the same sentiment, they were afraid to ask the teacher for additional help. Regarding the causes of the anxiety, the students replied that they found statistics simpler than math since it had easier to follow rules; however they thought that they lack use of the science in practice. Some of them suggested that it would be useful if they had more time to cover the material or work with people who applied statistics in their field of study. This is in line with previous conclusions from Kaiser who found that the inability to link statistical abstractions with the existing know ledge 'causes' severe anxiety among students (Kaiser, 1992). Interestingly, some of the students who transferred from universities that did not teach statistics on computers, to universities who thought statistics on computers declared that this helped them ease their anxiety. This is in line with previous findings from the literature (Stickels, John W.; Dobbs, 2007). In addition, students highlighted that the approach of the professor is crucial in their understanding and anxiety level regarding statistics. In general, professors who are kinder, more patient and explain in simple words are more preferred by students who suffer from statistical anxiety. Interestingly, this is in line with the findings of an amusing research done by Berk and Nanda (Berk and Nanda, 1998). These two researchers measured changes in attitudes and anxiety and their relationships to achievement levels on three incidental samples of



142 students who participated in a humorous instructional intervention. More specifically, they used seven humor strategies: (a) humorous material on the syllabus, (b) jokes in the beginning of the classes, (c) in-class humor, (d) in-class humor examples, (e) humor in exercises, (f) jeopardy type review examinations, and (g) humorous material on the examinations. They found statistically significant t-ratios in the predicted directions and practically significant effect sizes attitudes toward course content and anxiety for all classes. Similarly, a positive approach that is part of a student-oriented statistics course seems to produce a more significant redusction in stataistical anxiety. Widmer and Chavez recoomend a combination of the following: putting more emphasis on understanding; reducing complex tasks to simple ones; building positive attitudes toward statistics; and adapting a supportive statistics teacher role (Widmer, C. C., & Chavez, 1986).

As this is the first research of this kind one in the Republic of North Macedonia, there are some inherent limitations. First, no national comparative data are available. The data was collected during the spring semester and in the midst of social isolation due to the coronavirus pandemic. This limited the qualitative feedback that would potentially be provided to the researcher in case the questionnaire was administered in person and in class. This also applied to the potential for observation of the reactions of students while they are completing the survey. However, it should be noted that being the first national research in field also provides some valuable strengths. In example, previous research that investigated cross-country differences in statistical anxiety (Baloglu, Deniz and Kesici, 2011) found that the main effect of country was significant on worth of statistics, interpretation anxiety, fear of asking for help, and fear of statistics teachers on which American students scored higher than Turkish students. Therefore, this suggests limitation in generizability of data from one country to the rest of the world and hence the need and importance of national research.

Regardless of the limitations, the results of the survey provide a valuable basis for revising the statistical curricula and providing a focus on potential statistical anxiety of students on medical and business studies.

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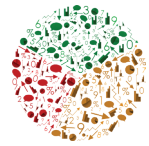

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Profiling as a new tool for measuring globalisation – slovenian experiences

1 Introduction

Profiling is a new tool for measuring globalisation. It is a way to improve consistency and quality of data about relevant global enterprise groups (GEGs) across borders. With better understanding of the legal and economic structure of the GEG globally and nationally we improve the EuroGroup Register (EGR) and the national statistical business registers (NSBRs). Globalisation can be better monitored by correctly determined surveyed units.

With profiling we understand GEGs better and as a consequence we record them correctly and consistently. With correct determination of the surveyed units we serve concrete statistical users producing business and macroeconomic statistics better and allow them to improve data consistency.

However, it is also important to point out that profiling is only a starting point. Within profiling we collect only core variables in business registers - turnover, number of employees and NACE code. It is also important to point out that profiling checks only important GEGs. A GEG is important if it has big influence on statistics. In the selection process we follow criteria such as group size, group complexity and the number of EU Member States where the group operates (economic relevance). In European profiling we select European important groups and in national profiling we select nationally important legal units in groups to produce consistent and relevant statistics at the European and national levels.

There are many types of the profiling process. Manual profiling is used for the most important GEGs and automatic profiling for other important GEGs. Within manual profiling the most important source is consolidated annual reports (CAR) of each GEG. GEGs with the most important impact on statistics are profiled intensively and they are visited. The meeting is often with top management of the group and/or with top management of the financial/accounting section of the group. That way we have better understanding of the group's organisational structure and also a possibility to get additional data. Other manually profiled groups are profiled as light/desk manual profiling. The most important source is also CARs and, if necessary, for additional explanations we can have a phone contact with the group. Other important GEGs are profiled as automatic profiling by using one or more proposed methods for consolidation.

SURS was involved in many profiling cycles within Commission grants to test all types of profiling and to realise which are more appropriate for national statistics. SURS cooperated also in the Eurostat Task Force on Profiling. As Slovenia is a small country involved in globalisation, SURS shared experiences and sometimes different points of view. The most important output of this group is the European business profiling, recommendations manual[1] - updated profiling methodology with guidelines how to delineate statistical units to produce global and national statistics closer to the reality.

[1] European business profiling, recommendations manual, 2020 edition https://ec.europa.eu/eurostat/documents/3859598/10479728/KS-GQ-20-002-EN-N.pdf/e13f0907-5e5a-7521-604a-287004d07043

2 Delineating statistical units within profiling

In statistics the first important step is to correctly define statistical units. Profiling has the most important role in this process. European profiling checks legal units (LeUs) perimeter in economically important GEGs at the European level and national profiling at the national level.

Within European profiling we delineate:

- Global enterprise groups (GEGs) and
- Global enterprises (GENs).

Within national profiling we delineate:

- National enterprises (ENTs).

From a country's point of view, it is possible to cooperate in the profiling process of one GEG as a global decision centre country (GDC country, country where GDC is) or as a partnering country (country in which at least one LeU of the GEG is and GDC of the group is in another country). The country where the profiled GEG has GDC is firstly the country which also decides to profile this GEG. Secondly, this country also profiles this group at the European level (does European profiling). Thirdly, this country does also national profiling for residential legal units within this profiled group.

On the other hand, the country which has LeUs in the profiled GEG with GDC in another country does only national profiling for this group.

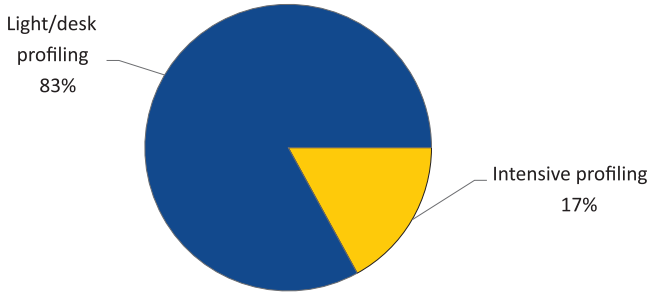
This paper will focus on delineating national enterprises (ENTs) as statistical units with manual profiling.

3 Slovenian cooperation in Commission grants

SURS cooperated in many Commission grants for providing feedback on methodological and technical aspects, in grants for manual profiling and in a grant for automatic profiling. Ended are grants within which we profiled data for reference years from 2014 to 2017. We cooperated in four grants for manual profiling and one grant for automatic profiling. Within manual profiling we profiled 14 different groups (profiled as initial and/or follow up profiling) and we visited 3 groups profiled as initial intensive profiling.

The following charts illustrate profiling at SURS.

Chart No.1: Proportion of groups profiled as intensive or light/desk manual profiling, Slovenia, reference years 2014-2017



Source: internal data.

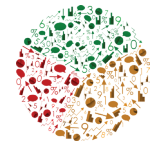
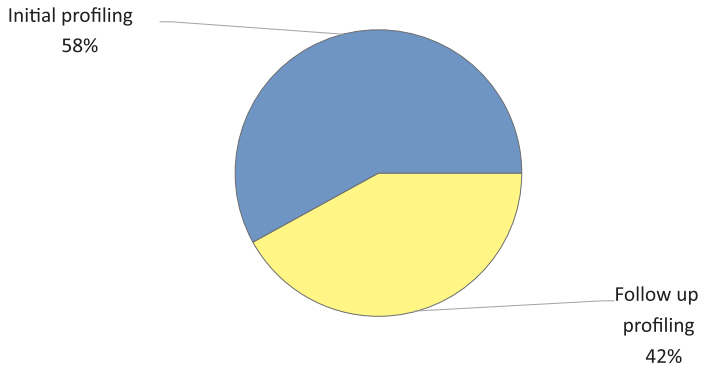


Chart No.2: Proportion of groups profiled as initial or follow up manual profiling, Slovenia, reference years 2014-2017



Source: internal data.

Within grants for manual profiling SURS also profiled LeUs in Slovenia which are in groups with GDC in another country. In these cases SURS participated as partnering profiling. Around 70 groups were profiled as partnering profiling.

Now SURS cooperates in an on-going grant for manual profiling within which we profile data for reference year 2019.

3.1 National profiling in a small country

In national profiling we have a different view than in European profiling. In European profiling the biggest European groups should be profiled but in national profiling we should focus on nationally important legal units (LeUs) that are part of GEGs.

Based on our experiences we can conclude that our groups are relatively small and on average they have 10 LeUs in Slovenia. It was also realized that LeUs profiled as partnering profiling (GDC in another country) are based on some criteria more important for national statistics than LeUs in groups with GDC in Slovenia. In these groups SURS cooperated as partnering profiling.

4 Process of delineating national enterprises

For statistics that shows the reality the first important step is to have correctly delineated statistical units. Within national profiling we check in each profiled GEG all residential LeUs.

National ENTs are delineated to be then used in all domains where the ENT or for the corporate sector the institutional unit is an observation unit. As a consequence an important role is played by the NSBR, which should be the backbone for business statistics and national accounts. In SURS it is and it is also the main source for the sampling frame for all business statistics.

In the process of delineating ENTs all those domains should be included which have an observation unit ENT (SBS, FATS statistics, national accounts, ICT, etc.) with the purpose to delineate statistical unit ENT useful for all domains where it is an observation unit and with the purpose to fulfil all requirements of each domain. All domains where the ENT or for the corporate sector the institutional unit is an observation unit then have also

an opportunity to express opinion in the beginning, in the delineating statistical units.

Within national profiling we check residential LeUs in the profiled group and then we delineate national ENTs. There are two possibilities in the decision-making process: first ENT consists of two or more LeUs and second one LeU is equal to an ENT. Quite often we use for ENT that consists of two or more LeUs the term a "complex ENT".

Once a complex ENT is created it should be used in all domains where the observation unit is an ENT and it must be feasible to prepare all data needed. Then we will have more consistent statistics in all domains.

4.1 Delineating lower statistical units

If we decide within national profiling for complex ENTs, it is important to check also lower statistical units. In the case of complex ENTs it is important to delineate those lower statistical units correctly and in a consistent way in all countries. Since the NSBR is the backbone for all business statistics, also lower statistical units have to be delineated. As lower statistical units we have in mind:

- Kind of activity unit (KAU)
- Local unit (LU)
- Local kind of activity unit (LKAU)

In the process of delineating national ENTs, domains where lower statistical units are observation units (STS and others) should also be included.

5 Factors in deciding on complex enterprises

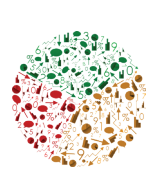
Within national profiling all nationally important LeUs should be checked every year. But the decision on the perimeter of national ENTs is sometimes complex. Within national profiling SURS realized that some factors should be satisfied in the decision-making process on complex ENTs based on own experiences.

The most important sources for manual profiling are CARs and annual reports of LeUs in each profiled group. The groups with the biggest impact on statistics are within intensive profiling also visited. Based on those and other sources, important factors in deciding on complex ENTs are listed for manual profiling.

First is **the organizational structure of the group** which is usually presented in CARs. Useful is also information about how and where important decisions are made.

Then **the availability of data**. If we decide to merge some LeUs in complex ENT, we need consolidated data for LeUs included in complex ENT. But in CAR there are available consolidated data if so only for turnover. However, in statistics for different domains we need more variables. We need data for all non-additive variables in the SBS. Colleagues from national accounts also pointed out that in the case of merging LeUs to an ENT all data from different sources have to be prepared and consolidated (for example data from financial statements, tax data) for those ENTs. According to our experience, the profiled groups are not willing to prepare additional consolidated data.

Important are also **deadlines in domains** and quarterly GDP is one of the first in a row. Profiling is an annual activity and the most important source CAR has also data only for the annual period. But there are also additional requirements for short-term statistics (quarterly and monthly). It is possible that CARs of some important group are published eight months after the end of the year or even later. In Slovenia we have such cases. If a country has good administrative sources at the LeU level much earlier (for SBS it is possible for example to use administrative sources), it is good to take them into account. SURS strongly uses administrative



sources. In Slovenia almost all LeUs must prepare annual reports (balance sheet, and profit and loss account) for statistical purposes. Data on turnover in the SBR are gathered from these annual reports and they are also used for the preparation of structural business statistics and annual accounts.

Important are also **internal flows**, but all groups do not prepare so detailed CAR and they rarely include operating segments as autonomous part of the group in the decision-making process.

In the end it is good to be aware that **reported data are better than any estimates.** It is also good to check **if the input (manual profiling, additional burden for reporting units and work on surveys) exceeds the output.**

There are two opportunities in decision-making on national ENT in the end. We can decide firstly for ENT equal to two or more LeUs or secondly ENT equal to one LeU. Based on SURS's experiences the decision that ENT is equal to one LeU does not mean no profiling and no checking.

6 Coordination between different domains when delineating an enterprise in Slovenia

After including all domains in the decision-making process, it is also important how this coordination is going on.

As mentioned, the proposed ENTs within the profiling process should be checked before they are delineated with the purpose to be then useful for all domains where the ENT or for the corporate sector the institutional unit is an observation unit.

With this purpose SURS established two groups, the first named "Profiling Team" and the second named "Group for Enterprises". The Profiling Team has a purpose to propose ENT as a statistical unit (or complex ENTs or ENTs equal to one LeU) and make a proposal for lower statistical units. This team consists of the representatives of the SBS, FATS statistics, the NSBR and the EGR. Then the proposed complex ENTs are consulted with all domains using ENT as an observation unit in the Group for Enterprises, which consists of the representatives from business statistics (SBS, STS, ICT), environmental and social statistics, data collection unit, general methodology, and national accounts.

The Profiling Team had many meetings per year. Some important conclusions are listed below:

1) The GEGs visited within manual intensive profiling explained that all their LeUs in Slovenia are autonomous and should be treated as each LeU is equal to an ENT. They explained that all LeUs in Slovenia are market-oriented.
2) In manual profiling it was realized that the differences between consolidated and non-consolidated turnover at GEG and GEN level were bigger, but at the national level (only between national LeUs) there were no differences. The difference between the sum of turnover of residential LeUs and consolidated turnover of those LeUs was around 1%. In one GEG there was also a need to separate one LeU. In this group we decided for two GENs with different activities (metal and tourism). The mother company was included in one GEN, but one department of this unit was included in another GEN because it was performing the main activity of another GEN.
3) In grants we tested all methods proposed for consolidation within automatic profiling. It was realized that in several cases the summed up value of turnover of LeUs is the best estimation of consolidation value (difference is 1%). This estimation of consolidation value was better than the consolidation done with the proposed method within automatic profiling. Since a simple sum is not a consolidation, there is a dilemma if this should be done or not[2].

[2] For LeUs in Slovenia within national profiling only manual profiling is appropriate in the process of delineating ENTs.

4) All nationally important GEGs have been profiled. But the structure of the group can change very quickly and also some organizational changes (mergers, etc.) are possible. SURS checks every year if groups had bigger organizational changes (they are then candidates for follow up profiling) or if any other GEG became important (they are candidates for initial profiling).
5) In the future we will profile all important groups and as partnering profiling even if GDC country will not profile those groups, if they have LeUs important for national statistics. A significant number of GEGs relevant at the national level could remain outside of the scope of the European profiling. These GEGs should be analysed using national profiling.

Within the Group for Enterprises the domains where the observation unit is an ENT express their opinion about proposed complex ENTs. Based on groups profiled so far it was realized that LeUs in complex ENTs should be separated in order not to lose any information because data for all SBS variables could not be calculated. As mentioned, colleagues from national accounts pointed out that for complex ENTs all data from different sources have to be prepared and consolidated (financial statements, tax data). Each LeU in Slovenia has a full set of accounts and as such some autonomy. According to ESA, one criterion for autonomy of the institutional unit is that LeU keeps a complete set of accounts (COUNCIL REGULATION (EEC) No 696 / 93 and ESA 2010). And in Slovenia the Companies Act (ZGD-1) demands the preparation of a complete set of accounts for each LeU.

The Group for Enterprises is open also for additional ideas for complex ENTs. ICT proposed to delineate two additional complex ENTs in two domestics groups, because they had common IT. The Profiling Team checked this proposal and it was realized that common IT is the only thing in common. There were no internal flows and LeUs had separated selling activities. This was a case where it is not a complex ENT for all domains.

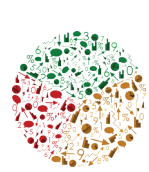
6.1 Informing the entire national statistical institution about profiling activities

For users of the NSBR it is important to hear about the profiling work on different occasions. To this end SURS had presentations of profiling activities and results at the:

- Workshop on profiling and the EGR to the Business Statistics Section and
- Internal event where best practices and new activities are presented to the whole SURS (this event takes place twice a year).

SURS had also a discussion about treating ENTs in SURS at the methodological meeting with all top management, middle management from all domains using the statistical unit (including national accounts) and members of the Profiling Team. It was realized that still more coordination, feedback and guidelines are needed. An important conclusion was also that on working groups (WGs) on concerned domains the delineating ENTs and KAUs process should be discussed and how to use complex ENTs in the statistical process in each national statistical institution (NSIs).

All the important information about work done on the profiling is also presented on SURS's intranet page. Documents include explanations of profiling work with examples.



7 Conclusions

Profiling is a good starting point for better delineation of statistical units - in national profiling we have in mind national ENTs. Within profiling we collect three important variables useful for the EGR and the NSBR, such as turnover, number of employees and NACE.

In the process of delineating national ENTs coordination between domains using statistical unit ENT is important to delineate ENTs correctly and useful for following statistical processes of those domains to produce consistent data on business statistics.

SURS realised that sometimes Slovenia as a small country has different points of view. LeUs profiled as partnering profiling (GDC in another country) are based on some criteria more important for national statistics than LeUs in groups with GDC in Slovenia. In these groups SURS cooperated as partnering profiling.

Within profiling we collect only turnover, number of employees and NACE code at the annual level but different domains need much more variables and not only at the annual level. This methodological work is out of the profiling process but should also be done. Different GEG-related activities such as Large Cases Units (LCU), Gross National Income (GNI), MNE Pilots and Early Warning System (EWS) should be coordinated to draw synergies and to avoid overlaps.

References

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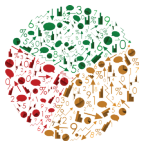
2. European Commission, EUROSTAT, Directorate G: Business and trade statistics, Unit G.1: Coordination and infrastructure development: **Task Force European Profiling proposal on The European profiling programme (Profiling programme principles and Roadmap to operationalisation)**, updated following TF e-meeting on 12/03/2020, 2020, 12 pages.

3. **European business profiling, recommendations manual**, 2020 edition
https://ec.europa.eu/eurostat/documents/3859598/10479728/KS-GQ-20-002-EN-N.pdf/e13f0907-5e5a-7521-604a-287004d07043



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The impact of Globalisation on Enterprise Statistics

Introduction

The idea of "globalization" as the diffusion of techniques, goods, services, ideas, movements and similar across regions, nations and continents is a topic that attracts worldwide attention. Its popularity is somewhat linked to the implicit promise of integrating different countries, cultures and economies for the benefit of everyone. Obviously, the notion of globalization is often used in diverse ways (social globalization, cultural globalization, globalization of knowledge, etc.); often without any indication if all those aspects can be understood as being independent phenomena or if they are even somehow related.

The view of globalization as an economic phenomenon also involves considerations about productivity and enterprises as driving factors in this process. From the perspective of Official Statistics, the question arises how to grasp the related tendencies appropriately in order to provide political decision makers as well as society in general with a reliable account.

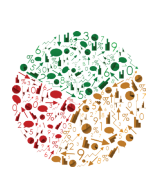
The present paper takes the perspective on globalization as a primarily economic process while focussing on the challenges that arise for Official Statistics in giving appropriate accounts of this tendency. Especially enterprises with international activities are considered as carriers of economic globalization, often building-up production chains with different stages of value added that span across regional, national or even continental borders while expanding the geographical limits of markets. The spread of such "multinational enterprises" (MNEs) across different countries presents a challenge to national Official Statistics since the locally available information sources usually don't provide the whole picture of such entities. Hence, the information about such supposed "national" enterprises, which is usually stored and administered in central statistical business registers within National Statistical Offices (NSOs), is often incomplete and reflects often only a fraction of the whole enterprise in terms of e.g. its structure, employment or economic activity. Although in most countries over 90 percent of all enterprises consist of small and medium enterprises (SMEs)[1] with only one, or eventually two affiliates, MNEs tend to be markedly larger enterprises with occasionally substantial employment numbers whose economic activity might include different fields.

Subsequently, we will first review and discuss some deliberately chosen definitions of globalization that inspire the selection of criteria and measures as concerns the main economic drivers behind this trend.

After having presented some empirical indications on the worldwide situation with regard to economic globalization, we will turn to some general considerations on enterprise structures while considering how they reflect globalization tendencies.

The final chapter presents some reflections on the consequences that arise from the insights gained on globalization tendencies and how they affect enterprise structures. A brief explanation will be given about the EuroGroups Register (EGR) as a concrete endeavour in Official Statistics to deal with ongoing globalization effects on enterprises.

[1] See also: Banatte and Täube (2017) on SMEs in Switzerland.



Definitions and related characteristics of Globalization

A definition that limits itself to pointing out that *globalization* is a process that takes place at *international level* is merely a tautology. In order to be able to judge if such a tendency is in fact prevailing in the worldwide economic system, we need to derive indicators from our theoretical reasoning that inform us about its empirical existence or its absence.

Hence, we turn first to some deliberately chosen definitions that will serve as the basis for some short reflections on adequate factors for determining globalization tendencies. According to those definitions, globalisation is, or manifests as:

- "… the process by which businesses or other organizations develop international influence or start operating on an international scale." (Oxford English Dictionary)[2]
- "… the spread of products, technology, information, and jobs across national borders and cultures. In economic terms, it describes an interdependence of nations around the globe fostered through free trade." (Investopedia)[3]
- "… the increase of trade around the world, especially by large companies producing and trading goods in many different countries." (Cambridge Dictionary)[4]

Obviously, the first definition given by the "Oxford English Dictionary" is rather broad and does not focus exclusively on economic aspects. Although it also mentions *businesses* as carriers of this process, it remains vague on the actual activity or means, ("develop international influence") through which globalization is realized.

The second definition by "Investopedia" has a somewhat narrower focus and refers explicitly to economic factors ("products, technology, information, and jobs") that are spread through *free trade*, although it remains unclear what is meant in this regard by "cultures", and how the "interdependence of nations" arises.

Finally, the third definition by the "Cambridge Dictionary" clearly mentions an increase of *international trade*, which is especially carried out by large enterprises that also produce internationally. As compared to the second definition above, the decisive activities that drive globalization are reduced here to production of goods and trade and nothing is said about production factors like information.

Whereas *trade in goods, productivity* and *information* or knowledge in the sense of *Intellectual Property* are mentioned in the above definitions as important characteristics of globalization, none of the three definitions also consider explicitly *trade in services*. Notably, the latter aspect suggest itself as a major driver for globalization while including e.g. services provided through the internet. Therefore, we will have a look at some empirical evidence on the three characteristics of globalization *trade in goods and services, productivity* and *information* on a worldwide level in the next chapter.

Economic Globalization: some empirical evidence

Until now, we have devoted our attention mainly to the discussion of some theoretical dimensions or characteristics of economic globalization. At this point, we will put some of these dimensions to the test and see, if they are in fact pointing to the assumed direction.

In a similar vein as J. Klein (2001), we distinguish three main channels of economic globalization that were also mentioned in the above review of definitions on globalization:

[2] See: https://www.oed.com/view/Entry/272264?redirectedFrom=Globalisation#eid
3 See: https://www.investopedia.com/terms/g/globalization.asp
[4] See: https://dictionary.cambridge.org/de/worterbuch/englisch/globalization

- trade in goods and services;
- foreign direct investment (FDI);
- international transfer of knowledge and technology, Intellectual Property (IP)

Whereas the significance of trade in goods as a characteristic of globalization does not need much further explanation, FDI is regarded here as a characteristic of productivity due to its relevance for labour productivity.[5]

The transfer of Intellectual Property (IP) contributes to globalization by ensuring the spread of technologies and knowledge.

If trade is a characteristic of globalization as proposed by Kleinert as well as by several definitions of globalization, one should expect worldwide increasing trade volumes / values over time.

A look at data on the world trade values for goods and services as shares of world Gross Domestic Product (GDP) from 1970 to 2018 confirms this expectation, indicating a clear growth tendency over the whole period as can be seen in chart No. 1:

Chart No.1: Main drivers of globalization - World Trade (goods and services) values in percent of world GDP

Apart from the impact of the global economic recession in the 1980s, which effected most of the developed world also in terms of declining world trade, and the Global Financial Crisis starting in 2008, the value of world trade as a share of world GDP rose steadily. As chart 1 shows, this trend lasted from the 1970s (trade as share of GDP in 1970: 27.3%) until 2018 (trade as share of GDP in 2018: 59.4%).

Turning now to the second criteria we defined for globalization, Foreign Direct Investment, we will concentrate on FDI inflows, which are defined by the OECD as follows:

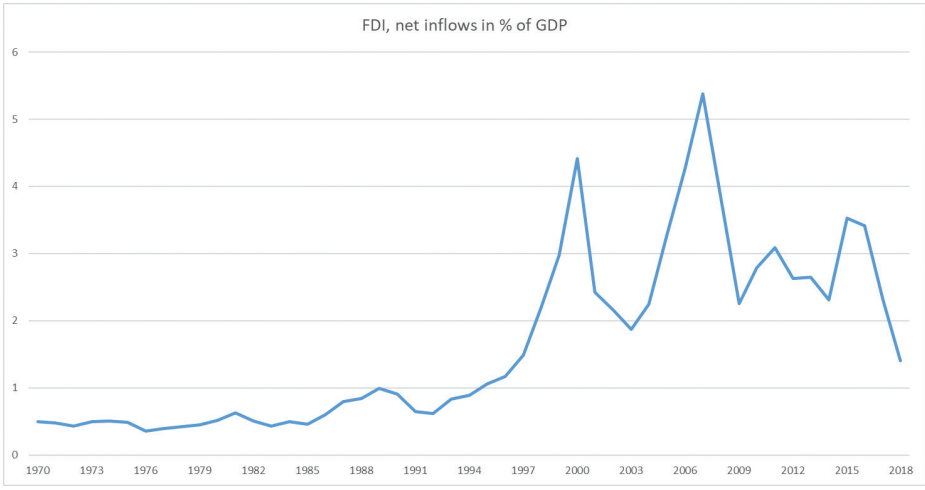
"Inward flows represent transactions that increase the investment that foreign investors have in enterprises resident in the reporting economy less transactions that decrease the investment of foreign investors in resident enterprises."[6]

As can be seen from chart 2, which focusses on FDI inflows over the period 1970 to 2018, the contribution of FDI inflows to globalization – although obviously positively correlated – is less clear than for trade in goods and services:

[5] See also Desbordes and Franssen (2019, p. 54) stating that: "... intra-industry FDI has a large positive effect on total and "exported" labour productivity".

[6] See: https://data.oecd.org/fdi/fdi-flows.htm or also OECD (2020) for international comparisons on FDI.

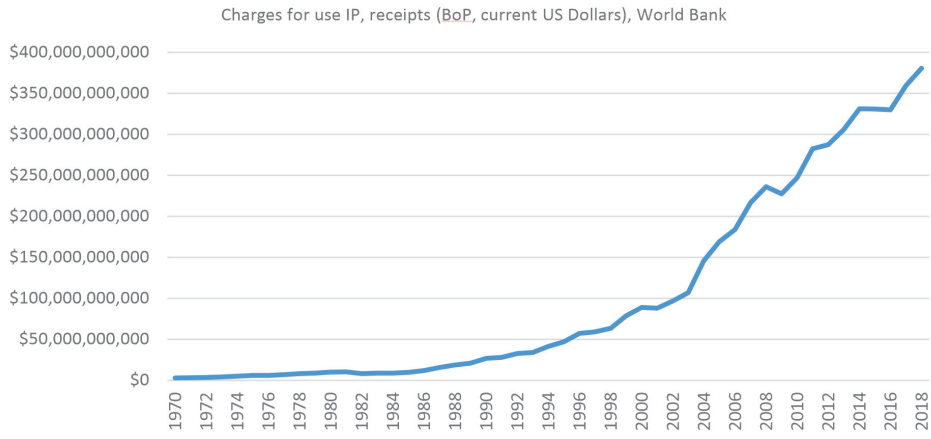
Chart No.2: Main drivers of globalization - FDI Inflows in percent of world GDP



Although the worldwide FDI inflows as shares of GDP have clearly increased from 1970 (0.5% of worldwide GDP) to 2018 (1.4% of worldwide GDP) and confirm a general tendency towards globalization, the high fluctuation with shares of up to 4.4% (2000), 5.3% (2007) or 3.5% (2015) seem to put somewhat of a question mark on its sustainability.

Finally, the following chart three presents evidence on our third globalization indicator, showing increasing charges for the use of information in the form of Intellectual Property in absolute values (US Dollars).

Chart No. 3: Main drivers of globalization - Knowledge Transfer, use of Intellectual Property (IP)



Whereas the total amount of worldwide spending on royalties amounted in 1970 to 2.8 billion USD, this sum cumulated in 2018 to over 380 billion USD. Over the period considered here from 1970 to 2018, there seems to be a clear acceleration in related spending from the mid-eighties until the present.

We conclude from the empirical data for the three characteristics, which we consider being indicative of a tendency towards globalization and which we have reviewed here, that globalization is indeed a tendency that characterizes the dynamics of the world economy up to this date.

Some considerations on enterprise structures and Statistical Business Registers (SBRs)

The question now is how globalization is perpetuated and how Official Statistics can give an appropriate account of such developments. We will argue here, that enterprises are among the central carriers of globalization and that differences in the overall enterprise structure reflects the corresponding level of internationalization. The degree to which MNE are active in different countries is indicative of the territorial extension and interdependencies of the productive processes that are landmarks of globalization. Hence, Statistical Business Registers (SBR) play a central role when it comes to ensuring the respective data provisions for the production of Official Statistics on enterprise structure.

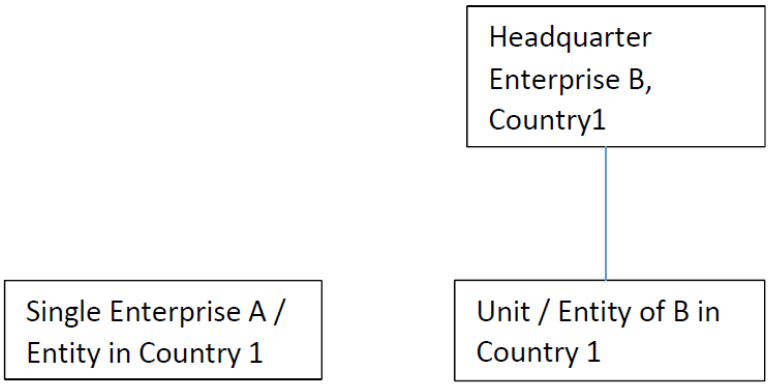
In their simplest form, enterprises are productive units that exercise control over their activities. Eurostat (1993) defines an enterprise as follows:

"An enterprise is an organisational unit producing goods or services which has a certain degree of autonomy in decision-making. An enterprise can carry out more than one economic activity and it can be situated at more than one location. An enterprise may consist out of one or more legal units."

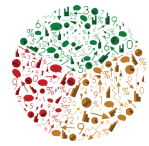
Without going into further detail as concerns the legal definitions of enterprises, units and enterprise groups, we will mainly concentrate here on the organisational or structural aspects of enterprises on a national and international level. Besides, the concept of the enterprise group is not a statistical unit in any Official Statistics and is mainly used in the context of the compilation of Foreign Affiliates Statistics (FATS) and FDI.

Figure No.1 provides a simple representation of basic national enterprise structures:

Figure No.1: Examples of national enterprise structures.



If an enterprise (or an enterprise group) exists exclusively in a given country, the respective Statistical Business Register (SBR) usually entails a depiction of its structure, based on data coming either from:



- enterprise surveys,
- other administrative sources (commercial register, social insurance register, tax register, etc.),
- dedicated monitoring tools such as "profiling",

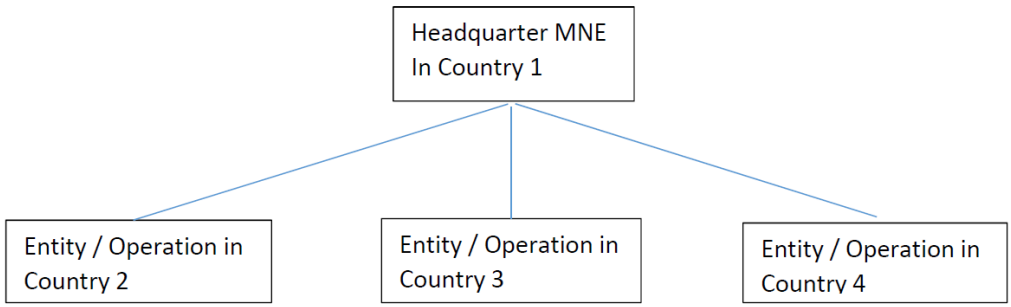
or a combinations of such sources.

All these data sources have in common, that they grasp the situation of enterprises within the boundaries of a national territory. However, National Statistical Offices generate through the already mentioned Foreign Affiliates Statistics (FATS) some information on international linkages of enterprises in the European Union and EFTA countries.[7] As we will briefly discuss further down, this information is compiled at a European level and fed into the EuroGroups Register.

National enterprises that also possess the decision-making power over their activities as shown in figure 1can of course be a part of a supply-chain, which involves other foreign enterprises. However, in this case it is easier to obtain complete data on the enterprise structure since the whole legal entities lie by definition within national boundaries. The criterion of the decision-making power is in this regard central since it takes into account the possibility that an enterprise not only behaves according to national circumstances and policies, but also might have to contend with orders from a controlling entity outside of the country.

The situation is somewhat different if the decision-making power of an enterprise lies outside the borders of a given country (inward FATS) or lies within the country but the enterprise has affiliates abroad (outward FATS) as schematized in Figure No. 2:

Figure No.2: Example of the structure of a Multi-National Enterprise (MNE)



In such cases, the usual data sources for collecting information about businesses cannot cover the full structure of the entity but merely the part that lies within the boundaries of the national territory. This is the case for MNEs. Since it is activities of multinational enterprises that especially drive the economic globalization process to a large degree, national Statistical Enterprise Registers cannot provide the complete data needed that would allow mapping such enterprises.

As a European solution to this problem of insufficient coverage of national enterprise data with regard to MNEs, Eurostat together with the EU and EFTA countries have set up the so-called "Eurogroup Register" (EGR).[8]

[7] See also Eurostat (2012).

[8] See also: https://ec.europa.eu/eurostat/web/structural-business-statistics/structural-business-statistics/eurogroups-register.

The EGR is actually a network of national Statistical Business Registers. Its use is exclusively reserved for statistical purposes in the EU and EFTA countries and consists of data on multinational enterprise groups. In fact, the EGR is the statistical business register of multinational enterprise groups having at least one legal unit in the territory of the EU or EFTA countries. Similar to national SBRs, the objective of the EGR is to facilitate the coordination of survey frames in the European Statistical System (ESS) and the production of high quality statistics on global business activities, like Foreign Affiliates Statistics (FATS) and Foreign Direct Investment statistics (FDI).

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