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SERBIA ON THE PATH TO MODERN ECONOMIC GROWTH

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I. Introduction

The objective of this paper is to prepare GDP estimates for Serbia for a number of years during 1867-1910 in order to gauge growth trends and assess to what extent Serbia had attained "modern economic growth" prior to World War 1 (WW1). As defined in The Cambridge Economic History of Modern Europe, based on Kuznets (1974), the key elements of modern economic growth are: (i) high rates of growth of per capita product and population; (ii) high growth of total factor productivity i.e. productivity of all inputs; (iii) rapid sectoral transformation from agriculture to industry and services, as well as from personal enterprise towards large scale organization; (iv) urbanization and secularization; and (v) globalization.[1] We also compare the GDP level and growth performance with Serbia's Balkan peers, Bulgaria and Greece.

Our interest in tackling this topic is not only the (lack of) convergence of the European periphery ahead of WW1, but to provide a contribution to the debate about the economic performance of the pre-WW1 Kingdom of Serbia. Economic historians, such as Palairet (1997) and to some extent Sundhaussen (1989), as well as many Serbian Marxist authors, largely saw 19th and early 20th century Serbia as backward and stagnant, with most of the population facing increasingly difficult living conditions. On the other hand, many other Serbian authors have emphasized the progress made in developing institutions or the introduction of modern technological processes or organization in specific sectors prior to WW1.

The literature on Serbia's pre-World War 1 (WW1) growth performance is limited and what there is gives highly divergent results. This in large part reflects the absence of a solid quantitative underpinning. Palairet (1997) maintains that per capita income was falling in the half-century or so prior to WW1 and draws attention to the lack of structural transformation. On the other hand, Bairoch (1986) and Good and Ma (1999), in the context of regional work, detect significant per capita income growth in Serbia on the basis of indicators such as urbanization, mortality, and consumption of particular goods and services. However, they still differed among themselves widely on the pace of growth, reflecting a different selection of indicators. Studies of world, European or regional growth, including Maddison (1995 and 2003), Broadberry and Klein (2008), Lains (2002), and others, largely adopt growth rates from Bairoch or Good and Ma in the

[1] Broadberry, S. and O'Rourke, 2010. K.H. Introduction to Volume 1. in Broadberry, S. and O'Rourke, K.H. Eds. The Modern Economic History of Europe. Cambridge: Cambridge University Press. P. 1.

case of Serbia. Serbian authors have unfortunately produced virtually no quantitative work on pre-WW1 growth, despite a strong tradition of Marxist economic history during the post-World War 2 (WW2) period in Yugoslavia.

In this paper, we go back to basics and construct rudimentary production-side GDP estimates for 1867, 1890, 1895, 1900, 1905, and 1910, based mainly on official statistics. The choice of years largely reflects data availability. Even such a limited time-series should put us on a firmer footing in assessing growth trends in pre WW1 Serbia.

The availability of economic statistics expanded sharply in Serbia between 1862 and 1910. However, pre-WW1 Serbian statistics had some serious shortcomings as discussed by Sundhaussen (1989) and later by the Yugoslav Federal Statistics Bureau in its publication "140 Years of Official Statistics".[2] [3] Perhaps most importantly, they did not provide adequate accompanying notes on what the statisticians were actually doing, including on definitions, methodologies, and sources.[4] Nevertheless, Holm Sundhaussen observed that Serbia, given its level of development, managed surprisingly early to follow international practice, while expanding functional and regional coverage. In other words, Serbia was not on the cutting edge of major statistical advances during this period, but more than kept pace with the region. This enabled us to mainly rely on official statistics for our 1867-1910 GDP estimates. The development of Serbian statistics is described in more detail in Appendix VI.

To put our work in context, the reader should be aware of some very basic Serbian history. Serbia emerged gradually from Ottoman domination during the course of the 19th century. Following the Second Serbian Uprising in 1815, Serbia was granted a political and economic autonomy. This was strengthened with the Sultan's Hatt-i-Sharif in 1830 when Serbia became a vassal principality. A period of institution-building ensued as the country developed a constitution, legislature, and administration, amongst other attributes of statehood. Turkish forces finally abandoned the last six fortresses they held in Serbia in 1867. De jure independence was achieved, and full international recognition granted, in 1878 at the Congress of Berlin. The Congress also resulted in the expansion of Serbian territory, as four counties populated mainly by Serbs were incorporated into Serbian territory. Serbia expanded further in 1912-13 following the first and second Balkan wars. At the end of WW1, it merged into the Kingdom of Serbs, Croats, and Slovenes.

In the next section, we review earlier work in estimating Serbia's national income and output, no matter how limited in terms of methodology. In Section III, we describe our

[2] H. Sundhaussen: Istorija Srbije od 19. do 21. veka, Clio, 2009, p. 198. He is also the author of the seminal work on Serbian economic statistics: "Historiches Statistik Serbiens 1804-1914.
[3] Federal Statistics Bureau: 140 years of Official Statistics, Belgrade, 2002. P. 20.
[4] Sundhaussen, H, 1989. H. Historisches Statistik Serbiens 1834-1914. München: R.Oldenbourg Verlag. Introduction pp 21-45.

methodology to derive spot production-side estimates of GDP in 1910 constant prices. The results are presented in Section IV, together with our assessment of Serbia's progress towards achieving modern economic growth and some comparisons with neighboring countries. We conclude in Section V.

II. Estimates of pre-1914 Income, Output and Growth

Quantitative work on pre-WW1 income, output, and growth in Serbia is sparse, but not non-existent. Estimates made prior to or during WW1 contain virtually no information on how they were derived, and only one more recent GDP estimate (for 1910) was methodologically well-founded. Growth rates have been mainly derived on the basis of indicators such as urbanization, use of postal services, or mortality rates.

A few official figures made claims about the size of national income, but apparently without substantiation. Vladan Djordjevic (1890), Minister of the Economy and later Prime Minister, said that aggregate income in 1890 amounted to 300 million dinars.[5] A parliamentary committee investigating budgetary issues in 1902 put the value of output at 500 million dinars. Kosta Stojanovic, a multiple Minister of the Economy, valued Serbian output in 1910 at 750-800 million dinars.[6] Michael Mulhall (1896), a member of the Royal Statistical Society, in his classic work "Industries and Wealth of Nations", included some Balkan countries in his estimates. In the case of Serbia, he came to a figure of 480 million dinars for the mid 1890s.

The best-known estimate of pre-WW1 National Income was by the Geneva Committee, established in 1916 by Serbian ex-ministers and industrialists living in Geneva, to appeal for support for Serbia during World War 1. The Committee prepared in 1917 a short booklet providing a description of Serbia's economy, as well as estimates of national wealth and of the losses suffered during WW1. An estimate of National Income for 1913-14 was also prepared. Areas under cultivation and estimated incomes per hectare for various crops were used to estimate agricultural incomes, but further methodological details for agriculture were lacking, and none at all were provided for other sectors. Later authors such as Sundhaussen suggested that the Committee relied on 1905-06 data that was reflated, including by 10-20% during the 1912-13 Balkan wars.[7] There were also suggestions that the estimates may have been may have been inflated as part of a pitch to obtain higher reparations. It is also not clear whether intermediate outputs were deducted from the income estimates. In all, National Income was estimated at 1330 million dinars in 1912 or 1913.

Despite the obvious methodological shortcomings, the work of the Geneva committee became very influential and was used by many authors as the benchmark for Serbian economic development prior to WW1. For example, Djuricic et al (1927), in their excellent study of post-WW1 National Income in Yugoslavia, presented the Geneva Committee's

[5] V. Đorđević, „Moje ministrovanje", *Otadžbina*, Vol. 26, 1890, p. 167.
[6] K. Stojanović: „Privredni pregled Srbije", *Govori i rasprave političko-ekonomske*, I, Beograd, 1910, p. 33.
[7] Sundhaussen, op. cit. p. 438

work in the introduction. Lampe (1975) also used these estimates, except that he substituted his own for large scale private industry. In his study of National Product and Fixed Assets in Yugoslavia 1909-59, Dr Ivo Vinski used the Geneva Committee's work for the territory of "Serbia proper" as he put together a notional pre-WW1 estimate for the state of Yugoslavia (established in 1918). Vinski's estimates were subsequently adopted by Maddison (2006 and other work) for 1910 and became a basis for estimates of growth and GDP in Yugoslavia, pre and post 1918. In his 1940 study, The Conditions of Economic Progress, Colin Clark also appears to have used Geneva Committee estimates, via a study by Dresdner Bank.[8]

Sundhaussen (1989), in addition to reviewing all previous work, put together a GDP estimate for 1910. Amongst the larger items, he used gross output data for crops and calculated livestock GDP on the basis of exports, domestic consumption, and the growth of the herd. Sources for large scale industry and services were Lampe (1975) and the Geneva Committee, respectively. He approximated GDP at 700 million dinars in 1910.

The only full production-side estimate for pre-WW1 Serbia was made by Michael Palairet in his book Balkan Economies 1804-1914.[9] His estimate for 1910 was to a significant degree based on data contained in the 1910 Statistical Yearbook. To a lesser degree, Palairet also relied on a few other sources, including Bulgarian prices/quantities when Serbian data was not available. Palairet also made an estimate of national income in 1863.[10] To agricultural income derived from a census of that year he added an estimate of property income, giving national income at 132 million dinars. Using a CPI-type deflator (which he claimed was very similar to the growth of export unit values during the same period), he came to the conclusion that per capita income growth was negative during 1862-1910.

Serbian GDP and growth estimates are also touched upon in several important papers dealing with European economic growth, including Bairoch (1975), Good and Ma (1999), and Broadberry and Klein (2008). However, with Serbia having a very small share of European GDP, no effort was invested in improving the data on Serbia.

For countries such as Serbia, with virtually no readily available GDP data, Bairoch relied on 13 indicators (the agricultural share of population, death rate, letters and rail travel, child mortality per capita, per capita consumption of tea, coffee, sugar, cocoa, and cotton) to relate the level of real GDP to countries with better data. He also used the work of Mulhall and the Geneva Committee (via Djuricic (1927) and Vinski (1961)). Unfortunately, in his statistical appendix we are not able to identify the specific steps in his derivation, but Sundhaussen makes a case that Bairoch overstated per capita GDP in Serbia, putting it, for example, at the level of Scandinavian countries and Austro-Hungary in 1860.[11]

[8] Clark, C. 1940. The Conditions of Economic Progress. London: McMillan and Co., p132-133.

[9] Palairet, 1997, P 322.

[10] Palairet, M. 1983. Land, Labor, and Industrial Progress in Bulgaria and Serbia before 1914 in The Journal of Economic History 12 Pp. 163-185.

[11] Sundhaussen, op. cit P 440-442.

Good and Ma use data for twelve European countries with more advanced statistics to estimate a regression equation where per capita income is a function of several proxy variables—the share of the nonagricultural labor force, the crude death rate, and per capita mailed letters. Per capita in Central and East European and Balkan countries is estimated using this equation. In general, Good and Ma's method suggests strong convergence with more rapid growth in East European countries, including Serbia, than in many other studies. Good and Ma's estimates were adopted by Madison and subsequently Broadberry, so that in much of the literature late 19th century Serbia appears to be a high-flier.

III. Methodology

In this section we explain how our GDP estimates for 1867-1910 were prepared. In the absence of virtually any information on incomes and expenditure, we prepare production-side estimates. The cornerstone of our work is 1910, as there was far more production and price data contained in Statistical Yearbook (SY) 1910 than in any earlier statistical publication in Serbia. GDP for earlier years is constructed by either using available output data (agriculture and livestock for example) or by using certain indicators (such as employment in specific sectors) to proxy the evolution of output back in time from 1910. We use 1910 prices from SY1910 for the bulk of products. If 1910 prices are not available, we deflate 1923 prices reported in Djuricic (1927) by an index composed of prices for 13 equal-weighted products for which data are available in both SG1910 and SG1923. Based on this procedure, we basically divide specific 1923 prices by 21 to obtain 1910 prices. We use this procedure to estimate the average price of slaughtered pigs, as well as a few less important products. More details on our methodology by sector is given in Appendix I.

We use five major data sources: (i) crops surveys; (ii) livestock surveys; (iii) employment surveys; (iv) a survey of the industrial sector for 1910, as well as detailed data on some "modern" services, from SY 1910; and (v) fiscal data. The selection of years for which we produce national accounts is driven by the need to reconcile availability of the five major sources. In the end, we settled for 1867, 1890, 1895, 1900, 1905, and 1910.

(i) Crop surveys. Comprehensive crop output and price data, based on full surveys, are available for 1900-1910, as well as selected earlier years (1867, 1889, 1893, and 1897). Key elements of these surveys are available in SYs. We used 1889 data as a proxy for 1890 and 1893 as a proxy for 1895. Output data for several products were not available for 1867 and 1890, including beans, onions, and plums. We therefore used movements in an index which combined the available output data in 1867 and 1889 to approximate movements in the output of the missing products.

(ii) Livestock surveys. Comprehensive livestock censuses were published for 1866, 1890, 1895, 1900, 1905, and 1910, and are also presented in SYs. Herd size for cattle, pigs, sheep, goats, and horses are available throughout the period but not fowl. The latter is

obtained before 1900 by extrapolating backwards on the basis of rural population movements. We used 1866 census data as a proxy for 1867.

To convert crop output and herd size into GDP estimates, we use the excellent study by Djuricic et al "Naša Narodna Privreda i Nacionalni Dohodak".[12] This study contains a very useful description by region (including Serbia) of the economy in the newly founded Kingdom of Yugoslavia for the early to mid-1920s. The study also contains an estimation of national income fully consistent with the new methods of national accounting being developed at the time. We use the coefficients in this study to obtain, for example, seed costs for particular crops, as well as the percentage of crop output that was used as cattle feed in the case of corn, barley, oats and some other crops. Djuricic also provided detailed guidance on cattle off-take and the productivity of livestock such as milk output per cow and egg per chicken. However, consistent with Ivanov and Tooze, (2007) we assume some of these parameters increase by 0,5 percent per year between 1867 and 1910. We also use Djuricic's methodology to ascertain GDP in various agriculture related industries and services such as home processing (plum brandy, cheese, and others) and cart transport. We estimated activity in the commerce sector based on Djuricic's formula that links trade to agricultural and industrial output and foreign trade.

(iii) Employment Surveys. These are available for 1867, 1890, and 1900. We rely on employment surveys to estimate GDP for small-scale manufacturing, construction, and various professional and personal services. We obtain GDP in for these sectors in 1910 by multiplying employment by an estimated average wage. For example, in the case of small-scale manufacturing, this is the average wage in large scale-manufacturing while for domestic service we use the wage for unqualified labor. For years in which employment surveys were not available, we extrapolate forward or back from 1900 on the basis of population data. We assume unchanged productivity throughout so we may thus be understating growth somewhat.

(iv) 1910 industrial survey. The 1910 SG contains detailed data on the revenues, employment, and wage and material costs of large-scale industry by sub-sector which we use to determine value-added in the large-scale industrial sector. Unfortunately, such surveys are not available for earlier years. We therefor extrapolate backwards using data on flour and beer output in the case of the dominant food processing industry while for other industrial sub-sectors we extrapolate backwards on the basis of imported or purchased inputs (tobacco).

(v) fiscal data. We use officially published fiscal data to estimate output of government services through spending on salaries and goods and services. Fiscal data are also used to calculate the value-added generated by government monopolies. Government monopolies were established for some key products such as tobacco and salt for fiscal reasons. We treat this value added as government excises and place it in the "indirect

[12] V.M. Đuričić, M.B. Tošić, A. Wagner, P. Rudačenko i dr M.P. Đorđević: "Naša narodna privreda i nacionalni dohodak", Državna nacionalna štamparija, 1927.

subsidies" category, except for a small amount that corresponds to the local output of tobacco. Aside from the tobacco monopoly, indirect taxes are also sourced from fiscal data. Finally, we estimate the income generated in the real estate sector on the basis of property tax receipts, assuming a 3.5 percent tax rate.

Our efforts to assess long-term growth trends in pre-WW1 Serbia are made more difficult by the extreme volatility of crop production, as we only have spot estimates for a few years prior to 1900. The choice of beginning and end years is crucial to determining the medium-term growth rate. We therefore use a three-year moving average (1908-10) as a proxy for 1910. However, such a procedure is impossible for 1867. Therefore, based on verbal descriptions of the size of crops in the five years 1865-1869 in the official publication Državopis Srbije, we give numerical rankings to the size of the crop in each of these years. It turns out that 1867 is some 22,6 percent higher than the average crop in 1865-69. We call this the "Alternate High 1867 Case". In view of the somewhat arbitrary nature of this adjustment, we do not modify our baseline estimate, but use the adjustment for sensitivity analysis.

Size of Crop, 1865-1869

Year	Score
1865	9
1866	9
1867	12.5
1868	12
1869	8.5
Average	10.2
Ratio of 1867 to Average	1.22549

An adjustment was also made to take into account Serbia's expansion following the Congress of Berlin in 1878 to ensure that growth rates between 1867 and years after 1878 are appropriately calculated. In sum, 22 percent of Serbia's population, 31 percent of arable land, and 12 percent of its livestock belonged to areas that were a part of the Ottoman Empire before the Congress. We assumed productivity was the same in the new territories and pre-1878 Serbia.[13]

IV. Results

In this section we begin with a summary of the results and a comparison with earlier estimates of Serbian GDP in 1910 and pre-WW1 growth. There follows a discussion of whether modern economic growth had been attained in Serbia pre-WW1. Finally, we make some basic comparisons in per capita income with other Balkan countries.

[13] Statistika Kraljevine Srbije. Kraljevina Srbija - novi krajevi, 1884. Beograd: Državna Štamparija.

1. Summary of results and comparison with earlier work

We estimate that Serbian GDP expanded by 1,9 percent per annum in constant 1910 prices during 1867-1910, with nominal GDP reaching 819 million dinars by the end of the period from 366 million dinars in 1867. However, much of this income growth was eroded by rapid population growth of 1,6 percent per annum, an exceptionally high rate by European standards (see box 1). Serbia's real income per capita thus grew by only 0,3 percent per annum. However, using the Alternate High 1867 Case discussed above, per capita GDP growth is estimated at 0,5 percent during 1867-1910. Agriculture accounted for 56 percent of GDP in 1867 in constant 1910 prices and its share fell by 9 percentage points through 1910. These results are presented in the text table below and Appendix II, III, and IV.

GDP developments, 1867-1910, in constant 1910 dinars

	1867	1910	Growth 1867-1910
GDP	366	819	1.9
o/w Agriculture	206	383	1.5
Per capita GDP	245	281	0.3

In comparison with earlier work, our estimate of GDP in 1910 is significantly higher than Palairet (658 million dinars), Sundhaussen (700 million dinars), and even Kosta Stojanovic (750-800 million dinars). Comparisons with the influential Geneva Committee report are impossible as their estimates refer to 1913 or 1914, after a few years of high inflation during the 1912-13 Balkan wars.

Palairet's estimate for 1910 is similar to ours in terms of overall methodology, though we have different approaches to the estimation of some sectors. Our higher overall GDP reflects in large part higher livestock and cart transport GDP because of the use of Djuricic's technical parameters and prices.[14] A detailed comparison is given in Appendix V.

As regards per capita growth during 1867-1910 (or similar periods), our estimates correspond most closely to Bairoch, who employs a broad array of indicators to deduce per capita growth. We therefore estimate much lower growth than Good and Ma. Palairet is clearly an outlier. The methodologies behind these estimates have already been discussed in Section II.

Serbia: Growth Rate per capita (in percent)

	Period	Growth Rate per capita (in %)
Palairet	1863-1910	-9-12 for period as a whole
Mijatovic and Zavadjil	1867-1910	0.3
Bairoch, Lains	1870-1910	0.5
Good-Ma	1870-1910	1.7

[14] Palairet, 1997, P 322

Broadberry and Klein	1870-1910	1.4
Madison--Yugoslavia	1870-1910	1.4

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BOX: Serbia's Rapid Population Growth

Serbia's population growth of 1,6 percent during 1867-1910 was the highest in Europe. It reflected continuing high birth rates which had barely dipped below 40 per thousand even by 1910, far higher than most other Southern and East European countries. In addition, Serbia witnessed a gradual decline of death rates, from 36,7 per thousand in 1866-70 to 24,3 in 1906-10. Finally, Serbia was exceptional in that it was a net immigration country, in contrast to the remainder of the European periphery. Despite the low per capita income in Serbia, Serbs living in the Austro-Hungarian and the Ottoman empires migrated in significant numbers to their land-rich, newly independent homeland. In effect, Serbia's rapid population growth represented a repopulation of the areas emptied out by centuries of Austro-Turkish and Serbian-Turkish conflicts through end-1815. At the beginning of the 19th century population density was 12,5 persons per square kilometre, by far the lowest in Europe outside Scandinavia. By 1910 population density had recovered to 60 per square kilometre, more than Greece and Bulgaria, and in line with Romania, Spain and Hungary.[15]

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2. Modern Growth

In this sub-section we consider whether Serbia had attained modern economic growth by 1910 in terms of population and per capita income growth, as well as structural transformation. We also compare first Serbia's growth performance with other European regions and countries.

(i) Growth of per capita growth and population

Reflecting rapid population growth and expansion of cultivated areas, Serbia's economy grew by 1,9 percent per annum during 1867-1910, as noted above. This was broadly in line with North-Western Europe and higher than in Southern Europe, though somewhat slower than in Central and Eastern Europe. However, growth was extensive, as discussed below, and the rise in per capita income was amongst the slowest in Europe, though only modestly slower than in Balkan peers Bulgaria and Greece. Nevertheless, per capita income growth was modestly higher than the pre-modern growth of 0,0-0,2 percent evident in all of Europe during 1750-1820. Income convergence had clearly not begun in the case of Serbia, or other Balkan economies.

GDP, Population, and Per Capita GDP growth (in percent)

[15] Sundhaussen, op. cit, Tables 4 and 6.2, pp 88 and 92, respectively.

Country	Source	GDP Growth	Population growth	Per capita GDP growth
North-West Europe	Broadberry and Klein (2008)	1.95	0.92	1.03
Southern Europe	Broadberry and Klein (2008)	1.64	0.49	1.15
Central and East Europe	Broadberry and Klein (2008)	2.47	1.35	1.13
Austro-Hungary	Carreras and Josefsson (2010)	1.93	0.79	1.14
Turkey	Carreras and Josefsson (2010)	1.48	0.56	0.91
Romania	Carreras and Josefsson (2010)	2.36	1.25	1.10
Bulgaria	Lains (2002)	1.88	1.45	0.42
Greece	Lains (2002)	1.95	1.40	0.54
Serbia	Own estimates	1.89	1.56	0.32

We do not detect any systematic acceleration of growth in Serbia during 1867-1910. More evident are sharp fluctuations in GDP that largely reflect the volatility in crop output as a result of changes in weather conditions and occasional crop diseases. Non-agricultural GDP growth also shows no signs of gathering pace, though there was a sharp acceleration in the growth of "modern" sectors, as discussed below. Growth peaked in 1890-95 but turned negative in the next five-year period, before rebounding again in 1900-05. These movements in large part reflect the exceptionally high crops in 1893 (which we use to proxy 1895 output). It should be borne in mind that although agriculture and accounted for less than one-half of GDP after 1890, their impact on growth was significantly higher. Taking into account its indirect effects on farm processing and proto-industry, cart transport, and large sections of the commercial sector, agriculture probably drove directly or indirectly about two-thirds of GDP growth.

Serbia: GDP Growth, in % per annum

	1867-90	1890-95	1895-1900	1900-05	1905-10	1867-1910
Total	1.7	4.2	-1.3	3,0	2.4	1.9
Agriculture	1.1	3.9	-6.0	6.5	3.4	1.5
Other	2.5	4.5	1.2	1.7	1.6	2.4

(ii) Real wages

We use data from Mijatović and Milanović (2021) to analyse real wage trends in Serbia i.e., official wage data for skilled construction workers and unskilled workers, adjusted for standard employer contributions in food. Wages are deflated by a price index weighed according to a "respectability basket." These data indicate a rise in 0.2 percent per annum in real wages for skilled workers and a decline of 0.2 percent for unskilled workers during 1867-1910. If a "subsistence" basket is used to deflate the wages of unqualified workers, we get growth of 0.2 and 0.8 percent respectively for unskilled and skilled workers, respectively. Use of three-year moving averages instead of point data for 1867 and 1910 leaves the overall picture unchanged. In sum, real wage trends tend

to confirm the narrative of limited per capita real income growth in Serbia from the mid-1860s to 1910.

(iii) Sectoral transformation

There was some evolution in the structure of the Serbian economy during 1867-1910. Industry, Services, and Real Estate all made gains at the expense of agriculture. Almost two-thirds of the 9,5 percentage point loss in the share of agriculture is due to livestock. Crop production kept pace with population growth reflecting increases in areas under cultivation, as forests (where swine grazed) and pastures were converted to arable land. However, these data are somewhat misleading. Within both industry and services there co-existed "modern" and "traditional" sub-sectors. For example, industry consisted of both technologically modern and relatively large companies, as well as manufacturing in peasant households and handicrafts. Similarly, transportation contained modern railways and shipping, in addition to cart transport.

Sectoral Structure of GDP (in percent of GDP)

	1867	1910
Agriculture	56.2	46.7
Industry	11.7	15.0
Services	21.8	24.6
Real Estate	3.8	7.3

Excludes forestry and indirect taxes

To examine more closely the modernization process in the late 19th and early 20th centuries in Serbia, we construct a hypothetical "modern" sector comprising large-scale manufacturing, railways, shipping, banking and finance, and private health services. These sectors were more "modern" in terms of both technology and organization, consisting of large-scale enterprises, rather than individuals. Such enterprises barely existed in 1867, but by 1910 accounted for almost 6,9 percent of the economy, having grown by 7,4 percent per annum over the entire period. Growth appeared to be accelerating once more in 1905-10, compared with the preceding two five-year periods. In other words, Serbia was moving fast, but from a very low base, and remained a largely traditional economy in 1910.

Share of Modern Sectors - large-scale industry, power, railways, shipping, finance, and health

	1867	1890	1895	1900	1905	1910
"Modern" sectors (1910 constant prices)	2.6	11.3	17.2	23.5	28.7	56.4
Share in GDP (in %)	0.7	2.1	2.6	3.8	3.9	6.9

Not surprisingly, agriculture dominated employment to a much greater degree than GDP, reflecting very low productivity levels in this sector. About 84 percent of the

population was dependent on the agricultural sector in 1900 for their livelihood.[16] This was above the share in all European countries, though only modestly higher than Bulgaria and Romania. [17]The share of agricultural employment was reduced only 6 percentage points during 1867-1910.

(iii) Total factor productivity

We can unfortunately say very little about the evolution of total factor productivity (TFP) in Serbia prior to WW1. There is virtually no information on the capital stock or investment, except limited information on agricultural machinery in use. We will therefore limit ourselves to some back of the envelope calculations regarding TFP growth in crop production during 1867-1910. TFP is calculated using a Solow production function with an assumed labour contribution of 50 percent and a share of 25 percent each for land and capital. We do not have data for all inputs for the entire period, but arbitrarily assume the growth rates evident in the periods for which data is available prevail throughout.

TFP in Crop Production

Category	Time period	How estimated
Crop output, 1910 prices	1867-1910	Own estimate; 1,6 percent p.a.
Capital Stock	1866-1897	Increase in the number of ploughs, 2.3 percent p.a.
Labour	1867-1900	Increase in population dependent on agriculture, 1,26 percent p.a.
Land	1867-1910	Land in cultivation; 2,5 percent p.a. growth
Factor productivity growth	1867-1910	Calculated from the above as roughly zero

The results, which should be treated with more than the usual amount of caution, indicate an absence of TFP growth during 1867-1910. Instead, there is rapid growth of land and labour inputs.

(iv) Globalization

Taking into account its development level, Serbia was a relatively open economy. The ratio of exports and imports to GDP was well over 20 percent by 1910, similar to Austria, Hungary, Spain, and Italy. Nevertheless, it was much less open compared with countries in North-West Europe. Many of the latter had trade to GDP ratios in excess of 50 percent. Despite sharp fluctuations, openness appears to have been on a broadly rising trend. It increased sharply after 1895 even though trade relations with Austro-Hungary were fully normalized after a customs war only in 1910. The prices of many export products rose sharply during 1895-1910.

[16] Sundhaussen, op..cit . Table 43, p.189-190.

[17] Broadberry, S. Federico, G, and Klein, A: Sectoral Developments 1870-1914 in Broadberry, S. and O'Rourke, K.H. Eds. The Modern Economic History of Europe. Cambridge: Cambridge University Press, Table 3.1, p.61.

Openness to Trade (in percent of GDP)

	1867	1890	1895	1900	1905	1910
Exports plus imports to GDP	17.2	15.4	10.7	19.2	17.6	22.4

GDP is in 1910 constant prices

(v) Urbanization

Serbia urbanized relatively slowly during 1866-1910. In fact, there was little urbanization after 1890, though this could reflect methodological adjustments in the data. Urban population growth (2,3 percent) was above overall population growth, but the rural population grew rapidly because of still high birth rates and immigration into rural areas. Serbia's urbanization level in 1910 was well below most of Europe, including Bulgaria (19 percent) and Greece (33 percent).

Serbia: Urbanization (in percent of total population)

	1866	1890	1895	1900	1905	1910
Share of population in towns of over 5000 population	9.5	13.2	13.8	14.1	12.9	13.2

In all, it appears that Serbia had not completed the transition to modern economic growth by the time WW1 broke out. While there was strong population growth, per capita income growth was still sluggish by European standards. This conclusion is supported by real wage data, as well as indicators of sectoral transformation, factor productivity growth in agriculture, and urbanization.

3. Income comparisons with other countries

In this section we compare per capita income in Serbia with peers in the region. As discussed extensively in various papers issued by the Madison Project, to compare per capita GDP in various countries at various points in time, national currencies need to be converted to a common currency using purchasing power parities (PPPs). The procedure used by Madison in his opus, which tracks the evolution of the global economy since 1 A.D., is to express GDP and per capita GDP in 1990 Geary-Khamis dollars (GK$). After determining cross country parity relative to the US in 1990 based on the World Bank's International Comparison Project (ICP), Madison extrapolates GDP to earlier years using growth data from country national accounts or other growth estimates. As stated in various Madison Project papers, this method assumes that changes in PPPs over time reflect fully relative inflation rates. In practice, this may lead to inaccurate results because of changes in the economic structure or in relative prices over time, which would certainly be the case with Serbia. More recently there have been efforts to improve historical cross-country comparisons by improving on Madison's 1990 benchmark (see for example Bolt and Van Zanden (2018). Nevertheless, in view of its still wide acceptance, we shall continue to employ the 1990 benchmark. But a full

implementation of Madison's approach is not possible for Serbia, as there are major gaps in growth data between 1910 and 1990, especially for the two world war periods.

We therefore take a short-cut to estimate per capita GDP in 1910 in 1990 GK$, relying largely on the work of Ivanov and Tooze to place Serbia relative to other countries.[18] They estimated 1911 nominal GDP in Bulgaria from the production-side using a broad array of official and other statistics and building on relatively extensive earlier national accounts tradition in Bulgaria. We use these estimates to derive an estimate for Serbia (see table below). We assume prices in Serbia were similar to Bulgaria because Serbia used the same currency as Bulgaria (the French franc) and had a similar economic structure, heavily dependent on agriculture. Using the same conversion factor, we get a per capita GDP of just over 1200 GK$ per in 1910. We checked this approach by considering prices for 10 important products in Bulgaria and Serbia. There were no major discrepancies in the price structure, or systematic bias towards higher prices in one country or the other. Our methodology for converting nominal GDP into 1990 Geary-Khamis dollars was the following.

Serbia: Estimation of 1910 GDP in Geary-Khamis dollars (GK$)

1. Bulgaria nominal GDP in 1911, in millions of levs	1668
2. Bulgaria population, 1911, in millions	4.794
3. Bulgaria per capita GDP in nominal prices, in levs, 1911 (1./2.)	347.9
4. Bulgaria per capita GDP in 1990 in GK$ prices	1500
5. Ratio 3. /4.	0.232
6. Serbia nominal GDP in 1910, millions of dinars	819.2
7. Serbia population 1910	2.912
8. Serbia per capita GDP in nominal prices, in 1910 dinars	281.3
9. Serbia per capita GDP in 1990 GK$ prices ((4*8/3)	1213

Source: Ivanov and Tooze for all Bulgarian data, SY 1910 for Serbian population.

Starting with the 1910 estimate in 1910 GK$ prices, we extrapolated backwards using our estimated growth rate for 1867-1910, and obtained a per capita GDP of 1000-1050 GK$ in 1867. We also compared our estimate of per capita GDP in 1910 GK$ with Pamuk (2016), Lains (2002), and Broadberry and Klein (2008) and found no major inconsistencies.

Serbia: Estimation of GDP in 1990 Gheary-Khamis dollars (GK$)

	1870, GDP in 1990 GK$	Growth 1870-1910	1910, GDP in 1990 GK$
Serbia			
Mijatovic-Zavadjil	1056	0.32	1213
Pamuk	…	….	1100-1200
Lains	934	0.49	1152

[18] Ivanov and Tooze, op. cit. Pp 674-675.

Bulgaria			
Pamuk	…	….	1300-1400
Lains	1270	0.42	1521
Broadberry-Klein	809	1.5	1450
Greece			
Pamuk	1000	0.9	1400-1500
Lains	996	0.54	1255
Broadberry-Klein	986	1.0	1455

These data confirm that Serbia lagged behind Bulgaria and Greece in 1910. This gap had opened-up in the 1867-1910 period, as growth in Bulgaria and Greece accelerated slightly more rapidly, though the margin for error must be quite large for all these estimates. Needless to say, the gap between Serbia and the more industrialized countries of North and North-West Europe continued to grow.

V. Conclusion

In this paper we prepared production-side GDP estimates in 1910 prices for 6 years between 1867 and 1910, using mainly published data gathered by the official statistical agency. The objective was to gain some insight into the growth dynamics and the pace of structural transformation of the Serbian economy, in order to determine how far advanced Serbia was on the path to achieving modern economic growth.

Very little quantitative work had previously been done on the pre-WW1 Serbian output and growth. In the context of Europe-wide studies, Bairoch and Good and Ma used indicators to ascertain the growth of per capita income in Serbia, and came to quite different results. In terms of GDP levels, the work of the estimates of the Geneva Committee for 1912-13 is most referred to though it lacks a methodological foundation. The only methodologically sound attempt of building national income accounts for pre-WW1 Serbia was by Palairet, though we found both his estimate of 1910 GDP and 1867-1910 growth too low. In the absence of more thorough quantitative work, most of the GDP level and growth data on Serbia in regional studies, as well as in the Madison database, seems currently quite far off the mark.

Our research suggests that per capita GDP in pre-WW1 Serbia grew quite slowly, by only 0,3 percent per annum, during 1867-1910. This is supported by real wage data. Growth was slightly slower than in Bulgaria and Greece, but in the Alternate High 1867 Case, Serbia is fully in line with these two countries.

Although total real GDP in Serbia was rising at a respectable pace by European standards, population growth was the most rapid in Europe, reflecting still high birth rates, falling death rates, and, very unusually for the European periphery, net immigration. Thus, in 1910 Serbia was the least developed amongst the European countries for which data is available and, far from converging with North-West Europe, was continuing to fall behind. The structural transformation of the economy was

proceeding rather slowly. The dominance of agriculture in GDP was being reduced but urbanization was proceeding very sluggishly. Minimal total factor productivity growth was evident in crop cultivation. All this suggests that Serbia had not yet fully attained modern economic growth, as defined by Kuznets.

Nevertheless, there were some reasons for optimism. Serbia was a relatively open economy by the standards of the region with rapidly growing trade during 1900-1910. The small modern sector composed of large scale-industry, banking and insurance, railway and river transport, and similar sectors, was growing rapidly from a small base, especially in 1905-10. Railways were being built, modern institutions established, and, even in agriculture, human and physical capital were being developed with the opening of several specialized schools and the import of the latest agriculture machinery, respectively.[19]

We will never know how soon Serbia would have achieved modern economic growth and begun to converge with the rest of Europe. Its development was interrupted by the catastrophe of World War 1, where the country lost about a third of its population. After WW1, it became a part of the Kingdom of Serbs, Croats, and Slovenes, which affected its development in a myriad of ways.

[19] M. Zebić: La Serbie agricole et sa démocratie, Paris: Berger-Levrault, 1917, p 48.

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Appendix I: Summary of Methodology

Crops	SYs for 1893 (output or year1895), 1900, 1905, and 1910; 1867 and 1890 for several crops estimated on the basis of output in corn, wheat, potato, and cabbage output valued at 1910 prices for which data is available; seeds costs according to Djuricic (1927).
Livestock	SYs for all years, except Drzavopis IV for 1867; feed costs for 1910, take-off, animal sizes and output of products per animal based on Djuricic. Feed costs for earlier years assumed to move in line with cattle and swine herd size. Animal sizes and milk output increase by 0,5 percent per annum based on Ivanov and Tooze. Several 1910 prices are also based on Djuricic's estimates of 1923 prices deflated by a basket of 13 goods (see Appendix Ia.
Forestry, fishing	SY for 1910; extrapolated backward based on total agricultural output.
Large-scale industry	SY for 1910; earlier years extrapolated backwards based on industrial output or imports of inputs at1910 prices.
Handicrafts	Based on employment surveys. Assumes average wage for large-scale industry is the average income in handicrafts in 1910.
Farm Processing	Based on methodology used by Djuricic which derives Farm Processing from the output of various agricultural goods, such as cheese and plum brandy.
Home industry	Fixed percentage of Farm Processing, based on Djuricic estimates for 1923.
Construction	Based on employment surveys, and average earnings for skilled construction and unskilled workers in 1910. Profits assumed to be in same ratio to wages as in rest of large-scale industry. Extrapolated backwards based on construction employment.
Electricity	SY for 1910; earlier years extrapolated backwards based on electricity output.
Railways	SY for 1910; earlier years extrapolated backwards based on passenger and freight traffic from SYs.
Shipping Company	SY for 1910; earlier years extrapolated backwards based on traffic from SYs.
Cart transport	Based on stock of animals, using Djuricic (1927) methodology and prices.
Commerce	Based on formula that links trade to agricultural and industrial output and foreign trade, as in Djuricic (1927).
Hotels and Restaurants	1910 estimated on the basis of employment and wages for skilled and unqualified workers. For years in which there was no employment survey extrapolated based on population.
Finance and Insurance	SY for 1910, extrapolated backwards based on employment for earlier years.
Government Services	Official data on spending on salaries and materials and services. For local government, before 1890 extrapolated backwards based on overall government spending.
Post, telegraph	SY for 1910; for earlier years extrapolated backwards based on number of domestic and foreign letters

Professional services	1910 estimated on the basis of employment data and Djuricic estimates of incomes for key professions in 1923 deflated by index of 13 goods. Earlier years extrapolated backwards on the basis of employment surveys.
Domestic services	1910 estimated on the basis of employment survey data and wage for unskilled workers. Earlier years extrapolated backwards on the basis of employment data.
Real Estate	Fiscal data on real estate tax, assume 3.5 percent effective tax rate. Relationship between urban (taxed) and rural (non-taxed) rental incomes based on Djuricic (1927).
Excises minus subsidies	Official fiscal data for monopoly profits and indirect taxes. We assume 10 percent of tobacco monopoly profits are related to the production of tobacco and are attributed to large-scale industry, while the remainder of tobacco profits and all other monopoly profits are treated as indirect taxes. Monopolies for tobacco, salt, matches, petroleum, and a few other products were established to support the budget.

Appendix Ia: Price deflator 1910-1923.

	1910	jan.23	jun.23	dec.23	Av 1923	index 1923/1910
White wine , 1 lit.	0.77	3.5	2.5	4	3.3	4.3
Plum brandy, 1 lit.	0.59	16	10	10	12.0	20.3
Lard, 1 kg.	1.63	30	36	34	33.3	20.4
Wool, washed, 1 kg.	3.13	45	70	65	60.0	19.2
Beef 1 kg, live	0.3833	8	14	13	11.7	30.4
Fattened pig 1 kg, live	0.9833	18	24	23	21.7	22.0
Chicken	0.73	20	20	19	19.7	26.9
Plum, dried, 1 kg	0.4222	4.8	3	4.5	4.1	9.7
Hemp cloth1 kg	1.28	14	18	18	16.7	13.0
Eggs, 10	0.036	1.25	0.9	2	1.4	38.4
Sheep	0.37	5	5	6	5.3	14.4
1000 bricks	27.23	730	650	500	626.7	23.0
1000 roof tiles	26.12	780	900	700	793.3	30.4
Average						21,0

Appendix II: GDP in 1910 Prices (in millions of dinars)

	1867.	1890.	189	1900	1905	1910
TOTAL GDP	366.1	543.2	667.4	626.7	726.9	819.2
Agriculture	205.9	263.5	318.7	255.7	323.4	382.7
Crops	136.6	179.7	234.2	172.1	235.3	275.5
Livestock	69.2	83.8	84.4	83.6	88.1	107.2
Forestry, Fishing, Hunting	4.8	6.3	8.2	6.0	8.2	9.0
Industry and Crafts	42.9	72.6	112.2	108.2	116.0	123.2
Farm processing	13.9	19.0	42.7	33.1	33.1	25.4
Large-scale industry	2.2	7.9	10.2	12.6	15.9	29.9
Monopolies	1.1	0.9	1.3	1.2	1.2	1.3
Small-scale industry	17.8	34.6	39.5	44.2	47.0	46.8
Home industry	4.0	5.4	12.2	9.4	9.4	7.2
Construction	3.8	4.7	6.3	7.4	8.5	9.2
Electricity	0.0	0.0	0.1	0.3	0.9	3.3
Services	80.0	116.8	134.1	154.5	179.4	201.8
Transport Services	31.8	26.8	30.6	44.0	45.2	51.8
Railways	0.0	2.6	3.6	4.9	6.2	8.4
Shipping Company	0.1	0.1	0.6	0.8	0.8	0.9
Cart Transport	31.7	24.1	26.3	38.3	38.2	42.2
Trams	0.0	0.0	0.0	0.0	0.0	0.4
Commerce	20.2	26.4	30.5	30.6	34.9	43.5
Hotels and Restaurants	0.3	1.1	2.8	4.5	4.9	5.3
Finance and Insurance	0.0	2.0	4.8	7.5	8.1	8.8
Government Services	22.7	51.0	54.6	55.5	72.6	76.6
Government	18.3	41.1	41.1	36.0	56.9	54.3
Regions	0.3	0.6	1.8	3.5	1.9	5.6
Communes	0.5	1.1	1.0	2.3	1.0	1.8
Boroughs	3.6	8.1	10.7	13.7	12.7	14.9
Post, telegraph, telephone	0.0	0.4	0.4	0.6	1.0	2.2
Professional services	1.4	4.9	6.7	8.5	9.2	9.9
Domestic services	3.1	3.3	2.0	0.6	0.6	0.7
Private Health	0.3	0.9	1.7	2.5	2.7	2.9
Real Estate	13.9	57.6	62.2	68.0	62.3	60.1
Excises minus subsidies	18.6	26.4	32.1	34.3	37.5	42.4
Monopoly profits	15.0	15.8	19.9	18.0	19.7	21.4
Other	3.7	10.6	12.2	16.2	17.8	21.0

Appendix III: Growth Rates (in percent)

	1890	1895	1900	1905	1910	1867-1910
TOTAL GDP	1.7	4.2	-1.3	3.0	2.4	1.9
Agriculture	1.1	3.9	-4.3	4.8	3.4	1.5
Crops	1.2	5.4	-6.0	6.5	3.2	1.6
Livestock	69.2	0.2	-0.2	1.1	4.0	1.0
Forestry, Fishing, Hunting	1.2	5.4	-6.0	6.5	1.8	1.5
Industry and Crafts	2.3	9.1	-0.7	1.4	1.2	2.5
Farm processing	1.4	17.5	-5.0	0.0	-5.1	1.4
Large-scale industry	5.7	5.2	4.3	4.8	13.5	6.2
Monopolies	-0.9	7.4	-1.1	0.0	1.8	0.4
Small-scale industry	2.9	2.6	2.3	1.2	-0.1	2.3
Home industry	1.4	17.5	-5.0	0.0	-5.1	1.4
Construction	0.9	5.9	3.3	2.8	1.5	2.0
Electricity	54.7	28.2	28.2	28.2	28.2	41.8
Services	1.7	2.8	2.9	3.0	2.4	2.2
Transportation Services	-0.7	2.7	7.5	0.6	2.8	1.1
Railways		6.8	6.2	4.7	0.6	0.0
Shipping Company	4.1	35.8	4.1	1.2	1.2	6.7
Cart transport	-1.2	1.8	7.8	0.0	2.0	0.7
Trams	0.0	0.0	0.0	0.0	0.0	…
Commerce	1.2	2.9	0.1	2.7	4.5	1.8
Hotels and Restaurants	5.6	20.8	10.0	1.5	1.6	6.8
Finance and Insurance	20.8	18.7	9.5	1.5	1.6	14.5
Government Services	3.6	1.4	0.3	5.5	1.1	2.9
Government	3.6	0.0	-2.6	9.6	-1.0	2.6
Regions	3.6	23.4	15.1	-11.6	24.1	7.3
Communes	3.6	-2.6	18.8	-14.8	11.6	3.0
Boroughs	3.6	5.8	5.0	-1.4	3.2	3.3
Post, telegraph, telephone	13,0	13.0	2.0	8.5	10.6	16.9
Professional services	5.4	6.6	5.0	1.5	1.5	4.6
Domestic services	0.3	-2.3	-5.0	0.3	0.3	-3.4
Private Health	4.6	13.0	7.8	1.5	1.6	5.2
Real Estate	6.4	1.5	1.8	-1.7	-0.7	3.5
Excises minus subsidies	1.5	4.0	1.3	1.8	2.5	1.9

Appendix IV: Share in GDP in 1910 Prices (in percent)

	1867	1890	1895	1900	1905	1910
Agriculture	56.2	48.5	47.8	40.8	44.5	46.7
Crops	37.3	33.1	35.1	27.5	32.4	33.6
Livestock	18.9	15.4	12.7	13.3	12.1	13.1
Forestry, Fishing, Hunting	1.3	1.2	1.2	1.0	1.1	1.1
Industry and Crafts	11.7	13.4	16.8	17.3	16.0	15.0
Farm processing	3.8	3.5	6.4	5.3	4.6	3.1
Large-scale industry	0.6	1.5	1.5	2.0	2.2	3.7
Monopolies	0.3	0.2	0.2	0.2	0.2	0.2
Small-scale industry	4.9	6.4	5.9	7.1	6.5	5.7
Home industry	1.1	1.0	1.8	1.5	1.3	0.9
Construction	1.0	0.9	0.9	1.2	1.2	1.1
Electricity	0.0	0.0	0.0	0.0	0.1	0.4
Services	21.8	21.5	20.1	24.6	24.7	24.6
Transport Services	8.7	4.9	4.6	7.0	6.2	6.3
Railways	0.0	0.5	0.5	0.8	0.9	1.0
Shipping Company	0.0	0.0	0.1	0.1	0.1	0.1
Cart transport	8.7	4.4	3.9	6.1	5.3	5.1
Trams	0.0	0.0	0.0	0.0	0.0	0.0
Commerce	5.5	4.9	4.6	4.9	4.8	5.3
Hotels and Restaurants	0.1	0.2	0.4	0.7	0.7	0.6
Finance and Insurance	0.0	0.4	0.7	1.2	1.1	1.1
Government Services	6.2	9.4	8.2	8.9	10.0	9.3
Government	5.0	7.6	6.2	5.7	7.8	6.6
Regions	0.1	0.1	0.3	0.6	0.3	0.7
Communes	0.1	0.2	0.1	0.4	0.1	0.2
Boroughs	1.0	1.5	1.6	2.2	1.8	1.8
Post, telegraph, telephone	0.0	0.1	0.1	0.1	0.1	0.3
Professional services	0.4	0.9	1.0	1.4	1.3	1.2
Domestic services	0.9	0.6	0.3	0.1	0.1	0.1
Private Health	0.1	0.2	0.3	0.4	0.4	0.4
Real Estate	3.8	10.6	9.3	10.9	8.6	7.3
Excises minus subsidies	5.1	4.9	4.8	5.5	5.2	5.2

Appendix V. Comparison of 1910 GDP with Palairet (1997) In current prices

	Palairet	Mijatovic-Zavadjil
Total	**658**	**819**
Agriculture	315	383
Crops	197	276
Livestock	119	107
Forestry, fishing	8	9
Large scale-industry	30	30
Monopolies	--	1
Farm processing	12	25
Handicrafts and proto-industry	53	54
Construction/electricity	22	13
Transport	45	52
Commerce	60	44
Hotels and restaurants	--	5
Finance	11	9
Government Services	53	77
Post and telegraph	2	2
Other services	10	14
Real estate	38	60
Indirect taxes	0	42

Methodological explanation

For crops and livestock, Palairet and Mijatovic-Zavadjil use different methodologies. From crops, Palairet excludes the production of cattle feed and of seeds needed for next year's planting. That is why the figure in Mijatovic-Zavadjil is much higher. In fact, once the appropriate adjustments are made, livestock GDP is higher in Mijatovic-Zavadjil by about 80 million dinars because of the use of different methodologies to calculate cattle off-take. Mijatovic and Zavadjil rely strictly on the methodology in Djuricic et al (1927) and use Djuricic 1923 prices, deflated in accordance with Appendix Table Ia. The same difference holds true for cart transport which about 10 million dinars higher in Zavadjil-Mijatovic. The third major difference relates to government services where Mijatovic-Zavadjil defines GDP as spending on salaries and materials, rather than just salaries

Appendix VI: Serbian Statistical Sources pre-1914

Regular statistical monitoring in Serbia began in 1862 when the Statistical Department was established by Prince Michael Obrenovic, ruler of Serbia, under the auspices of the Ministry of Finance. Before 1862, statistical work had been done across government departments and focused on censuses of population and livestock. Foreign trade was monitored from 1843 (though the results were first published in 1862), while prices and wages also became available from 1862. The Statistical Department became a more independent service in 1864 and, subsequently, came under the purview of the Ministry of Economy in 1882.

The first Serbian Statistical Bulletin (Državopis) was issued in 1863 and contained information on weather conditions, the population, the Topcider state farm, foreign and domestic trade, and selected prices. The Statistical Bulletin would continue to be issued over the next 30 years, on an ad hoc basis and without a firmly set structure, sometimes focusing on only one issue, such as the wine industry in 1889. Importantly for our purposes, the results of agricultural censuses in 1866/67, with detailed data on crops and livestock, were published shortly thereafter. This data enables to begin our research on growth in these years. The last Bulletin was issued in 1894. By then, statistics were being collected systematically in a number of areas: population, movements of population, education, the economy (especially agriculture), employment (based mainly on surveys), trade (domestic and foreign), prices, and the criminal justice system.

The Statistical Bulletin was replaced in the 1890s by Annual Statistical Yearbooks, the first of which was issued in 1895 with data for 1893. It contained data on the population, agriculture, prices, transport, trade, the financial system and the judicial system. Statistical Yearbooks expanded in size with growing coverage of industry, social issues, wages and employment, military issues, and state debts. In addition, special reports were occasionally published covering: the results of population, livestock and agricultural censuses[20]; price data; and local government revenues. The last Annual Statistical Yearbook was for 1909-10 and was well over twice the size of the first one in terms of page length. It represented a major step forward in terms of data availability, with detailed information on the turnover, employment, wages, and profits in the industrial sector, and some segments of the service sector, as well as detailed data on local governments. The increased amount of data becoming available in 1910 encouraged us to use 1910 as the base year in our GDP calculations.

Outside the Statistical Service, data was also collected by many other public sector agencies. For example, the Ministry of Finance collected and published detailed data on the execution of the central government budget in 1910 (as well as less detailed data on

[20] The first census was in 1834. 15 more were conducted before World War 1. According to A. Vuletić: Statistika u službi državne uprave i unapređenja narodnog blagostanja u Srbiji 19. Veka, u *Država i politike upravljanja (18–20. vek)*, red. P. V. Krestić; Istorijski institut, 2017.

earlier years) that provided an excellent base for estimating GDP generated government services and the state monopolies.