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ECONOMIC GROWTH ON THE PERIPHERY: ESTIMATES OF GDP PER CAPITA OF THE CONGRESS KINGDOM OF POLAND (FOR YEARS 1870–1912)

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Economic growth on the periphery: Estimates of GDP per capita of the Congress Kingdom of Poland (for years 1870–1912)

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Abstract: This paper presents the estimates of the GDP of Congress Kingdom of Poland for period 1870–1912. Authors used bottom-up methodology and calculated sectoral added values using historical economic, social and demographic data. Presented results offer first ever insight into the structure of sectoral added values in the Congress Kingdom of Poland during the period of first globalization (1870–1913) and first reliable estimates of GDP of Congress Kingdom of Poland. All results are presented in Geary-Khamis dollars PPP1990 and are compatible with Maddison dataset.

Keywords: Congress Kingdom of Poland, Poland, 19th century economic history, economic history of Poland, little divergence, estimates of historical GDP

JEL codes: N10, N13

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1. Introduction

The Congress Kingdom of Poland (or Congress Kingdom) was established in 1815 as a result of the Vienna Congress agreements, in personal union with the Russian Empire. Researchers studying the economic history of this period have suggested that sufficient autonomy and the advantages of its location, between Russia and Western Europe, allowed the Congress Kingdom reasonably rapid growth and a path to industrialization (see part 2). Unfortunately, until recently, such assertions could only be partially verified due to the lack of credible estimates of the Kingdom's GDP per capita in the second half of the 19thcentury. This paper aims to address this problem by providing estimates of the Congress Kingdom's GDP during the industrial revolution between 1870 to 1914.

Presenting credible estimates of the GDP level makes it possible to verify statements about the rapid modernization of the Congress Kingdom's economy during the final decades of the 19th century and at the beginning of the 20th century. New estimates also give us an opportunity to compare the economic development of the Congress Kingdom with other countries in Europe, including the Eastern and Northern peripheries, such as Russia, Hungary and Finland.

The paper is divided into 6 main sections. In the first section we discuss the place of the Polish and the Congress Kingdom's economy in the current debate on the history of European economy. We also raise a major hypothesis here, which is verified during the course of our analysis. In the second part we discuss the existing estimates of the Polish and the Congress Kingdom's GDP per capita. In the third part we present the method we used in our estimates. In the fourth part we describe the data sources for the Kingdom's estimates. In the fifth we present new estimates of the GDP per capita of the Congress Kingdom between 1870 and 1914. In the final section we offer a comparative analysis of the GDP *per capita* in the Congress Kingdom and other European economies.

2. The Congress Kingdom and Poland in the European economy debate

In recent decades one of the most important issues in economic history is the problem of divergence in the world economy during the period of industrialization. Scholars have discussed the causes and consequences of the divergence between the economies of the European core and the rest of the world (see e.g. Pomerantz 2000). New data sets have provided some exemplifications of the hypothesis that the phenomenon of the divergence in economic development started even earlier, in the pre-modern period, before the industrial revolution, and

this phenomenon not only occurred between European economies and the rest of the world but also happened within Europe (the so-called "Little Divergence" between the North Sea countries of Holland and England and the European peripheries which includes Poland).

The problem of the different dynamics of long-term economic growth in Europe was studied based on different data sets. Allen stressed the growing difference in the living standards between cities in England and the Netherlands (London, Amsterdam, Oxford) and major cities in the rest of Europe (Milan, Leipzig, Vienna, and Cracow in Poland) (Allen 2001). He also indicated the divergence of the agriculture productivity in Europe between North-West countries and other economies in the pre-modern time (Allen 2000). Van Zanden pointed out differences in the skill premium and literacy between the core regions and the rest of the Europe (Van Zanden 2009a, 2009b). One of the most important indicators used in the Little Divergence Debate were the estimates of the GDP *per capita* for the pre-modern European countries, which show the growing gap between the North Sea countries and other European economies (see e.g. Van Zanden 2001).

One of the results of the Little Divergence Debate is the growing interest in the studies of the European economies which lagged behind the Netherlands and England in the late pre-modern period. Special attention was given to the Mediterranean countries which were leading economies in Europe in the Middle Ages and early pre-modern period. Economic historians have estimated the GDP *per capita* in Spain and Italy which shows the slowdown of those economies in the 17th century and stagnation in the next century (Malanima 2010; Álvarez-Nogal and Prados de la Escosura 2013).

The case of the East European countries in pre-modern times was rather on the margin of this debate. However in recent years, Poland has been the subject of empirical studies by Malinowski and Van Zanden. They estimated the GDP *per capita* for Lesser Poland (the southern part of the Polish Kingdom) in the pre-modern period. The results of the estimation confirmed the hypothesis of the backwardness of the Polish economy, which was characterized by second serfdom in agriculture and urban areas of little importance. As Malinowski and Van Zanden have pointed out, the level of Poland's economic development was not only far behind the European core, but also significantly behind the less developed West European economies such as Germany and Sweden (Malinowski and Van Zanden 2017; Malinowski 2016).

According to the studies on the divergence in Europe, on the eve of the industrial revolution, there were only two economies – the English and Dutch – which escaped the Malthusian trap and achieved sustained long-term economic growth. Other countries, including

Poland, were still highly dependent on agriculture and relied on rather basic technology, and the standard of living was much lower there than in the leading two economies.

This situation changed in the 19th century, in the time of the industrial revolution which altered the nature of economic development in many European countries. The growth spurt originated in new technologies and the development of human capital and institutional change (Kuznets 1966, 1971; Mokyr 2002). As a result, the process of convergence began. However, only a part of Europe succeeded in catching up with the core economies, the rest of the countries developed slower and remained on the continent's economic peripheries.

Malinowski and Van Zanden (2017) have suggested that Poland experienced rather slow economic growth until the second half of the 19th century and stayed far behind the industrial newcomers of Belgium and Germany. The authors based this on Angus Maddison's data set for economic growth in the 19th century (Maddison 2001; Bolt and Van Zanden 2014) which showed that the growth spurt in Poland occurred in the late 19th century only and the level of GDP *per capita* was lower than in other European countries, including the rather peripheral economies of the Mediterranean region (Spain, Northern Italy).

According to Polish researchers, industrialization in Poland (i.e. territories inhabited by a Polish speaking majority) occurred mostly in the Congress Kingdom (excluding Upper Silesia), which was part of the Russian Empire (see e.g. Łukasiewicz 1988). In the first half of the 19th century, the Congress Kingdom's economy was based on agriculture. However in the 1820s and 1830s, the government in Warsaw introduced economic reforms to develop the mining, steel and textile industries. Most of the government's investments in mining and heavy industry were highly inefficient and the politics of state-led industrialization finished with a spectacular collapse (Jedlicki 1964). A concurrent policy that protected private industry in the Mazovian Voivodship – although very costly – initiated the industrialization of the Łódź area which led to a rapid development of the textile industry in the region (Missalowa 1964). Nevertheless, until the 1870s, the Congress Kingdom as well as other Polish territories remained highly rural areas. Scholars studying the Congress Kingdom's economy have stressed the rapid economic development starting from the 1870s. According to Łukasiewicz, in the last three decades of the 19th century, the Congress Kingdom economy experienced a technological breakthrough, which resulted in fast industrial growth (located mostly in three main centers: Łódź, Warsaw and the Dąbrowskie basin) (Łukasiewicz 1988; see also Ihnatowicz 1965; Puś 2014). Polish historians have pointed out that the agrarian reforms introduced in the 1860s and the growing demand for products in the Russian market supported this growth spurt in the last three decades

of the 19th century (Jezierski 1967). In this sense, in the late 19th century the Congress Kingdom became the most economically developed part of the Russian Empire, which could only be compared to Moscow and the Petersburg areas.

Kochanowicz (2006) suggested that in the late 19th century, the Congress Kingdom became one of the fastest growing regional economies of the Russian Empire. According to Kochanowicz, the Congress Kingdom took advantage of its location, relatively easy access to foreign capital and direct investments. The development of infrastructure, particularly of railways, removal of border customs procedures, enfranchisement of peasants in 1864, also contributed to its rapid growth. Despite the loss of its autonomy, the Congress Kingdom preserved all its distinct legal resolutions (e.g. Napoleonic code), which led to relatively more beneficial economic conditions than in majority of other Russian territories.

However, Kochanowicz and older studies presented only limited and insufficient empirical documentation and data to support this point of view. Due to the lack of quantitative indicators, Kochanowicz did not put the Congress Kingdom's economic development in a comparative perspective. No one has estimated the Congress Kingdom's GDP *per capita* and its structure in a way which would allow for a comparative analysis. Moreover, the existing data for Poland is also questionable. Maddison's data is based on the Good and Ma's (1998) estimates for Galicia (the Austrian partition) which was criticized for its reliability. The most current estimates of Wójtowicz (2006) are dedicated to the current Polish territory but the method of estimation is unclear. This paper seeks to address this gap, we present the results of our estimation of the GDP *per capita* of the Congress Kingdom for the years 1870−1914. Our calculations allow us to verify Kochanowicz's statement and to detect when the growth spurt in the Congress Kingdom occurred. We also compare the Congress Kingdom's economic performance to other European economies to check whether the Russian part of Poland was on the path of convergence to catch up with the most developed European economies and whether the Congress Kingdom economic growth was faster or slower than other economies in the region.

3. The historical GDP estimates for Poland

Our estimates are one of the first attempts to calculate the historical GDP of the Congress Kingdom. Until recently, there have been virtually no GDP estimates of the Russian partition itself and only a few of the Polish lands during the analyzed period. During the socialist era, researchers had focused on the indicators of material production such as industrial

manufacturing, foreign trade and agricultural production (cf. Łukasiewicz 1963, 1968; Puś 1997; Wyczański 2006), rather than on 'capitalistic' measures such as the GDP. Recently, Markevich (2013) estimated the regional GDP of the Russian Empire for the year 1897 (the census year in the Russian Empire). In his calculation he also took into account the governorates which composed the Congress Kingdom. These calculations are the only available GDP estimates for the territory of the Congress Kingdom.

In the Maddison database (now continued as the Maddison Project), the data for Poland in the 19th century is based on the estimates of Good and Ma (1999). It raises a number of methodological caveats. Good and Ma calculated the level of the GDP for the territories of today's Eastern European countries on the basis of a regression which takes into account several readily available parameters. In the case of Poland, their estimates are not reliable for several reasons–regression was calibrated solely on the basis of the data for highly developed European countries (and then applied to a different economic environment). Moreover, reconstruction of this time period for the countries in Eastern Europe uses data only for the Austro-Hungarian lands. This is understandable due to the availability and consistency of the data, as well as a map of Eastern Europe. This approach gave relatively reliable results for the countries whose total territory (and population) belonged to the Austro-Hungarian Empire in the 19th century (such as Austria, Czech Republic, Slovakia or Hungary). But in the case of the Polish lands, whatever boundaries (contemporary or interwar), these criteria are not met (only part of Galicia and a small part of Silesia is included in the Polish territory). The authors, moreover, recognized this problem and indicated that their estimates represented only that part of the lands of the former Austrian partition, which constitute present Polish borders (thus, this extrapolation is not fully reliable).Therefore, in reality, Maddison's data (Maddison Project 2013) mostly accurately describes the dynamics of development (and probably the level of development) of Małopolskie and Podkarpackie Voivodeships and a small part of Silesia. Later estimates for Galicia (Schulze 2007) show different dynamics for the region, which makes Maddison project data even more questionable.

As mentioned above, historical estimates of Poland's GDP were presented by Wójtowicz (2006; see also Wójtowicz and Wójtowicz 2009). These estimates present GDP *per capita* for a very long period (since 1000 AD) but in Wójtowicz's publications, the methodology as well as the data used for estimation are both vague and mostly undisclosed. As a result, it is impossible to verify the calculations made by the author. Lastly, researchers of the pre-industrial development of Poland, Malinowski and Van Zanden (2015, 2017) estimated the

GDP *per capita* of the Krakow Voivodeshipin1776 to be 634 USD 1990 PPP, i.e. which constituted approximately 0.4 of the Western European average. This estimation is the first for the Polish region in the pre-industrial time, but Malinowski and Van Zanden did not calculate the GDP for the 19th century and for this period they used the Maddison data to compare Poland to other European countries (Malinowski and Van Zanden 2017). Our estimates for the Congress Kingdom in the late 19th and early 20th century should complete this gap and give an opportunity to compare the size of the Polish (Congress Kingdom's) economy to other economies in that period.

4. The methodology

In our estimation we use the bottom-up method, following the Schulze's method for estimating the GDP of Austro-Hungary (Schulze 2007). This approach seems to be appropriate because of the similarities of both economies, especially between the Congress Kingdom and the Austrian partition (Galicia). We calculate the GDP *per capita* for eight years between 1870 and 1914: 1870, 1879, 1888, 1894, 1897, 1900, 1904 and 1912. For the years 1897, 1904 and 1912 we estimate the Congress Kingdom's GDP using the calculation of value added in every sector of the economy (agriculture, industry, services). In our estimates we also include the increase of property and capital stock. We assume the value added rates for every sector of the economy following research in similar economies such as Russia (Markevich 2013) or Austria and Hungary (Schulze 2007; Katus 1970). In the sector of industry, we follow Markevich's estimates for Russia (Markevich 2013), and in the case of mining and craft we assume the rate of value added as in the Katus (1970) calculation for Hungary. Our estimation of the value added for agriculture is based on Schulze's estimates for Galicia (the Austrian partition) (Schulze 2007). As in Schulze's estimates, we also use the estimation of the value added in the branch of building and construction. In the next step we calculate the total value added in every sector and then the total GDP of the Congress Kingdom for the chosen years. In the final step we estimate the GDP *per capita* using the population data for the Congress Kingdom. The estimation of the Congress Kingdom's GDP for the years 1870, 1879, 1883, 1894 and 1900 is more complicated because information concerning the economic performance for these years is less available and less precise. We use the general statistics of the Congress Kingdom to estimate the total production in the main sectors. We also have to calculate the level of production in some branches of the economy based on the data from the later periods (see below).

We estimate the agricultural sector of the economy by the calculation of the value added from crop and livestock production, we also estimate the harvesting and the forestry/timber sector. The value added by crop production was estimated by using data on the production of the four main cereals (wheat, rye, oat, barley) and other important crops such as potatoes and sugar beet. The value added by livestock production was calculated using information on the amount of animals (pigs, sheep, cows, horses) and the data on the weight of unit, and the average amount of wool, meat, milk and eggs in particular years. The difficult issue is the huge decrease in the number of registered animals in the early 20th century, which was probably caused by the change in the tax system and did not occur in practice. The information on the increase in the weight of animal carcasses and rise in the production of milk and wool suggests an increase in livestock productivity (Łukasiewicz 1968). This increase could even account for the growing contribution of this branch to the value added by the agricultural sector. However, in 1900 a new tax on cattle was enacted, and farmers/peasants stopped registering their animals. In turn, the official number of animals sharply declined. To replace this unreliable data, we cautiously assume that the value of livestock production in the years 1900, 1904 and 1913 was at the same level of 1897. For the forestry/timber sector, existing data allows us to estimate the value added for the year 1912. Using the information on the scale of the sawmills' production, we estimate the level of total forest production in 1897 and 1904.

The calculation of the agricultural sector for the earlier period is much more complex. In our estimates we use the general data for agriculture prepared by Łukasiewicz (1968) to calculate the value added in this sector. In the case of forestry, we assume that the value added in the earlier period was similar to our calculation for the first decade of the 20th century. These suppositions seem reliable because of the rapid decrease in forest areas in the Congress Kingdom in the 1870s, 1880s and 1890s, which suggests a large-scale exploitation of the woods in this period.

The information on industry is more complete compared to other sectors of the economy. We estimate the value added by mining and industry using the data of the industrial reports made by local administrations, the information from the Russian census of 1897 (*Obszczij*... 1905) and the Puś (2014) analysis of large industry in the Congress Kingdom.

Separately, we estimate the value added by artisan production and cottage industry using mostly information from local statistics and the dataset of Koszucki (1905). However this data is rather unreliable and we have made a conservative estimates on the basis of the population of craftsmen and partial information about the production and some data concerning the value

of production of cottage industry. For the year of 1870 we have no data on the size of the craftsmen population and artisan production and the so-called home industry, we estimate the size of this sector assuming the linear trend of production growth.

For the calculation of the output of building and construction sector, we use the data of the estates values for 1911 and 1912 (Krzyżanowski and Kumaniecki 1915) and for 1902 and 1910 (Grabski 1914, 1915). On the basis of this data, we estimated the growth of the total value of buildings (for earlier periods we used values from the linear trend). Expenditures on road and rail infrastructure are estimated based on the analysis of the railways and network of roads development (Nestorowicz 1913, Łukasiewicz 1968).In the calculation of the costs of railway construction, we also use information on the prices of the construction of 1 km of track, which reached 20,000 rubles in 1913 (Kołodziejczyk 1970). We assume that the price of railway construction was rather stable. For the narrow-gauge railway network, which developed in the first decade of the 20th century, we assume that the cost of construction reached half the cost of standard track and was thus equal to the cost of construction of 1 km of road. For the costs on the maintenance of the transport infrastructure, the estimates are based on the assumption that the relative costs were similar to those in the Habsburg Empire (Schulze 2007) and therefore equal to 1/30th of the construction cost. The only information regarding the costs of maintaining the roads comes from 1912. Nestorowicz stated that the price was about 350 rubles per kilometer (Nestorowicz 1913).

In the calculation of the service sector we assume – following Markevich (2013) and Schulze (2007) – that in the case of domestic services (e.g. servants) the value added is equal to the total value of the wages. In this calculation we use regional data (*Goroda Rossiji* 1906) for the years 1904−1905. Then we sum up the results at the level of the Congress Kingdom. For other years we assume the same dynamics of wages as in the case of the industrial workers between 1905 and 1913 (20%) (Siegel 1949). The number of domestic servants we estimated was determined by using the corrected census data of 1897 (Koryś and Tymiński 2015) and in the next step we calculate the numbers for the years 1900, 1904, 1913 using the relations between the urban population and the number of servants in 1897 and the dataset on urbanization for the years 1900, 1904 and 1913. In the case of market services (e.g. banking or trade) we use tax data in the calculation and information about incomes and wages/salaries. The added value of public services we estimate using the budget statistics. To calculate the output of the entire sector, we use information on the employer's size and the structure of the service

sector (Koryś and Tymiński 2015).The profits of railways, post offices and the financial sector is estimated based on tax statistics and reports of those firms and organizations.

The income from capital and real estate was calculated from the property tax data for 1905 and 1912 , which amounted to 10% of net income from the property in towns and cities (Strasburger 1916). For the year 1897, we use the data of 1905 corrected by the dynamics of urbanization. For the rural area we utilize the information on property tax, although the data is less detailed: tax was paid in equal amounts from every household. We assume that it amounted to 10% of the income from the property. The income from leasing land was calculated on the basis of the information for the year 1921 (Tańska-Hus 2009) and the dataset on arable land in the Congress Kingdom in 1912 (Janicki 1918). We assume that the amount of land which was leased in the Congress Kingdom during the period being researched was stable and equaled 6%. The income from capital and property we add to the value added of the third sector.

As in the case of agriculture, the calculation of the value added in services for the 1870s and 1880s was much more complicated because of the lack of reliable data. We assume, following Schulze estimates for Galicia (Austrian partition), that the share of services in the economy was rather stable and the level of value added from the third sector in the earlier period is the same as in 1897.

In the final step, we sum up the total values added from all sectors to become the total product of the Congress Kingdom economy. In our calculation we use the prices of 1913 for all the chosen years. The deflators are constructed using the price indexes or prices and wages data for 1913 (Siegel 1949). All results are then recounted to the G-K US dollars PPP 1990 using the exchange rate of 16 roubles to 1dollar, which was employed by Gregory (1982) and Markevich (2013). In the estimation of the GDP *per capita*, we use the population data from the Congress Kingdom general statistics (Grabski 1914, 1915; Strasburger 1916, Krzyżanowski and Kumaniecki 1915; Romer and Weinfeld 1917). In the opinion of Szulc (1921) the credibility of this data is dubious, especially the incorporation of military forces into the population of Congress Kingdom is undermined. Due to this, we estimate two versions of the GDP *per capita* with and without the military forces. In the second case, we exclude the military budget from the GDP (about 40 million roubles in 1905 and 1911) (Grabski 1914, 1915).

5. The sources

The estimation of the Congress Kingdom's GDP is complicated because of the limited number of sources and different modes of collecting data by the officials in the country. There was only

one census made in Russian Empire before World War One and the local datasets of the Congress Kingdom governorates were rarely collected. Although the number of different sources related to different sectors of economy is limited, it allows one to estimate the dataset for the Congress Kingdom's economy. According to the proposed method of estimation of the Congress Kingdom's GDP *per capita*, we use different sources of data concerning the main sectors of the economy. We employ both the statistical materials collected in the 19thand early 20thcentury in the Congress Kingdom and the Russian Empire and also the later elaborations prepared by Polish economic historians.

For the estimation of all sectors of the economy, employment structure, urbanization and population we use data from the Russian census of 1897 (*Obszczij*... 1905) and statistical materials from Congress Kingdom published in the late 19th and early 20th century by Polish statisticians in several collections as statistics of the Congress Kingdom for the late 19th century (Załęski 1876, 1900−1901; Koszutski 1905) and statistical yearbooks of the Congress Kingdom for 1913, 1914 and 1915 (Grabski 1914, 1915; Strasburger 1916). We also utilize collections of statistics for all the Polish territories published at the time of WWI in Cracow, which also include information on the Congress Kingdom (Krzyżanowski and Kumaniecki 1915; Romer and Weinfeld 1917). However, these datasets do not include enough information to properly estimate products from all sectors of the Congress Kingdom's economy. We complement the shortcomings using regional data or the later analysis of Polish statisticians and historians.

From all branches of the Congress Kingdom's economy, the most researched are the large-scale industry and mining sectors. For this reason, the shortcomings in the primary sources could be supplemented by later estimates. In the last fifty years, many researchers have analyzed the development of the Congress Kingdom's industry including the level of production in several branches during the second half of the 19th and early 20th century (see e.g. Łukasiewicz 1963, 1977, 1988; Puś 1984, 2014). Although the statistics presented by historians sometimes differ between one another, the number of sources enable one to estimate the volume of production in all the main branches of mining and industry in the analyzed period. Compared to large-scale industry and mining, the data regarding craft and small industry (including so-called rural industry) are much more limited. The production of craftsmen and small workshops, was estimated by using several different sources: industrial inspectors' reports (Svody dannych… 1889−1896; Svody otczetow… 1904−1912),the Warsaw Statistical Committee statistics and elaborations (Kustarnaja…1901, Vobłyj 1907; Fabriczno… 1907; Dziesiat guberni… 1908) and the analyses of Zakrzewski (1888) and Koszucki (1905). The information

on the construction sector, was based on the Congress Kingdom's general statistics (Grabski 1914, 1915; Krzyżanowski and Kumaniecki 1915). For the construction of infrastructure (railways, roads), we also use the later studies of Łukasiewicz (1963), Kołodziejczyk (1970) and Nestorowicz (1913).

The agricultural sector was the chief part of the Congress Kingdom's economy, but the statistics regarding this sector are less complete than the mining and large-scale industry data. Apart from the information from the census and from publications on the Congress Kingdom's general statistics, we also utilized several later analyses of crop production and the size and value of the livestock (Łukasiewicz 1968, 1982; Sobczak 1968; Janicki 1918; Leskiewiczowa 1964, 1970). Our estimates of the costs of agricultural production are based on the Russian statistics on the net product in agriculture (Sielskoje choziajstwo 2010). In this part of our work, we also use the method of calculating social income introduced by Dederko (1930) in the 1920s.

Estimating the value of services is the most difficult due to insufficient and incomplete data. For the calculation of the railway's revenue, we use the analyses of the railway companies operating in the Congress Kingdom (Hilchen 1912; Gieysztor 1918; Kołodziejczyk 1970). However, researchers only presented the number of freight cars in these studies. More detailed information is available for the early 20th century, especially the period of 1908-1913. The data on the income, costs and profits of the railways was included in the documents of the Warsaw Regional Committee (*Otczet…* 1912, 1914). The data on other services is even more scarce, information on wages and salaries in some services is included in the general Congress Kingdom's statistics (Krzyżanowski and Kumaniecki 1917).In the same collections, insurance statistics and budget data (including taxes) are also available. These datasets allow one to estimate the size of financial and public services and property revenues. In the estimation of the total value of the third sector, we also use the employment data which was taken from the census of 1897 (Koryś and Tymiński 2015).

As was mentioned above, the data on the different sectors of the Congress Kingdom's economy is limited and the reliability of some information is uncertain[1]. In such circumstances, we have to treat all sources with caution and in some areas in some years, we have to estimate results based on indirect data or on the information from other periods. Nevertheless, the state of Congress Kingdom's statistics is sufficient to construct the database required to estimate the Congress Kingdom's GDP *per capita*.

[1] On the quality of the Russian and Congress Kingdom's statistics see: Szulc 1920.

6. Economic growth in the Congress Kingdom and its structure

The GDP level estimated by us in the following years is presented in Table 1 (GDP government). As described in the previous part, due to unreliable data on livestock production in agriculture for the years 1901−1912 (a sharp decline in livestock production and increasingly wealthy society seems implausible), we have made a correction based on the assumption that the added value of livestock production remains constant during this period. The adjusted result is presented in the next row (GDP (1) and in Table 1. Furthermore, the data on the population of the Congress Kingdom is ambiguous. Official statistical data, provided by Krzyżanowski and Kumaniecki, which is different from the data used by Szulc, provides revised data on civilians, excluding the armed forces (Szulc 1920). For the first decade of the 20th century, discrepancies between data from both sources are significant and go beyond the army's size (cf. Table 2) and this is due to an overestimation of the official population data (by approx. 8%). To use more reliable Szulc population data in further analysis, we have estimated the value added by the service sector which also excludes the army and we present the GDP for the civilian population (GDP (2) and GDP (3), additionally taking into account the agricultural adjustment described above).

Table 1. GDP (total VA) in the Congress Kingdom, 1870−1912

Millions of US dollars G/K	**1870**	**1879**	**1883**	**1894**	**1897**	**1900**	**1904**	**1912**
GDP	5483	6857	8353	9917	11898	14537	17016	21523
GDP (1)	5483	6857	8353	9917	11898	14737	17416	22023
GDP (2)	5318	6650	8102	9619	11542	14099	16376	20883
GDP (3)	5318	6650	8102	9619	11542	14299	16776	21383

Sources: own estimates.

Table 2. Population in the Congress Kingdom, 1870−1912 (thousands of people)

Source of data	**1870**	**1879**	**1883**	**1894**	**1897**	**1900**	**1904**	**1912**
Krzyżanowski & Kumaniecki	6080	6978	7422	8800	9402	10500	11312	12776
Szulc (civilian population)	5834	6857	7260	8710	9150	9669	10424	11913

Sources: Krzyżanowski and Kumaniecki 1917; Szulc 1920.

As a result, the level of the GDP p/c in the UK for the adjusted agricultural output (for GDP (1) and (3), respectively, taking into account the population data of Krzyżanowski and Kumaniecki and data of Szulc) is in Table 3. The differences between the two methods of estimation do not exceed 5%.

Table 3. GDP per capita in the Congress Kingdom, 1870-1912 (G/K dollars 1990)

	1870	1879	1883	1894	1897	1900	1904	1912
GDP (1) p/c	901.8	982.5	1125.4	1126.9	1265.5	1403.6	1539.7	1723.8
GDP (3) p/c	939.8	999.8	1150.5	1138.6	1300.3	1478.9	1609.3	1794.9
GDP (3)/GDP (1)	1.04	1.02	1.02	1.01	1.03	1.05	1.05	1.04

Sources: own estimates.

The calculation method used makes it possible to estimate the sectoral structure of added value, as shown in Table 4.

Table 4. Value added in sectors, the Congress Kingdom 1870−1910 (millions of G/K dollars 1990)

Sectors	1870	1879	1883	1894	1897	1900	1904	1912
Manufacturing & mining	1167	1690	2330	3068	3301	4853	6035	6871
Construction	346	380	401	442	483	483	568	1790
Agriculture	2326	2728	3116	3433	4545	5019	5494	6448
Services	1645	2057	2506	2975	3569	4382	5319	6913
Serv. (excl. military)	1480	1851	2255	2678	3212	3944	4679	6273

Sources: own estimates.

During the period 1870−1900, due to the lack of data, we assumed a steady share of the services sector in global added value. The importance of the manufacturing sector grew rapidly, in relative terms from 17 to over 30% of the GDP, and in absolute terms over four fold, between 1880 and 1904. There was a marked slowdown in growth in 1904 which was influenced by the Revolution of 1905 and Russia's economic downturn. The rapid increase in the value and share of the construction sector in the added value generated between 1904 and 1912 is probably related to the increase in the scale of industrial, infrastructural and private investments, the development of the insurance sector used in the estimates, as well as a decrease in the importance of the 'cottage' construction sector in rural areas, along with the proliferation of new technologies. It seems that after 1904 the industrialization process slowed down and the share of the manufacturing sector (including construction) started to stabilize in the area of 40% of the GDP. Between 1870 and 1912, agricultural production was steadily increasing, but at the same time, its share in the GDP was decreasing (due to unreliable results, the value of agricultural production for 1883 and 1904 was additionally revised). The share of the service sector decreased in the early 20th century and then stabilized. In the previous period, due to the lack of data, we assumed a steady share of the sector in the GDP in 1900, or 30% (28% excluding the military sector).

Table 5. Shares of sectoral VA in total VA (GDP), %.

Sectors	1870	1879	1883	1894	1897	1900	1904	1912
Military sector including								
Manufacturing & mining	21%	25%	28%	31%	28%	33%	35%	31%
Construction	6%	6%	5%	4%	4%	3%	3%	8%
Agriculture	42%	40%	37%	35%	38%	34%	32%	29%
Services	30%	30%	30%	30%	30%	30%	31%	31%
Military sector excluding								
Manufacturing & mining	22%	25%	29%	32%	29%	34%	36%	32%
Construction	6%	6%	5%	5%	4%	3%	3%	8%
Agriculture	44%	41%	38%	36%	39%	35%	33%	30%
Services	28%	28%	28%	28%	28%	28%	28%	29%

Sources: own estimates.

In our previous research, we reconstructed the structure of employment in the Congress Kingdom for the analyzed period (Koryś and Tymiński 2015). However, those results need to be further adjusted due to the misallocation of domestic services (where a large segment was actually working in the first sector and some in the second sector as well) and still low labour market participation compared to other countries (cf. eg. Malanima and Daniele 2016 on Italy). This allows an estimate to be made on the basis of employment data and the sectoral breakdown of productivity added value per worker.

Table 6. Occupational structure of Congress Kingdom of Poland

Sectors	LF 1870	LF 1897	share 1870	share 1897
I	2 227 022	2 974 655	74.51	70.48
II	380 937	613 708	12.74	14.54
III	381 058	631 949	12.75	14.97

Sources: own estimates.

It follows that productivity per employee in the individual sectors increased in the period from 1870−1897 − in relative terms, the fastest in the industrial sector (secondary) and in agriculture (primary) and services (tertiary). In absolute terms, the lowest level of VA per employee, as shown in Table 7, can be observed in agriculture, where it was 3−4 times lower than in the other two sectors. Thus, a key role in dynamic economic growth at the end of the 19th century was played by inter-sectoral productivity growth, due to the relative growth of employment in sectors II and III, at the expense of the agricultural sector. The second important factor was intra-sectoral productivity growth in each sector.

Table 7. Sectoral labor productivity (VA per worker)

Sectors	VA/worker 1870	VA/worker 1897
I	1044.41	1527.84
II	3969.65	6165.39
III	3885.01	5083.40

Sources: own estimates.

7. Conclusions: Economic growth in the Congress Kingdom in the European mirror

Our estimates did not confirm the hypothesis of a growth spurt in the Congress Kingdom's economy in the second half of the 19th century. After 1870 until the mid-1890s, the Congress Kingdom enjoyed only a brief period of rapid economic growth in the late 1870s and early 1880s, and between the mid-1880s to the mid-1890s experienced a prolonged period of stagnation. The huge growth spurt came later: the rapid economic growth started in the mid-1890s and lasted until the mid-1900s, then the Congress Kingdom's economy enjoyed a stable rate of growth until World War One (see Table 8).

Table 8: The Congress Kingdom's average rates of growth of GDP *per capita* (%)

	Congress Kingdom GDP p/c (1)	Congress Kingdom GDP p/c (3)	Maddison's estimates of Polish GDP p/c
1870–1879	**0.95**	**0.69**	**1.54 (1870–1890)**
1879–1883	**3.50**	**3.58**	
1883–1894	**0.02**	**-0.10**	
1894–1897	**3.92**	**4.51**	**1.81 (1890–1900)**
1897–1900	**3.54**	**4.39**	
1900–1904	**2.34**	**2.13**	**0.96 (1900–1913)**
1904–1912	**1.42**	**1.37**	
1870–1912	**1.55**	**1.55**	**1.43**

Sources: own estimates, Maddison Project 2013.

The second issue which we would verify using our estimates is the problem of the Little Divergence and catching up with the European core economies. According to our estimates, until the mid-1890s the catching up process between the Congress Kingdom and the most developed countries did not occur (see Tables 9 and 10). In the next two decades, the trend changed when we compare the Congress Kingdom's GDP *per capita* to the leading European economies (UK and Germany). Between 1894 and 1912, the Congress Kingdom's economic growth was similar to the United States. This means that during the period of 1894–1912, the Congress Kingdom started to catch up with the European core economies. However, we can argue that in the case of the Congress Kingdom, the convergence process was rather weak in

the analyzed period and started rather late which in turn caused the Congress Kingdom's economy to lag far behind the most developed economies of the West until the beginning of the First World War.

Table 9: GDP *per capita* in the Congress Kingdom and the most developed countries (GK$ 1990)

Year	Congress Kingdom (1)	Congress Kingdom (3)	UK	Germany	US
1870	902	940	3190	1839	2445
1894	1127	1139	4029	2598	3314
1912	1724	1795	4762	3524	5201

Sources: own estimates for the Congress Kingdom; for other countries the Maddison Project 2013.

Table 10: GDP *per capita* of the Congress Kingdom (CK) as a share of the GDP per capita of the United Kingdom (UK), Germany (D) and US

Year	CK (1)/UK	CK (3)/UK	CK (1)/D	CK (3)/D	CK (1)/US	CK (3)/US
1870	28.3	29.5	49.0	51.1	36.7	38.4
1894	28.0	28.3	43.4	43.8	34.0	34.4
1912	36.2	37.7	48.9	50.9	33.1	34.5

Sources: own estimates for the Congress Kingdom; for other countries the Maddison Project 2013.

Is the story of Congress Kingdom similar to others peripheral economies or is the case of the Polish lands under Russian rule unique? Was the Congress Kingdom's economic growth one of the fastest in the Russian Empire as suggested by Kochanowicz? To answer these questions we compare the GDP *per capita* for the Congress Kingdom to other peripheral economies: Spain, Italy, Portugal, Finland, Hungary, Czechoslovakia and Russia (Tables 11 and 12).

Table 11: GDP *per capita* in selected countries (GK USD 1990)

Years	Congress Kingdom (1)	Congress Kingdom (3)	Russia	Finland	Czecho-slovakia	Hungary	Spain	Portugal	Italy (Centre-North)
1870	902	940	-	1140	1164	1092	1207	975	1542
1890	1127**	1139**	866	1381	1505	1473	1624	1128	1690
1900	1404	1479	1196	1688	1729	1982	1786	1302	1855
1913	1724***	1795***	1414	2111	2096	2098	2056	1250	2305
1913/1870	1.91	1.91	1.63*	1.85	1.80	1.92	1.70	1.28	1.49

*- 1913/1890;**- 1894, *** - 1912
Sources: Maddison Project 2013, Congress Kingdom - own estimates.

Table 12: Average growth rates of GDP *per capita* in selected countries (%)

Years	Congress Kingdom (1)	Congress Kingdom (3)	Russia	Finland	Czecho-slovakia	Hungary	Spain	Portugal	Italy (Centr-North)
1870-1890	**1.12**	**0.96**	**-**	**0.96**	**1.29**	**1.51**	**1.49**	**0.73**	**0.46**
1890-1900	**2.22**	**2.65**	**3.28**	**2.02**	**1.40**	**3.01**	**0.96**	**1.44**	**0.94**
1900-1913	**1.73****	**1.63****	**1.30**	**1.74**	**1.49**	**0.44**	**1.09**	**-0.31**	**1.68**
1870-1913	**1.55/1.95***	**1.55/2.06***	**2.15***	**1.44/1.86***	**1.38**	**1.53**	**1.25**	**0.58**	**0.94**

* 1890−1913; ** 1900−1912
Sources: Congress Kingdom − own estimates; Maddison Project 2013.

Our estimates did not confirm Kochanowicz's hypothesis that the Congress Kingdom was one of the fastest growing regional economies of the Russian Empire. Although the Congress Kingdom experienced one of the highest level of GDP *per capita* among Russian regions (see Markevich's estimates for 1897), the average rate of economic growth was similar to the rate of the entire Russian Empire or even lower (see table 5). According to our estimates, we can argue that the development of the Congress Kingdom was rather slow and followed the path of the rest of the Russian Empire.

Compared to other peripheral economies, the Congress Kingdom's level of GDP *per capita* was one of the lowest during the entire period. The path of economic growth was similar to Finland which was another part of the Russian Empire; in the first two decades the growth rate was rather low and then until WWI, the economy grew very rapidly as did the whole economy of the Russian Empire. The average rate of economic growth during this entire period was more or less the same as in other countries of Eastern Europe (Czechoslovakia, Hungary, Finland), but the Kingdom's economy developed much faster than the Southern countries, even in the first two decades of lower economic growth (the only exception was Spain in the 1870s and 1880s). Therefore, we can conclude that the development of the Congress Kingdom was similar to other countries of the region and better than the Southern countries (although similar to the whole Russian Empire), fast economic growth started later than in other countries of the region.

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