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# Income distribution in Warsaw in the 1830s

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## Abstract

In this paper, I estimate income inequality in Warsaw in the early XIX century. The data source is the 1833 tax census. I compare the income of Jews and Christians and investigate the spatial dimension of income inequality in the city. In 1833, income inequality in Warsaw was very high by modern standards, and medium by contemporary standards. The Gini index stood at 0.59, and the share of the top 1% was 19%. The inequality extraction ratio equaled 76%. A high level of economic inequality and inequality extraction might be driven by the fact that Russian Poland was still a rural economy based on serfdom. The mean income of Jews was significantly higher than the mean income of Christians. Mean income varied strongly across districts of the city. The income hierarchy of districts was quite similar to today.

**Keywords:** income distribution, inequality, Poland, social table, Warsaw

**JEL Codes:** D31; N33

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## 1. Introduction

Economic inequality is once again a subject in the mainstream of economic literature. Although most research focuses on modern societies, the literature on pre-modern societies is also expanding (e.g. Milanovic et al., 2011; Milanovic, 2016; Alfani, 2021). The investigation of economic inequality in pre-industrial times is worthwhile because it provides valuable insights into the long-term evolution of inequality. Moreover, it may provide new evidence for the debate on the link between inequality and economic growth (Kuznets, 1955; Alfani, 2021). Kaelble and Thomas (1991) quote two reasons why economic historians should be interested in income distribution. Firstly, they are interested not only in the mechanics of growth but also in its consequences. The second reason is the oft-stated proposition that inequality promotes growth. Authors investigating economic inequality in pre-modern societies use various sources – social tables, population censuses, fiscal data, or even archeological records.

In this paper, I investigate the distribution of income in Warsaw in 1833, at the very beginning of the industrialization process. The first steam mills had already been installed in the city by this time, but the structure of the society was still pre-modern (Drozdowski et al., 2017). First capitalist enterprises coexisted with feudal structure of the society and political institutions. The income distribution is estimated based on the administrative tabulations from the tax census conducted in 1833. My data source reports the number of taxpayers of class tax (occupation-based income tax) in each bracket on the city level and the district level. Outcomes are reported separately for Christians and Jews, which reflected old, feudal rules.

There are three important contributions made by this paper. The first is the estimate of income inequality. By using city-level (or regional data) data we are able to provide estimates of economic inequality in earlier periods (e.g. Van Zanden, 1995), than scholars studying inequality on a national level (e.g. Bukowski & Novokmet, 2021). According to our results, the Gini index stood at 0.59. The top 1% controlled 18.7% of total income, while the bottom 50% received 15.3% of total income. Our estimates of economic inequality show that income inequality in the city was already high before the beginning of the industrialization process. High degree of inequality extraction supports the conclusion on the positive impact of serfdom on income inequality (Malinowski & Van Zanden, 2017). A comparison of our results with the results of Piltz (1929), who investigate the income distribution in Warsaw in 1925, suggests that income inequality in Warsaw declined between 1833 and 1925, despite economic growth and industrialization. This outcome contradicts the hypothesis that economic inequality is a product of economic growth.

The second contribution made by the paper is input in the debate on the role of Jews in the Polish economy. This issue is important in context of the debate on the roots of antisemitism. In his seminal book on antisemitism in Europe before the Holocaust, Brustein (2003) identifies the religious, racial, economic, and political roots of antisemitism. Levine (1993) sees antisemitism in early modern Poland mainly as the product of economic factors. Jews were overrepresented (in comparison with their share in the general population) in trade, and the cities and were seen as profiting at the cost of society. Although Polish historiography provides significant evidence for this overrepresentation, quantitative data on the position of both religious groups in the income distribution is missing. We use tax tabulations to provide empirical evidence on this issue. Comparing the incomes of Christians and Jews, we may assess the relative position of both religious groups in income distribution. We indeed find that Jews enjoyed higher incomes than Christians. The mean income of Christians stood at 863 *złotys* (ZŁ), while the mean income of Jews was 30% higher (1 111 ZŁ). Jews were overrepresented in the deciles 7 – 9, and at the very top (0.1%) of the income distribution, while Christians were overrepresented in the bottom 50% of the income distribution. This result contradicts the earlier research of Marcus (1983), who find that at the end of the XVIII century Jewish townsmen earned five times less than non-Jewish townsmen. To some extent, this religion-based income gap is the outcome of the selection process. Although during the Napoleonic period the constitution of the Duchy of Warsaw forbade religious discrimination, the new rights of Jews were quickly taken away. Therefore migration to Warsaw was more difficult for Jews than for Christians.

The third contribution made by this paper is the description of the spatial dimension of income inequality in Warsaw in the 1830s. I estimate the mean income, income inequality, and the share of homeowners in each city district (*cyrkuł)*. I find that in the richest district, mean income was over two times higher than in the poorest district. Similarly, as in earlier periods, central districts were richer than city peripheries. Income inequality was high not only on the city level but also within each district. Although Warsaw was nearly completely destroyed during World War II, the spatial distribution of income in Warsaw in the early XIX century was very similar to today.

In the next section of the paper, I review the historical estimates of economic inequality in Poland, the literature on the role of Jews in the Polish economy in the pre-industrial era, and the social topography of Warsaw. In the next section, I present data and research methods. The distribution of income in Warsaw is presented in Section 4. Then I compare the incomes of

Christians and Jews. The spatial dimension of income distribution in Warsaw is discussed in Section Six. The last section concludes and discusses directions for future research.

## 2. Literature review

### 2.1 Economic inequality

For decades, social scientists and economic historians have been interested in measuring economic inequality and its change over time. The link between economic growth and inequality is one of the most important topics in this research area. In his seminal paper, Kuznets (1955) claims that economic growth firstly increases income inequality, but later (when the benefits of economic growth are available for wider segments of the population) decreases it. Van Zandnen (1995) suggests that the 'super Kuznets curve' could be found in the Dutch republic, connecting pre-industrial and industrial economic growth. Milanovic (2016) argues that multiple Kuznets curves may be identified in the past. According to Piketty (2014, 2019), the long-term evolution of economic inequality may be explained by the gap between the interest rate (capital return) and economic growth. Recent research suggests that economic inequality may tend to grow continuously (Alfani and Ammannati, 2017), unless stopped by extraordinary events such as epidemics or war (Alfani, 2010; 2022; Scheidel, 2017). However, in Finland, economic inequality declined during industrialization (Bengtsson et al., 2019). In XVI century Poland, due to serfdom, there was greater inequality in rural areas than in the more economically developed capital of the country (Malinowski and Van Zanden, 2017). The evidence on the long-term evolution of economic inequality is expanding, but the overall picture of the link between economic growth and inequality is mixed. Long-term change in economic inequality cannot be analyzed without historical context, ignoring existing institutions.

The issue of the link between inequality and economic growth has been extensively studied by Lindert and Williamson (1980, 2016). They conclude that "*The link between income inequality and the rate of growth is very tenuous and pliable. It depends critically on the source of both the inequality and the growth*" (1980, p. 290). "*Inequality movements are driven not by any fundamental law of capitalist development, but instead by episodic shifts in six basic forces: politics, demography, education policy, trade competition, finance, and labor-saving technology. […] four centuries of American inequality can hardly have been driven by some capitalist law of motion*." (2016, p. 12)

Alfani (2019, 2021), Roine and Waldenström (2015), and Milanovic et al. (2011) review the literature on economic inequality in the pre-modern period. Brenner et al. (1991) is a

worthwhile reference for discussing older literature. Inequality is not a recent phenomenon caused by the industrial revolution. A substantial level of economic inequality existed also in pre-industrial societies, and also in ancient times (Milanovic et al., 2007; Fochesato et al., 2019). Milanovic (2018) identifies urbanization, population density, and colonization as factors associated with the rise of economic inequality in the pre-modern era. According to Alfani and Di Tullio (2019), regressive taxation to fund the increasing costs of wars was also an important reason for growing inequality.

Although our knowledge of the long-term evolution of economic inequality in Poland remains limited, it has expanded significantly in recent years. Malinowski and Van Zanden (2017) estimate income inequality in Poland in the late XVI century. Bukowski & Novokmet (2021) study the long-run evolution of income inequality in Poland since the last decade of the XIX century. We extend their research, providing earlier estimates of income inequality. Wagner (2016, 2020a, 2020b) measures wealth inequality in selected cities of the Polish-Lithuanian Commonwealth in the XVII and XVIII centuries. Poniat (2015) provides data on wealth inequality in Grodno in 1794. Wroński (2022b) estimates economic inequality in the Duchy of Warsaw. Wroński (2022a) estimates wealth inequality in Poland in the early 1920s based on administrative tabulation from extraordinary wealth tax. Kopczyński (2018, 2019, 2020) and Kopczyński and Rodak (2021) investigate evolution of social inequality using antrophometric data. Wroński (2021a) investigates the long-term evolution of intergenerational educational mobility. Koryś (2018) is the best source on the economic history of Poland for English-speaking readers. Brzeziński et al. (2020) provide top-corrected measures of wealth inequality in the XXI century. Wroński (2021b) estimates multidimensional inequality.

Among estimates of income inequality at the city level available in the literature, some are of particular interest. Wroński (2022b) estimates income inequality in the Duchy of Warsaw (also known as Napoleonic Poland) in 1810/11. He finds a moderate level of income inequality in the Duchy, but a relatively high level of income in the biggest cities. His research is also based on occupation-based income tax, which was introduced in the Duchy. Malanima (2006) estimates income inequality in Naples based on data from occupation-based income tax introduced in the Napoleonic era. Tilly (2010) also uses data from occupation-based income tax to estimate inequality in Prussia in the third quarter of the XIX century. Lindert and Nafziger (2014) provide estimates of income inequality in St. Petersburg and Moscow, two capitals of Russia. Milanovic et al. (2011) and Milanovic (2018) discuss the estimation of income inequality based on social tables.

In the 1830s Russian Poland was still a rural economy. The urbanization rate was under 10 % (Bukowski et al., 2019). Bukowski et al. (2019) estimate the GDP per capita of the Russian partition at 1220 2011GK$, approximately 35% of the GDP per capita in Great Britain. Agriculture was still based on serfdom. Serfs were allowed to leave the village but all their wealth was controlled by the landowners, usually Polish nobles. This, of course, limited the mobility of serfs Malinowski & Van Zanden (2017) in their study on income inequality in Poland in the late XVIth century discuss the impact of serfdom on income distribution. They argue that unequal political structure resulted in highly unequal income distribution. Within the agricultural sector, landlords profited from exploitation, which raised income inequality. Mobility restriction lowered wage competition within cities. Extraction in the agricultural sector secured the inflow of food. The high income of the landed elite created the demand for luxury goods produced by skilled workers. Surplus extraction redirected resources from the agricultural to the urban sector (Malinowski, 2016a). In the years 1500 – 1800 Polish economy was characterized by the widest income gap between the urban and rural sectors in Europe (Malinowski, 2016b). Skill premium in Poland was among the highest in Europe (Malinowski, 2016b; Van Zanden, 2009). Findings on the impact of serfdom on income inequality in the earlier periods may be also relevant in our case.

There is growing evidence that high levels of economic inequality predate modern economic growth. Tax tabulations are a good data source to estimate the distribution of income and measure income inequality. Therefore we use data from the collection of the class tax to estimate the income inequality in Warsaw. There are no other estimates on income inequality in Warsaw in the premodern period available in the literature. Following the literature discussed above, we formulate the following hypothesis:

**H1**. Income inequality predates modern economic growth. Income inequality in Warsaw in the 1830s was high.

### 2.1 Jews in the Polish economy in the pre-industrial era

In his seminal book, Levine (1991) discusses the role of Jews in the Polish economy in the early modern period. His research covers the period from around 1500 up to the partition of Poland in 1795. He concludes that in Catholic Poland, probably the most anticommercial country in Europe, Jewish commercial activities reconciled the contradictions between feudal economy and idealized autarky and the lords' need for goods that could not be generated on the estate. Jewish merchants, agents, traders, and bankers allowed lords to enjoy their principled

critique of trade without sacrificing their luxuries. Jews often served as managers of feudal estates, especially in royal estates. According to Levine "[…], *the Jews had helped the gentry to "save the system" of single-crop agriculture against rebellion from within, and market forces from without*" (Levine, 1991, p. 235). Jews were a useful source of revenue, not only for lords, but also for the state. In the late XVIII century, the Jewish poll tax accounted for almost a quarter of state revenues. Jews also paid many other special taxes (Marcus, 1983). Foreign visitors were surprised that Jews played such an important role in Polish economic life (Polonsky, 2013). However, at the same time, Jews were criticized for not engaging in "productive" activity, especially for lack of involvement in agriculture. They were blamed for economic failures, including the failure to modernize the economy. Even Stanisław Staszic, one of the leading reformers of the Polish Enlightenment, wrote a treatise on the "*harmfulness of Jews*" (Staszic, 1816/2003), in which he accused Jews of profiting from Polish peasants and taming the development of the industry. He argued that Jews control an increasing share of national income and wealth, and increase their share in the population. For Staszic this increase was taking place at the cost of the Christian population because Jews only traded goods instead of producing goods. Easily identifiable subgroups could serve as an explanation for conflicts that were difficult to resolve, and Jews indeed served as a convenient scapegoat (Polonsky, 2013). Levine sees economic conditions as important roots of antisemitism in Poland. Brustein (2003) discusses the economic roots of antisemitism in Europe in general, and in France, Germany, the United Kingdom, Italy, and Romania specifically. In all these countries, Jews were overrepresented in non-agricultural commercial activities, especially among moneylenders, and merchants. They served as scapegoats during economic crises and were accused of getting rich at the cost of the rest of society. Eisenbach (1972) describes the rights of Jews in the Congress Kingdom (Russian partition of Poland) in the XIX century. Szuchta (2015) is a worthwhile reference on the history of Jews in Poland.

Marcus (1983) provides indicative comparisons of the income of Jews and Poles in 1791. He finds that Jewish townsmen had five times less income than non-Jewish townsmen. While non-Jewish urban citizens enjoyed an average income of 157 ZŁ per capita, Jews on average had an income of only 30 ZŁ. According to Marcus in 1791, per capita income in Poland stood at 34 ZŁ in the case of the population as a whole, 81 ZŁ in the case of townsmen, and 24 ZŁ in the case of non-townsmen. However, his estimates are at best doubtful. No clear information on the assessment method is provided. Poniat (2015) investigates the wealth distribution in Grodno in 1794 based on wealth tax data. He finds that Jews were underrepresented in the

bottom half of the wealth distribution (the share of the Jews in the poorer half of the society was lower than the share of Jews in the general population), and overrepresented in the middle 40% of the distribution.

Borzymińska (2019) discusses the position of Jews in Warsaw in the late XVIII century. The legal situation of Jewish residents of the city was complicated. In 1527 Polish King Sigismundus I the Old issued the privilege *"de non toleranidis Judaeis"*, which forbade the Jews to reside in Warsaw. However, in 1570 Sigismundus II Augustus allowed for the temporal residence of Jews in the city. He also allowed Jews to reside in city peripheries. Jews were seen in Warsaw as migrants and strangers, even though many of them were born and died in the city. In 1775 Polish Parliament allowed Jews to reside within the city walls. However, their existence in the city was still highly controversial among Christian citizens of Warsaw. Jewish merchants were often accused of out-competing Christian competition, and they were also blamed for economic crises. The strong representation of Jews among city merchants raised the accusations of living at the cost of others, not by the work of their own hands. In 1807 the Constitution of the Duchy of Warsaw made all citizens equal before the law, but soon many new rights of the Jews were suspended (Eisenbach, 1972).

Aust (2018) describes the rise of the Jewish economic elite in Warsaw in the early XIX century. Jewish entrepreneurs profited from army procurement during the Napoleonic wars. They amassed significant wealth supplying all of the armies involved, and later the reorganized Polish army after 1815. Jews profited from earlier experience in trade and cross-national social networks. Jewish suppliers became important creditors of armies and the state. In the years 1810/11, Christian suppliers provided only 20% of the value of total supplies for the army. After the Napoleonic era, the richest Jewish entrepreneurs in Warsaw shifted to banking. Warsaw Jews also leased important state monopolies and were still the most important suppliers for the army, which absorbed 50% of public spending.

Warszawski (1931) investigates the social and economic structure of the Jewish population of Warsaw in 1840, seven years after the tax tabulations that we use in this paper were prepared. He was able to use archival evidence, which did not survive the Second World War. Based on official statistics, he finds that Jews were highly overrepresented among bankers, capitalists, and merchants. On the other hand, they were underrepresented among homeowners. He estimates the share of Jews in the population at 26%. According to data, which he publishes share of Jews among principal bankers stood at 58%, while the share of Jews among capitalists stood at 60%. The share of Jews among merchants equaled 64%. Among the largest merchants,

the share of Jews was even higher and stood at 77%. Warszawski notes that the data on the number of Jewish bankers and capitalists may be underestimated because official statistics might miss some less important Jewish bankers. All money lenders were Jewish because the Christian faith forbade usury. However, the share of Jews among homeowners equaled only 10%. Warszawski confirms the severe underrepresentation of Jews among public officials. He asses the number of Jewish public officials in the city at maximum 50 people.

Despite significant literature discussing the role of Jews in Polish economy in the premodern era, quantitative evidence on the position of Jews in the income distribution is missing. Tax tabulations provides data on the income of Christians and Jews. Therefore we can engage in a debate about the position of both groups in the economy, and the religious income gap. We use data from tax tabulation to empirically assess income gaps between Christians and Jews and compare the position of both groups in the income distribution. Based on the literature above, we formulate the second hypothesis.

**H2**. In the 1830s in Warsaw Jews enjoyed higher incomes than Christians.

### 2.3 Social topography of Warsaw

Mrozowski (2020) describes the social topography of Warsaw from the end of the XV century to 1569. He investigates the spatial variation of real estate value and taxes paid by residents and finds that the central areas of the city were the most prestigious. Although initially real estate on both sides of the city wall was valued similarly, real estate in areas outside the wall (suburbs, peripheries) had lower value from the 1520s. In his study on the development of credit and real estate markets in Warsaw in the same period, Łozowski (2020) reaches similar conclusions. Wagner (2020a) investigates the distribution of wealth in Warsaw in 1655 and 1702. She identifies "rich" and "poor" areas in the city, and finds "poor" areas also within the city walls (*intra muros)*, but in general peripheries of the city were poorer than its core. Łozowski (2018) investigates the property market in late medieval Warsaw.

Szczypiorski (1966) describes the economy and social structure of Warsaw in the years 1832-1862, the period between the November Uprising (also known as *Polish-Russian War 1830-31* or *Cadet Revolution*) and the January Uprising. He studies the budget of the city and the dynamics of revenues from class tax. In general, the three decades under investigation were rather a period of a stagnant economy. In 1849, revenues from class tax were the same as in 1839. In 1856, the number of taxpayers was lower than in 1836. Only after 1857 did the

economy revive and the number of taxpayers start to increase. Unfortunately, we have data on the number of taxpayers in brackets only for the early 1830s.

Kowalska-Glikman (1987) studies the social standing of the petty bourgeoisie in Warsaw in the XIX century, especially in the second half of the century. However, she does not provide any complete, quantitative assessment of the distribution of income in the city. Similarly, in his study on the social structure of Warsaw in 1897 and 1921, Trzciński (1927) only assesses the size of different social classes, not the distribution of income. Piltz (1929) investigates the distribution of income in Warsaw in 1925 based on tax data, and data from social insurance and wage surveys.

Statistics Poland (GUS, 2020) provides official estimates of the current spatial distribution of income in Warsaw. The residents of the western part of the city enjoy higher income than residents of the eastern part of the city. South Warsaw is richer than North Warsaw. Residents of the city center enjoy a medium income, but this result is to large extent driven by the higher share of pensioners, central districts have the oldest residents.

We expect that the spatial distribution of income is rather robust in the long run. Therefore we formulate the following third hypothesis:

**H3**. Income was highest in the central districts of the city.

## 3. Data and method

In 1833, the City of Warsaw introduced one of the first types of quasi-universal income tax in the history of Poland. The tax was levied to repay a large loan from the Bank of Poland (15 million ZŁ), which was taken out to finance the building of the Warsaw Citadel. The city had to bear the costs of the construction of the Citadel after the defeat of the November Uprising. November Uprising was an armed rebellion against Russian rule initiated by young Polish officers. It has begun in November 1830 and ended in October 1831. After the defeat of the Uprising, political, economic, and cultural freedoms in Russian Poland were severely limited. Martial law was imposed and lasted until 1856. A large fortress was built in Warsaw at the cost of the city to protect the city in the future. This idea was successful – in the January Uprising in 1863, Polish rebels were not able to conquer the Citadel and control Warsaw. The value of the loan equaled 520% of the city budget in 1832, 40% of the yearly income of the citizens of the city (income declared by the taxpayers of the class tax), or 75% of the value of annual food consumption in the city (Nowy Kalendarzyk Politczny, 1826).

The class tax (*opłata klasyczna*[1]) was based on a detailed classification of occupations and enterprises (over a hundred detailed categories), which were divided into thirteen income classes. The tax was levied at a flat rate of 1%. The class tax was paid by anybody with a stable source of income except for some types of state employees (e.g. public officials). Urban poor who did not have a stable source of income were exempt from taxation. Real estate ownership was also included in the tax classification. Real estate were allocated to the tax class based on their income. If the value of the income was not clear, it was assessed by a special delegation. This ensured that nobles who did not have any specific occupation and lived off the income from the agricultural activities outside Warsaw paid the class tax based on their real estate. Many important aristocrats and nobles owned palaces or other huge buildings in Warsaw, even if they lived outside the city. In 1833, the class tax was paid by 41 624 persons, approximately 30% of all city residents. The share of taxpayers in the population is similar to the share of economically active people in the population (Kowalska-Glikman, 1987). Occupation-based class taxes were often collected in the XIX century. The first class tax in Poland was collected in the Duchy of Warsaw to finance the development of fortifications. Unfortunately, no archival evidence on the income distribution in Warsaw at that time survived (Polish central archives lost over 90% of resources during World War II). The Kingdom of Naples similarly introduced an occupation-based income tax in the Napoleonic period (Malanima, 2006). Income tax based on the classification of occupations was also collected in Prussia (Tilly, 2010). In the early XIX century, tax administration was not yet developed enough to measure the exact income of taxpayers and thus relied on proxy measures.

The tax census conducted in 1833 is the data source I use to measure income inequality in Warsaw at the very beginning of industrialization. During the census, owners of houses reported the professional activities of all residents, including themselves. The declarations made by homeowners were verified by census commissions established in each district of the city. The outcomes of the tax census are available in the Central Archive of Historical Records. Although this data source has been discussed by historians before, it was never used to estimate income inequality. Eisenbach (1965) discusses the context of the implementation of the class tax and presents the main outcomes of the census. Although the class tax was collected until 1893, no data on the distribution of taxpayers among income classes is available for other years (Szczypiorski, 1966).

[1] The direct translation of the term would be "*classical tax*". We prefer to use term "class tax" to follow existing literature on occupation-based income taxes (Tilly, 2010).

Administrative tabulations from the 1833 tax census show a number of taxpayers in each of the thirteen income classes. In practice, the top class is divided into two groups, because there are only nine taxpayers, and income is reported for each taxpayer in the top class (100 000 ZŁ or 200 000 ZŁ). Outcomes are reported for the whole population and separately for Christian and Jews. This reflects old feudal rules. Moreover, the census separately reports outcomes in each district of the city. Information on the number of real estate owners is also provided, but only in the case of Christians, in 1834. However, because at that time Jews enjoyed only limited rights to acquire real estate, this probably covers the majority of real estate owners. Because administrative tabulations based on the 1833 tax census divide the city population into thirteen different occupation classes, they may be seen as the social table. In 1836 collection of the class tax from Jewish taxpayers was commissioned by the city to Jewish institutions. A separate tabulation of Jewish taxpayers exists for 1836, but data on the distribution of Christian taxpayers is missing. We compare the data number of Jewish taxpayers in tax classes in general tabulation for 1833 and Jewish-only tabulation for 1836 in Section 5, when discussing the position of Christians and Jews in the income distribution.

To better assess income inequality, we measure it using multiple metrics. Firstly we calculate the Gini Index, Theil Index, and Mean Log Deviation. Gini coefficients put greater weight on the middle of the distribution, The Theil Index reflects the top of the distribution to a greater extent, while the Mean Log Deviation is more sensitive to the bottom of the distribution. Then, to better assess the relative standing of different groups of the population, we estimate also income shares. Because inequality measures used in this paper are well known to the researchers, we do not discuss them here. Cowell (2011) provides an excellent review of the inequality measurement methods.

Our estimates of income inequality in Warsaw in 1833 are based on the social table. They reflect between-group inequality, but do not reflect within-group inequality and thus underestimate income inequality. This is a common problem in the estimation of income inequality based on social tables (Milanovic et al., 2011; Milanovic, 2018). Because the number of social groups is relatively high, the bias shall be small. According to Van Ourti and Clark (2011), the bias of the Gini coefficient due to grouping is 7-9% in the case of five income groups and only 2-3% in the case of ten income groups. Because our social tables include fourteen groups (1833), the resulting bias will be small. Although there are methods allowing for the correction of the bias (e.g. Kakwani and Podder, 1976; Chotikapanich, 2007; Van Ourti and Clark, 2011; Miljkovic and Chen, 2021), we refrain from applying them because in our case

the bias is relatively small as the number of groups is relatively high. Moreover, nearly none of the publications quoted in the literature review correct bias due to grouping. Therefore, applying corrections would reduce the comparability of our outcomes with the rest of the literature. To check the size of the bias, we also estimated inequality based on the generalized Pareto interpolation (Blanchet et al. 2021). The difference between baseline estimates and estimates based on the generalized Pareto interpolation is small[2]. The bias is very small also because in our case the income groups do not overlap[3].

In Section Four, I estimate the distribution of income in Warsaw in 1833 and then discuss income inequality in the city. This allows for the verification of the first hypothesis that significant income inequality predates modern economic growth. In Section Five, I compare the position of Christians and Jews in income distribution. By using tax tabulations I can empirically assess whether Jews enjoyed higher income than Christian residents of the city. The variation of the income across districts of the city is discussed in Section Five. In Section Five, I also briefly compare the spatial variation of the income in Warsaw in 1833, before 1833, and today based on official estimates of mean income in various areas of Warsaw (GUS, 2020).

## 4. Income distribution in Warsaw in 1833

The outcomes of the tax census conducted in 1833 are presented in Table 1. The total annual income of residents of Warsaw has been assessed at 38 million ZŁ. Annual income ranged from 200 ZŁ in the bottom (XIII) income class to 100 000 or 200 000 ZŁ in the top class. Four bottom classes (X – XIII) are composed of people working for pay (today we would use the term employees) and cover the large majority (over 90%) of the economically active residents of the city. The middle classes (V-IX) are formed from artisans, small merchants, and selected white-collar occupations. Class IV includes the top-earning members of the intelligentsia (best doctors, lead engineers, renowned lawyers). The top three classes are composed only of business and real estate owners. Business owners and real estate owners, as well as artisans and merchants, were classified into income classes based on the field of their economic activity, staff headcount, and quantity of production.

[2] Our estimate of the Gini index used in this paper is 0.590, the estimate based on the generalized Pareto interpolation is 0.579.

[3] Consider the classical social table with information on income of different social classes. Even if nobles enjoy higher income than burghers, some burghers may have higher income than some nobles. In our case, income (not the social class) is a categorization criterion. Therefore, for example, each member of the XIII class has lower income than each member of XII class. Thus the population is perfectly sorted (Modalsli, 2015) by groups.

In 1825 2,466 citizens of Warsaw did not have a stable source of income and were dependent on alms (Nowy Kalendarzyk Polityczny, 1826; Kołodziejczak, 1962). Therefore in our estimates of income inequality, we use an additional, "zero" class including the urban poor in the reference population. The income of the lowest tax class (200 ZŁ) was slightly lower than the cost of the bare-bones consumption basket (223 ZŁ) (Allen, 2001)[4]. The bare-bone basket is calculated for a household composed of two adults and two children. Households basket is an adult basket multiplied by 3.15 (one for the first adult, one for the second adult, one for two children, and additionally 0.15 for housing). It's possible that the poorest citizens of Warsaw had smaller families, and were more often single. On the other hand, however, our cost of bare-bone baskets may be also slightly overestimated, or the structure of the consumption in Warsaw might be different than usually assumed.

We assume the urban poor had income equal to 71ZŁ, the cost of bare-bone consumption basket for a single adult. Households of the urban poor were likely smaller than "normal" households. Moreover, their income had to be significantly lower than the income of the working population.

Some public officials (e.g. employees of the National Bank) were exempt from taxation, but they were not at the very top of the income distribution range, and thus the impact of this exemption remains limited. Available archival evidence shows that high-level public officials earned 2 000 – 5 000 ZŁ per year which situated them in classes IX – VII. To include them I add 300 people to class IX, 200 people to class VIII, and 100 people to class VIII. The data on the exact number of public officials is not available, but it should be a good approximation. Because we do not have any data on the distribution among the poorest public officials across city districts, our result on the district level disregards the corrections described in this paragraph. Because the access of Jews to public service was highly limited (Warszawski, 1931), I assume that 95% of public officials were Polish. I assume that the share of Jews among the poorest ("zero class") was the same as the share of Jews in the population.

[4] The bare-bone basket was proposed by Allen (2001) in his seminal study on European wages and prices. Like Malinowski (2016) I base the calculation of the basket on rye, which was the most often consumed grain in Poland. The source of data on prices is the same as in the case of Allen (2001) – the study on prices and wages in Warsaw in the years 1816 – 1914 (Siegel, 1949).

**Table 1. Outcomes of 1833 tax census.**

| Income class | Annual income (ZŁ) | Number of taxpayers | Christians | Jews | Example of occupations |
|---|---|---|---|---|---|
| I | 100 000 / 200 000 | 9 | 5 | 4 | large bankers, industrialist, real estate owners (e.g palaces, many buldings) |
| II | 50 000 | 10 | 5 | 5 | medium bankers, industrialist, real estate owners (e.g. large hotels) |
| III | 40 000 | 7 | 5 | 2 | smaller bankers, industrialists, real estate owners (other large buildings) |
| IV | 30 000 | 31 | 19 | 12 | best doctors, lead engineers, renowned lawyers, real estate owners |
| V | 20 000 | 85 | 73 | 12 | large artisans, journalists, real estate owners |
| VI | 10 000 | 275 | 217 | 58 | medium artisans, restaurant owners, real estate owners |
| VII | 6 200 | 530 (+100) | 392 (+90) | 138 (+5) | small artisans, small merchants, real estate owners |
| VII | 4 000 | 862 (+200) | 649 (+190) | 213 (+10) | small artisans, small merchants, real estate owners |
| IX | 2 400 | 1 854 (+300) | 1 592 (+285) | 262 (+15) | cabmen (4 horses), real estate owners |
| X | 1 400 | 3 376 | 2 640 | 736 | cabmen (2 horses), teachers, accountants, real estate owners |
| XI | 800 | 7 805 | 4 604 | 3 201 | valets, scribes, real estate owners |
| XII | 400 | 17 251 | 15 502 | 1 749 | waiters, cooks, real estate owners |
| XIII | 200 | 9 529 | 8 191 | 1 338 | porters, fishers, real estate owners |
| Zero | 71 | 2 466 | 2008 | 458 | urban poor depending on alms |
| Total | 38 148 686 | 41 624 (+3 166) | 33 894 (+2 573) | 7 730 (+ 593) | |

*Source: own estimation based on tax census.*

Estimates of economic inequality in Warsaw in 1833 are presented in Table 2. The Gini index stood at 0.59, the Theil Index was 0.87, and the Mean Log Deviation was equal to 0.62. The bottom 50% of the population received 15.3% of the total income, the middle 40% had 33.0% of the total income, while the income share of the top decile stood at 51.6%. The top 1% received 18.7% of the total income, while the top 0.1% controlled 6.0% of the total income.

**Table 2. Income inequality in Warsaw, 1833**

| Inequality measure | Value |
|---|---|
| Gini Index | 0.5906 |
| Theil Index | 0.8690 |
| Mean Log Deviation | 0.6370 |
| Share of the bottom 50% | 15.33% |
| Share of the middle 40% | 32.98% |
| Share of the top 10% | 51.68% |
| Share of the top 5% | 39.16% |
| Share of the top 1% | 18.71% |
| Share of the top 0.1% | 6.02% |

*Source: own estimation based on tax census.*

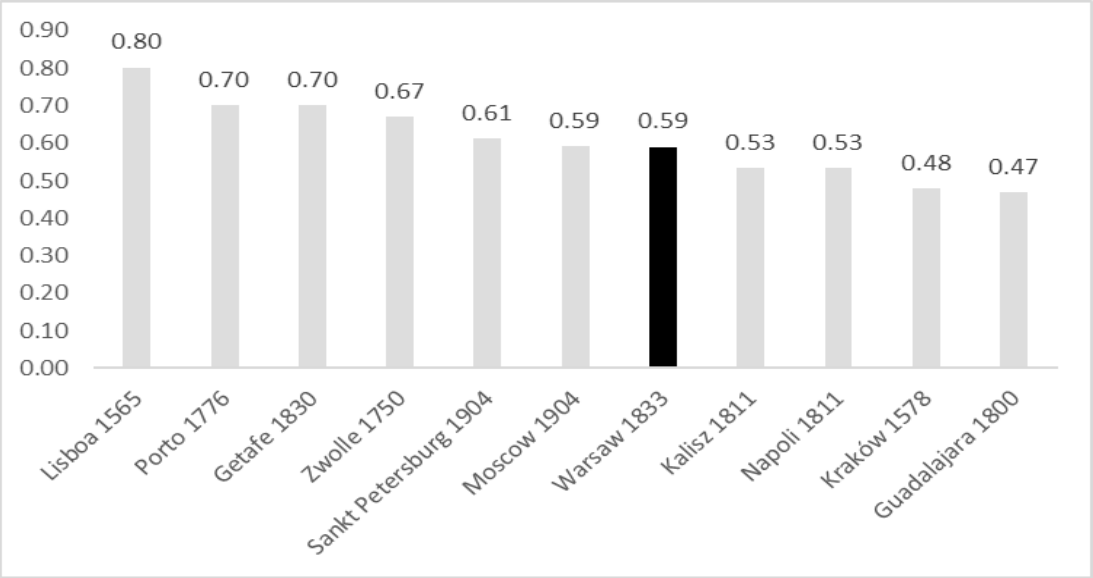
The data presented in Table 2 shows that income inequality in Warsaw was already very high before the industrialization process. Piltz (1929) investigates the distribution of income in Warsaw in 1925. He merges tax data (covering the top of the income distribution) with data from wage surveys, census, and social insurance. Although his estimates of income inequality do not comply with modern standards, his data may be still useful for us. He estimates that the top income group – the grand bourgeoisie – despite being only 0.1% of the population, received 4.1% of total income. This suggests that the share of the top 0.1% in total income in 1925 was lower than in 1833. He estimates that the top 10% (grand bourgeoisie, middle bourgeoisie, and petty bourgeoisie) received 36% of the total income. In 1833, the top decile of the income distribution controlled 52% of total income. This comparison suggests that income inequality in Warsaw declined in the years 1833 – 1925, despite industrialization and economic growth.

Our results are in line with Bengtsson et al. (2019), who document that economic inequality in Finland was high before industrialization and declined during the industrialization process. In Portugal in the years 1565 – 1770, economic inequality declined despite good economic

performance (Reis, 2017). Similarly, Bengtsson et al. (2022) find astonishingly high wealth inequality in Stockholm in the years 1650 – 1750. Malinowski and Van Zanden (2017) show that in XVI century Poland income inequality was higher in the rural sector, not in the more economically advanced urban sector. Warsaw is another example that economic inequality is not a product of industrialization and the transition to capitalism.

There are two ways to compare our measures of income inequality with the results on income inequality available in the literature. Firstly I may compare income inequality in Warsaw with income inequality in other countries. Because economic inequality is usually higher in urban areas (e.g. Lindert and Williamson, 2016; Alfani and Ammannati, 2017), such a comparison may be misleading. Therefore I compare income inequality in Warsaw and other cities, for which we have data on income inequality. Figure 1 gives historical estimates of income inequality in various cities.

**Figure 1. Income inequality in Warsaw in 1833 compared to city-level estimates of income inequality**




*Sources: for Lisboa and Porto Reis (2017); for Getafe Fernández and Santiago-Caballero (2018); for Zwolle Van Zanden (1995); for St. Petersburg and Moscow Lindert and Nafziger (2014); for Napoli Malanima (2006); for Kraków Malinowski and Van Zanden (2017) for Guadalajara Santiago-Caballero (2011); for Kalisz Wroński (2022b); for Warsaw our estimates discussed in this paper.*

Income inequality in Warsaw was lower than income inequality in Porto in 1776 (Reis, 2017), income inequality in Getafe in 1830 (Fernández and Santiago-Caballero, 2018), and income inequality in Zwolle in 1750. It was similar to income inequality in St. Petersburg and Moscow at the beginning of the XX century. However, it was higher than income inequality in Kalisz and Naples in 1811, and Guadalajara in 1800. Thus, we may assess income inequality in Warsaw in 1833 as average for the standards of cities in the pre-industrial era.

As discussed in the literature review, the evidence on the evolution of income inequality in Poland over time is scarce. Malinowski & Van Zanden (2017) estimate income inequality in late XVI century Poland, finding that in Kraków in 1578 the Gini Index stood at 0.48. Income inequality in Warsaw in 1833 was significantly higher than income inequality in Kraków in 1578. Bukowski and Novokmet (2021) estimate income inequality in Poland since 1892, finding that the income share of the top 1% in Prussian Poland in the 1890s was slightly higher than 10%. In Warsaw in 1833, the top 1% received nearly 20% of total income. Therefore, income inequality in Warsaw in 1833 was very high. Unfortunately, we cannot compare top income shares in Warsaw in the 1830s and the late XIX century, because no income tax was collected in Russia (unlike Prussia or Austria) at that time.

Because wealth taxes were introduced before income taxes, we know more about the distribution of wealth in pre-modern Poland than about the distribution of income. Wagner (2016, 2020a, 2020b) uses fiscal data to estimate wealth inequality in several cities of the Polish-Lithuanian Commonwealth in the XVII and XVIII centuries. She estimates the Gini Index for wealth distribution in Warsaw in 1702 at 0.66. Although this value is higher than the estimate of income inequality presented in this paper, it needs to be remembered that wealth inequality is always higher than income inequality. The bottom 50% of the population usually own less than 10% of total wealth, while it receives approximately 20% of total income. It is possible to live without wealth, but it is not possible to live without income. Although the gap between the Gini index estimated by Wagner (2016, 2020a, 2020b) for wealth distribution in Warsaw in 1702 (0.66) and the Gini index estimated in this paper for income distribution in Warsaw in 1833 (0.59) is significant, in this context it is rather small. For example, today in Poland, the Gini index estimated for income inequality is higher than the Gini index estimated for wealth inequality by 0.2 (HFCN, 2020; Brzeziński et al., 2020).

Milanovic et al. (2011) propose a method of inequality possibility frontier to better evaluate the level of inequality in societies living in different eras. The maximum possible inequality is an increasing function of overall income. If the average income is only slightly

above the subsistence minimum, the surplus to extract is small. If the gap between mean income and the surplus minimum is higher, there is more income to extract. The maximum Gini may be expressed as (a-1)/a, where a is the mean income divided by the subsistence income. The ratio of the actual Gini to the maximum Gini describes the inequality extraction ratio. For 28 pre-industrial societies studied by Milanovic et al. (2018), the inequality extraction ratio varies between 48% and 113%. In Warsaw in 1833, 200 ZŁ may be assessed as minimum subsistence income[5], mean income stood at 908 ZŁ. Thus, the maximum feasible Gini index is 0.7797. The Gini index was 0.5906. Therefore, the extraction ratio is 75.7%. This extraction ratio is rather high, similar to the Roman Empire in 14 (75%), Holland in 1561 (76.3%) and in 1732 (71.7%), and France in 1788 (76.1%). Although the inequality extraction ratio in Warsaw in 1833 was high, it was lower than in the Kraków Voivodeship in 1578, where it stood at 86% (Malinowski and Van Zanden, 2017). However, we should note that by so far inequality extraction ratios were estimated at the national or regional level. Estimates of the inequality extraction ratio at the city level should be treated with caution, because residents of the city may extract income not only from other residents but also from people living outside the city. This is particularly important in the context of the rural economy based on serfdom.

Our data do not provide quantitative evidence to assess the impact of serfdom on income inequality. However, the dynamics identified by Malinowski and Van Zanden (2017) were probably still there. Many palaces and important buildings were owned by the landed elite, usually residing out of the city. Skilled workers (goldsmiths, jewelers, watchmakers) were classified into high-income tax classes. The high incomes of the landed elite built on serfdom guaranteed stable demand for their products. The skill premium was relatively high.

Tax tabulations confirm that the distribution of income inequality in Warsaw was highly unequal. The estimated inequality extraction ratio confirms a high degree of inequality extraction. The high extraction ratio may be a result of the rural economy based on serfdom. The inequality extraction took place not only within the city but also between the city and rural sector. High levels of income inequality predate modern economic growth. Long-term comparisons of income inequality levels are complicated because different income concepts and inequality measurement methods are used. However, in the 1830s income inequality in

[5] The direct estimate of the cost of the bare-bones basket (Allen, 2001) for households composed of two adults and two children is 223 Zł. However, because an income-to-subistence ratio lower than 1.0 is hard to interpret, and wide segments of the population enjoyed income of 200 Zł, (lowest tax class), we prefer to use 200 Zł as the estimate of the subsistene cost. If 223 Zł was the estimate of the substience cost, the inequality extraction ratio would be 78.5%.

Warsaw was probably higher than in the interwar period. The income shares of the top 0.1% and top decile in 1833 were higher than in 1925 (Piltz, 1929). I hope that in the future, further research will allow for a more robust discussion on the long-term evolution of economic inequality in Poland.

## 5. Comparing the income of Jews and Christians

Data presented in Table 1 can be used to compare the income of Christians and Jews. The mean income of Jews was significantly higher than the mean income of Christians (1 110 vs 863 ZŁ), and the mean income of the population as a whole (908 ZŁ).

This outcome should be treated with caution because of the possible overrepresentation of Jews among the poor, as they did not have stable sources of income and did not pay (Eisenbach, 1965). The share of Jews among taxpayers (18.6%) was slightly lower than the share of Jews in the general population, which in 1830 equaled 22% (Eisenbach, 1972). In 1836, the collection of class tax among Jews was commissioned to Jewish religious institutions, which were in a better position to reach the poorest taxpayers. Jewish institutions agreed, because rich Jews controlling those institutions were threatened with higher tax rates if they did not comply. Moreover, controlling tax collection would allow them to shift the tax burden to the poor. Table 3 contains information on the distribution of Jewish taxpayers across tax brackets in 1836. Unfortunately, data on the distribution of Christian taxpayers among the classes is not available for this year.

**Table 3. The distribution of Jewish taxpayers in 1836**

| Income class | Annual income (Złoty) | Number of Jews |
|---|---|---|
| I | 100 000 / 200 000 | 1 |
| II | 50 000 | 5 |
| III | 40 000 | 3 |
| IV | 30 000 | 13 |
| V | 20 000 | 29 |
| VI | 10 000 | 71 |
| VII | | 91 |
| | 6 200 | (+5) |
| VII | | 155 |
| | 4 000 | (+10) |
| IX | | 302 |
| | 2 400 | (+15) |
| X | 1 400 | 506 |
| XI | 800 | 1 019 |
| XII | 400 | 2 434 |
| XIII | 200 | 3 581 |
| Zero | 71 | 458 |
| Total | 7 311 453 | 7 730 |

*Source: Szczypiorski (1966).*

A comparison of the distribution of Jewish taxpayers across tax brackets in 1833 (based on the tax census) and in 1836 (based on tax collection by Jewish institutions) shows that the number of taxpayers in the lowest tax brackets increased significantly (2 243 more taxpayers in class XIII, 685 more taxpayers in class XII). However, the number of taxpayers in class XI decreased by 2 182, and the number of taxpayers in the top class dropped from four to one. There is evidence that the Jewish bourgeoisie controlling Jewish institutions used tax collection to transfer the tax burden from rich to poor (Szczypiorski, 1966). Therefore, we may assume that number of Jewish taxpayers in the top classes is biased downwards. However, even based

on data for 1836, the mean income of Jewish taxpayers in 1836 (902 ZŁ) is higher than the mean income of the Christians in 1833 (863 ZŁ). The estimate that Jewish townsmen enjoyed income five times lower than the rest of the townsmen made by Marcus (1863) must be rejected.

Table 4 shows the income inequality among Christians and Jews in 1833 (based on the tax census). Although the value of the Gini index was similar in both groups, the Theil index was significantly higher among Jews (0.94 vs 0.84). The higher value of the Theil index reflects the fact that the very top income shares were higher among Jews. While in the case of Christians the share of the top 1% was 17.7%, in the case of Jews it stood at 21.7%. The gap in the income share of the top 0.1% is even higher (5.1% vs 8.9%). The gap between top income and the rest was higher among Jews than among Christians.

**Table 4. The distribution of income among Christians and Jews in 1833.**

| **Income class** | **All taxpayers** | **Christians** | **Jews** |
|---|---|---|---|
| Mean income | 908 | 863 | 1111 |
| Gini Index | 0.5906 | 0.5883 | 0.5731 |
| Theil Index | 0.8690 | 0.8401 | 0.9395 |
| Mean Log Deviation | 0.6370 | 0.6307 | 0.6199 |
| Share of the bottom 50% | 15.33% | 15.89% | 15.82% |
| Share of the middle 40% | 32.98% | 32.24% | 33.13% |
| Share of the top 10% | 51.68% | 51.86% | 51.05% |
| Share of the top 5% | 39.16% | 38.58% | 40.28% |
| Share of the top 1% | 18.71% | 17.73% | 21.68% |
| Share of the top 0.1% | 6.02% | 5.07% | 8.87% |

*Source: own estimation based on tax census.*

Table 5 shows the share of Christians and Jews in each decile as well as the top 1% and top 0.1% of the income distribution. The data presented in the Table confirm a better position of Jewish taxpayers in income distribution. Jews were underrepresented in the bottom six deciles of the income distribution and overrepresented in the top four deciles of the income distribution. Thus Jews were overrepresented among white-collar workers (members of intelligentsia), merchants and business owners. The Jewish population was concentrated in the seventh, eighth, and ninth deciles, which included over 50% of all Jewish taxpayers. In the eighth decile, the overrepresentation of Jewish taxpayers was highest. The share of Jewish taxpayers in this decile was three times higher than the share of Christian taxpayers (22.1% of Jews vs 7.3% of Christian taxpayers belonged to this decile). The shares of Christians and Jews in the top 10% and top 1% were relatively similar, while at the very top of the distribution (the top 0.1%) the share of Jews is three times higher than the share of Christians (0.23% vs. 0.07%). Our findings on the position of Jews in the income distribution in Warsaw in 1833 are similar to the results of Poniat (2015) for Grodno in 1794. These results suggest that Jews were overrepresented in the "middle class", and at the very top of society. In these income groups, shares of Jews were higher than the share of Jews in the general population of the city.

Tax data confirm qualitative evidence on the role of Jews in the Polish economy reviewed in Section Two. Jews were overrepresented (in comparison with their share in the general population) in tax classes composed of the intelligentsia, merchants, and business owners. They were also overrepresented at the very top of society. For example, despite being less than 20% of taxpayers, Jews were the majority of the taxpayers in the top two tax brackets. Jewish taxpayers enjoyed significantly higher income than Christian taxpayers. Empirical research confirms the validity of the view of Polish historiography on the role of Jews in the Polish economy in the premodern era. Tax data does not allow for the investigation if Jews in Warsaw earned their relatively good position in the income distribution by out-competing Christian merchants. However, if the accusation were true, this might be still beneficial for the residents of the city, even though bad for Christian traders.

**Table 5. Shares of Christians and Jews in each decile of the income distribution.**

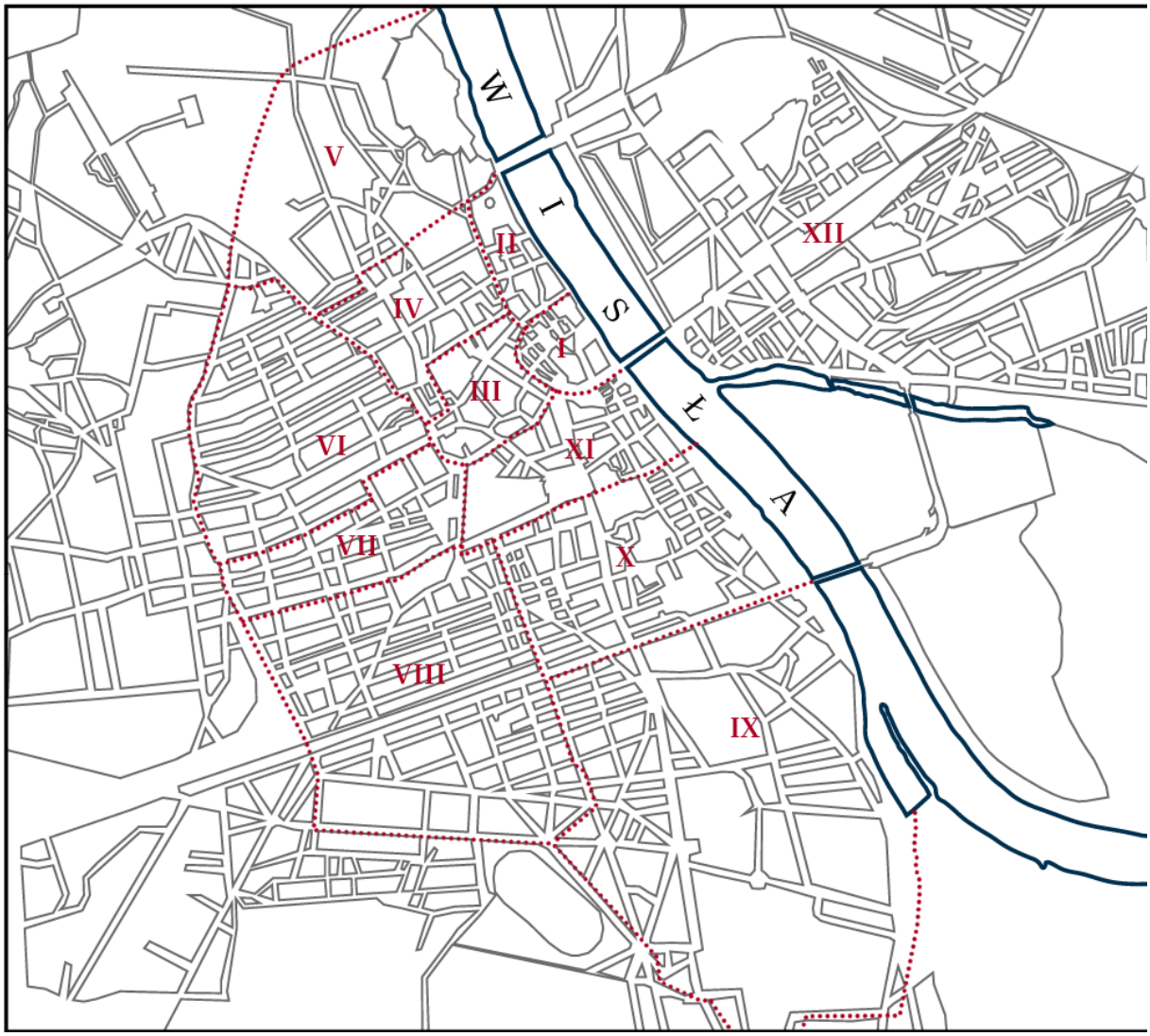
| Decile | Christians | Jews |
|---|---|---|
| I (bottom) | 10.3% | 8.9% |
| II | 10.5% | 7.9% |
| III | 10.7% | 6.9% |
| IV | 11.0% | 5.6% |
| V | 11.0% | 5.8% |
| VI | 11.1% | 5.1% |
| VII | 9.3% | 13.2% |
| VII | 7.3% | 22.1% |
| IX | 8.9% | 14.9% |
| X (top) | 10.1% | 9.7% |
| | | |
| The top 1% | 0.96% | 1.2% |
| The top 1% | 0.07% | 0.22% |

*Source: own estimation based on tax census.*

## 6. The spatial dimension of income inequality

In the 1830s, Warsaw was divided into twelve districts (*cyrkuły*). The administrative division of the city is presented in Figure 2. Our data source presents separate information on each district of the city, allowing investigation of the social topography of the city.

**Figure 2. Map of Warsaw**



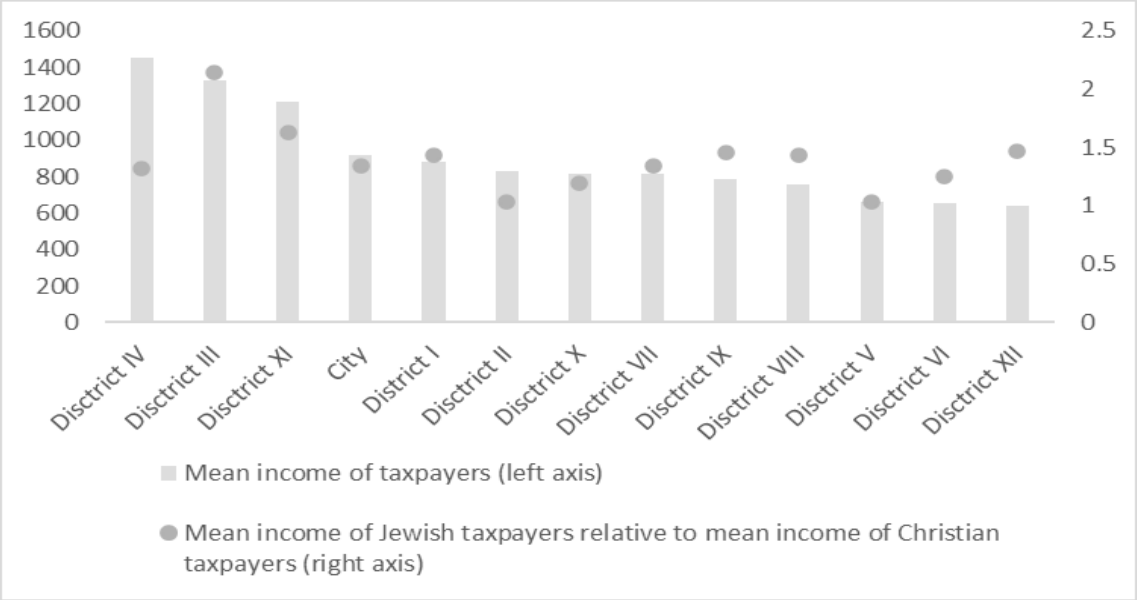

*Source: own based on Pietrzak-Pawłowska (1973).*

Even though all districts formed one city, huge income gaps existed across the city districts at the city level, the mean annual income of taxpayers was 918 ZŁ[6]. At the district level, mean income varied between 555 ZŁ in District XII and 1 452 ZŁ in District IV. Only in two,

[6] Here we ignore the corrections for urban poor and public officials because no data on district level is available (see Section 3). However, gaps between districts are big enough to not be significantly impacted by possible corrections.

relatively poor districts (District II and V) were mean incomes of Christian and Jewish taxpayers almost equal. In District III (the second richest one) the mean income of Jewish Taxpayers stood at 215% of the mean income of Christian Taxpayers (2 792 vs. 1 299 ZŁ). The mean income in each district, as well as the ratio of the mean income of Jewish taxpayers to the mean income of Christian taxpayers, are presented in Figure 3.

**Figure 3. Mean income – district level**




*Source: own estimation based on tax census.*

The results presented and discussed above show that income inequality in Warsaw was relatively high. Although mean income varied strongly across districts, income inequality was also high if measured on the district level. This shows that each district of the city formed its own inequality microcosm of rich and poor. Even in the richest District (IV), 48% of the total population belonged to the bottom two income classes. The members of the top 1% and the top decile could be found in each district of the city.

The income inequality measures (Gini Index, the share of the top 1%) calculated at the district level are presented in Figure 4. In all districts except for District XII, the Gini index was higher than 0.48, which is very high by modern standards. Income inequality measured by the Gini index was higher in rich districts than in poor districts. The top values of the Gini index could be found in District XI (0.64), District III (0.64), and District IV (0.62). District XII (the smallest one), where the Gini index stood at 0.40, is a clear outlier. Income inequality was also relatively low in District V (Gini = 0.48) and Districts VI and VIII (Gini = 0.49). The income

share of the top 1% varied between 8% in District XII and 27% in District IX. In the majority of districts, the income share of the top 1% varied between 11% and 17%.

**Figure 4. Income inequality – district level**

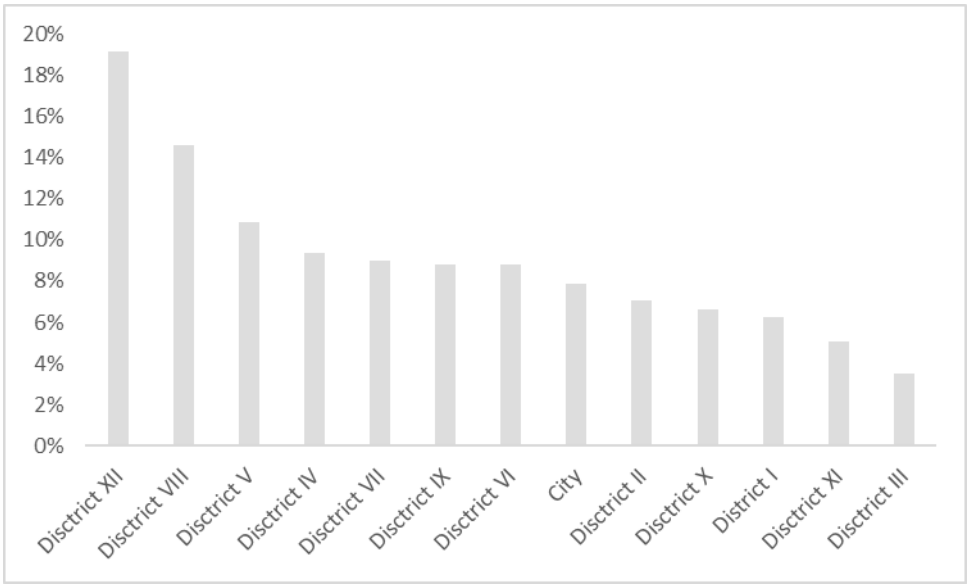

*Source: own estimation based on tax census.*

The spatial dimension of the distribution of income is similar as in earlier periods. Residents of central districts have a higher income than residents of peripheral districts. Among four central districts, districts bordering the Vistula river (II, III) were significantly poorer. Districts I and II joined the city later than districts IV and III. The southern peripheries of the city were richer than the northern peripheries. District XII, the only district east of the Vistula, was the poorest. The spatial variation of income in Warsaw in the early XIX century was quite similar to today (GUS, 2020). District XII corresponds to today's Praga, the poorest district of Warsaw. Southern districts enjoy higher income than the northern, and western districts. The robustness of the spatial dimension of inequality in the city, which was nearly completely destroyed during World War II and subsequently rebuilt, is astonishing. However, earlier research on the strategic bombing of cities in Germany (Brakman et al., 2004) and Japan (Davis and Weinstein, 2002) identify that the development of the cities is rather robust to exogenous shocks. Barylewska-Szymańska and Maciakowska (2016), who investigate the social topography of Gdańsk in the first half of the XIX century, similarly find that the central districts of the city were the richest. Literature on the social topography of Warsaw in earlier eras (Łozowski, 2020; Mrozowski; 2020 Wagner, 2020a) also identifies the central areas of the city as the richest ones.

So far, we have used only the outcomes of the tax census conducted in 1833. Our data source includes also separate tabulations based on the tax paid in 1834, which provides us with the number of taxpayers in each income class, who own and do not own a house in Warsaw. Although this tabulation covers only Christian taxpayers, it still allows the link between income and homeownership in early XIX century Warsaw to be examined. The share of homeowners among Christian taxpayers in each district is presented in Figure 5. The share of homeowners in each income decile (city-level income distribution) is presented in Figure 6.

Only 7.9% of Christian taxpayers owned real estate. When interpreting this number, we have to keep in mind that at that time it was usually not possible to own separate flats, someone owning real estate had to own the whole building. The share of homeowners in the district population (only Christian taxpayers included) varied between 3.5% in District III and 19.2% in District XII. In nine out of twelve city districts, the share of homeowners in the district population was lower than 10%. Here, the spatial dimension of results is opposite to that of income. Poorer districts had higher shares of homeowners. The reasons are clear – real estate was cheaper there because land prices were lower, more houses were built of wood, and there were more one-story houses.

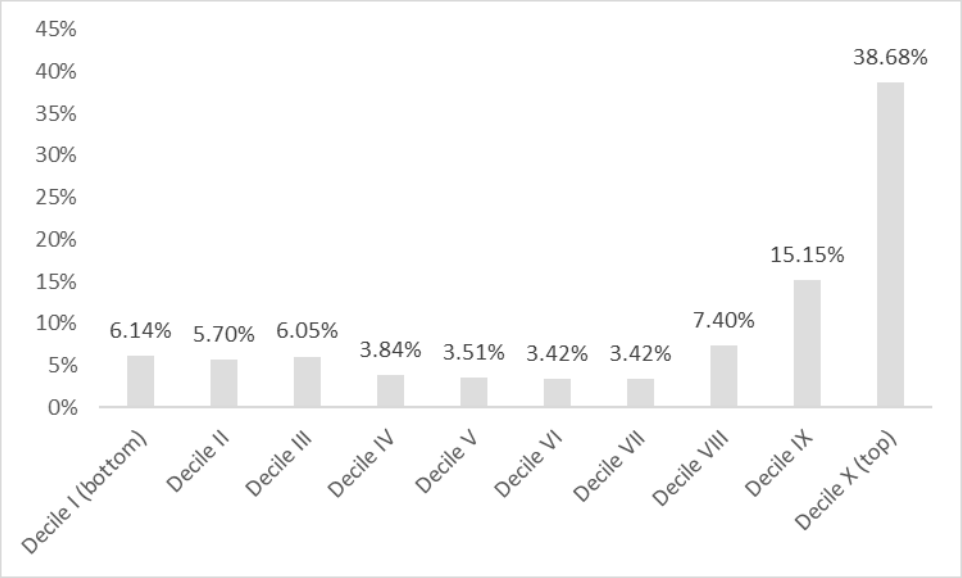
**Figure 5. Share of homeowners in the city and at the district level (Christian taxpayers only)**




*Source: own estimation based on the administrative tabulation of Christian taxpayers made in 1834.*

Taxpayers earning higher incomes had better chances of owning real estate. In the bottom, seven deciles of the income distribution, the share of homeowners varied between 3.4% and 6.1%. In the eighth decile, it stood at 7.1%, in the ninth decile it was 15.1%, while in the top decile it stood at nearly 40%.

**Figure 6. Share of homeowners in each decile of the city-level income distribution (Christian taxpayers only)**




*Source: own estimation based on the administrative tabulation of Christian taxpayers made in 1834.*

Tax tabulations confirm significant variations in income across city districts. Similarly, as in earlier periods, income was highest in the central districts. Further research on the link between income in various parts of the city in the 1830s, and today is needed, but the spatial variation of income in Warsaw in the XIXth century seems to be relatively similar to today. Data on taxes paid by homeowners clearly shows that homeownership was an important correlate of income.

## 7. Conclusions

In this paper, I provide novel estimates of income inequality in Warsaw in 1833 based on the tax census. My research contributes to the debate on the link between industrialization and inequality. I also compare the position of Jews and Christians in income distribution and investigate the spatial dimension of income distribution.

Income inequality predates industrialization and modern economic growth. According to our outcomes, the Gini index stood at 0.59 in 1833, which is very high by today's standards. In comparison with other cities in the pre-industrial era, inequality in Warsaw may be assessed as medium. In the early XIX century, income inequality in Warsaw was significantly higher than income inequality in Kraków in 1578 (Malinowski and Van Zanden, 2017), the capital of the Polish-Lithuanian Commonwealth during the Golden Era. A comparison of our results with the results of Piltz (1929), who investigated income distribution in Warsaw in 1925, suggests that income inequality in Warsaw declined between 1833 and 1925, despite economic growth and industrialization. Further research is needed, but the experience of Warsaw may indicate that industrialization and economic growth could lower economic inequality in Poland, similarly to Finland, which was also an agricultural and underdeveloped (in comparison with Western Europe) economy (Bengtsson, 2019). Our data source also provides information on the number of homeowners and their income. Only 7.9% of Christian taxpayers owned real estate in the city, and even in the top decile of the income distribution, the share of homeowners was lower than 40%.

Our data source also allows a comparison of the mean incomes of Christian and Jews. Contrary to Marcus (1983), who claims that the income of Jews in urban areas was five times lower than the income of non-Jews, I find that Jews enjoyed higher incomes than Christians and were overrepresented in the top deciles of the income distribution (except the top decile), and at the very top (top 1%, top 0.1%). The gap between the richest taxpayers and the rest was higher among Jews than among Christians.

The tax census shows the distribution of tax income in each district of the city separately. Therefore we can investigate the spatial dimension of inequality. Huge income differences existed between city districts. In the richest district, the mean income was over two times higher than in the poorest discitis. Central districts were richer than peripheries. Southern districts were the richest among peripheral districts, and the eastern district was the poorest. The spatial variation in income in Warsaw in the early XIX century was strikingly similar to today. Warsaw was nearly completely destroyed during World War II and subsequently rebuilt, so the robustness of the spatial dimension of inequality is to some extent surprising. Further research on this issue is needed.

The main limitation of this paper is the lack of estimates of inequality for other years. Polish central archives lost over 90% of archival resources during World War II, and the Central Economic Archive was burned down completely. Therefore, data availability is an important

constraint in research on Polish economic history. Because the literature on economic inequality in Poland is expanding rapidly, I hope that in the future we will be also able to discuss the evolution of economic inequality over time.

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**Conflict of interests:** The author declares that there is no conflict of interest.

**Data availability statement:** The data underlying this article are available in the Central Archives of Historical Records (pl. Archiwum Główne Akt Dawnych). Reference: "*Pobór opłaty klasycznej w m. Warszawie, vol. I.*" (1/191/0/-/5598).

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