East of Eden: The Place of Poland in The Little Divergence Debate

Polen in het debat omtrent de ‘Kleine Divergentie’
(met een samenvatting in het Nederlands)

Proefschrift

ter verkrijging van de graad van doctor aan de Universiteit Utrecht op gezag van de rector magnificus, prof.dr. G.J. van der Zwaan, ingevolge het besluit van het college voor promoties in het openbaar te verdedigen op dinsdag 21 juni 2016 des ochtends te 10.30 uur

door

Mikołaj Malinowski
geboren op 21 juni 1987 te Warschau, Polen

Promotoren: Prof.dr. Jan Luiten van Zanden

Prof.dr. Michał Kopczyński

Contents

Chapter 1: Introduction

1. Overview

Why are some countries rich whereas others remain poor? What are the origins of the exemplary economic development of North-Western Europe that remains one of the most prosperous regions of the world and why are so many countries unable to embark on a similar growth trajectory? Discussions about the timing and the explanations of the onset of the distinctive economic growth of England and the Netherlands and the reasons behind the underdevelopment of the less successful countries are known as the divergence debate.

In 2000, Kenneth Pomeranz coined the phrase 'The Great Divergence' to capture the growing gap in productivity and living standards between the West and the 'Rest'. Focusing on regional differences within both Europe and Asia, Pomeranz argued that there was no substantial difference between the two continents as late as 1800. In particular, he claimed that the Yangzi Delta, one of the richest parts of Asia, was just as developed as England and Holland. Although these claims are now widely seen as exaggerated, and Pomeranz (2011) has pushed back the first appearance of The Great Divergence to the first half of the 18th rather than the first half of the 19th century, the emphasis on regional variation in both Europe and Asia has continued to have a profound effect on our understanding of the first transition to modern economic growth. Rather than seeing the whole of Europe as developed and the whole of Asia as backward, a more nuanced picture of the process of development on both continents has emerged.

Discussions about the origins of developmental inequalities within Europe are known as 'The Little Divergence' debate. Economic historians analyse the economic performance of England and the Netherlands in the centuries leading to the Industrial Revolution in order to discover when exactly they began to develop differently and what the conditions were that allowed them to sustain their unique economic growth. Furthermore, scholars are interested in knowing what constrained economic development in the less successful European countries. Economic growth and development is a complex and multifaceted phenomenon. Therefore, economists and economic historians narrow it down to clearly defined, measurable, and thus comparable aspects. In particular, preindustrial economic growth and development is captured by quantifying the material living standards of a population. The basic question is to what extent people were able to purchase the goods and services they needed and what the

differences in this regard were over time and between nations. These are usually investigated by analysis of wages and Gross Domestic Product (henceforth GDP) per capita in the population, which approximates the amounts of goods and services available to a typical citizen for consumption. Next to changes in material standards of living, inter alia, scholars investigate development of an economy by quantifying changes in market conditions. These discussions are important because, according to conventional knowledge, economic advancement of a society is conditioned on its ability to promote exchange of goods and services between its members via markets. Furthermore, according to Karl Gunnar Persson (1999: 91-130), improvement in market conditions, particularly market integration, might have stimulated stabilisation of food prices, which was of crucial importance to the material standards of living of hand-to-mouth urban waged workers. Thus far, the majority of the literature focused on comparison of the North-West with the South of Europe (most recently Malanima 2013). In general, the literature argues that whereas Italy and Spain were more successful than England and the Netherlands in the late Middle Ages, the two latter countries overtook them and became the economic leaders of the European continent in the early modern period (Broadberry 2015: 3). This shift in economic status is known as 'The Reversal of Fortune'.

The East vs North-West aspect of The Little Divergence is, however, relatively understudied. This PhD thesis addresses this gap in the historiography. It does so by investigating the relative development of the Kingdom of Poland in the early modern period. Regarding the territorial focus, the thesis investigates cities and regions that were continuously a part of the Crown from 1526 (incorporation of Warsaw and the Duchy of Mazovia to the Crown) to 1772 (the first partition of the country by Austria, Prussia, and Russia). This mostly overlaps with the territory of the present day Republic of Poland. The thesis does not analyse territories that were a part of the Grand Duchy of Lithuania, despite it being in a close political union with the Kingdom. This thesis aims at improving our understanding of material standards of living and market conditions in the area. The contribution is three-pronged. First, the thesis investigates real wages. In particular, it analyses how composition of a consumption basket used to deflate nominal wages affects the picture of The Little Divergence. It identifies that a basket based on bread, beer, and relatively large amounts of manufactured products shows Polish cities in a less favourable light than a basket composed of less processed goods. Second, the thesis proposes the first long term-series of GDP estimates for a part of the Polish economy. It investigates the Voivodeship of Cracow and suggests that the region was already poorer (in per capita terms) than England or Holland by the 16th century. Third, the thesis investigates the long-term trends in market integration, efficiency, and performance of the Polish rye market.

It identifies a secular decline in the conditions on the market. It shows that in the 16th century market conditions in Poland were more favourable than they were in the 17th and 18th centuries. This was a result of market fragmentation in the 17th century followed by stagnation in the 18th. This finding is important because, according to Victoria Bateman (2011: Tables 3-5), commodity markets in Western Europe also fragmented in the 17th century. However, contrary to the Polish case, the majority of Western markets recovered and continued to develop in the 18th century. This dissimilarity suggests that there was a divergence in the trajectories of market development between Poland and Western Europe around the turn of the 18th century.

Next to quantifying economic development, the thesis participates in discussions on the causes of the identified divergence in economic performance. In particular, this thesis puts forward a hypothesis that challenges the dominant idea that serfdom was inherently detrimental to Polish economy. In line with conventional wisdom, it proposes that serfdom might have hampered urban growth in the period of more favourable market conditions. However, during a market crisis the higher duties charged to tenant-farmers by their landlords might have fostered commercialisation of agricultural production that, otherwise, would not have found its way from risk-averse peasants to a town via a turbulent market. Therefore, serfdom might have aided urban population growth in a time of market crisis. This is important because urbanisation is commonly considered to be the essence of economic growth in the early modern era (Bosker et al. 2013). It is also one of the main factors influencing GDP (see Chapter 3).

The rest of this introduction proceeds as follows. First, estimates of relative economic development of Poland vis-à-vis England and the Netherlands will be discussed. Particular attention will be paid to what is known about wages, GDP, and market conditions. Most notably, it will be discussed that (1) the existing accounts of real wages provide a confused picture of The Little Divergence (grain wages indicate that Poland was richer while wages represented in terms of so-called welfare ratios suggest that it was poorer than England) and (2) thus far the historiography has not produced any viable long-term GDP series nor estimates of market conditions for preindustrial Poland. The second part will outline leading explanations as to why the divergence between Eastern Europe and North-Western Europe occurred. This involves explaining the success of England and the Netherlands as well as the failure of Poland. Therefore, a very brief overview of the reasons for the breakthrough to modern economic growth in the North Sea area will be provided. In particular, (1) adoption of fertility restriction, (2) access to dynamic markets, and (3) well-developed institutions of governance will be listed as fundamental to growth of the region. On the other hand, a number of factors helping to explain economic under-performance in Poland will also be considered. These issues are (1)

poor political institutions, (2) trade dependency, and (3) the re-emergence and persistence of serfdom. Particular attention will be paid to a revisionist approach towards serfdom that tries to see the labour relation not as an institution inherently detrimental to economic development but as a solution to adverse market and political conditions. The third part of this introduction will outline the objectives of the thesis, which focuses on four research questions addressed in the following chapters: (1) Do real wages represented in subsistence ratios based on the bare-bones basket identify a divergence between North-Western Europe and Poland and how do changes in composition of the basket affect the picture of The Little Divergence? (2) When did levels of GDP per capita in Poland become lower than the North-Western European values? (3) What were the long-term trends in market conditions on the Polish commodity market and were they different to the trends identified previously for Western Europe? (4) Was serfdom beneficial to the growth of urban settlements under adverse market conditions? The fourth part discusses methodologies used to reach the objectives. The fifth part outlines the data. The sixth part discusses the results. The last part proposes possible directions for future research.

2. Identification of The Little Divergence

Economic historians quantify and analyse various aspects of the overall long-term development of preindustrial economies. Regarding Poland, scholars have already conducted pilot studies into levels of human capital proxied by book production and numeracy (Van Zanden and Buring 2009; Baten and Szołtysek 2014), biological standards of living proxied by body stature (Koepeke and Baten 2005), and agricultural output (Topolski and Wyczański 1982). Furthermore, economic historians have also investigated material standards of living and market development, which are the main focus areas of this thesis. This section discusses the available accounts of wages, Gross Domestic Product per capita, and market conditions.

2.1. Wages

One of the simplest and most intuitive ways of comparing material standards of living in different places and different periods of time is to measure wages and the amount of goods and services that they can purchase. The majority of edited sources on remuneration of unskilled workers in preindustrial Europe provide insights into the living standards of urban construction workers (Allen 2001). An important issue that arises here is the units of comparison, since wages are typically paid in different currencies across space, and currencies can also change over time. Accounts of wages based on different source materials are typically converted into remuneration for one day of work in the national money of account. The numbers must then be

standardised and transformed into a common and thus comparable measure of value. One simple way of making the comparison during the period 1500-1800 is via the silver content of daily wages paid to an unskilled building worker. Since the world was largely on a silver standard at this time, different currencies could be converted to their intrinsic silver content, which thus determined their exchange rates (Hoszowski 1928: 52).

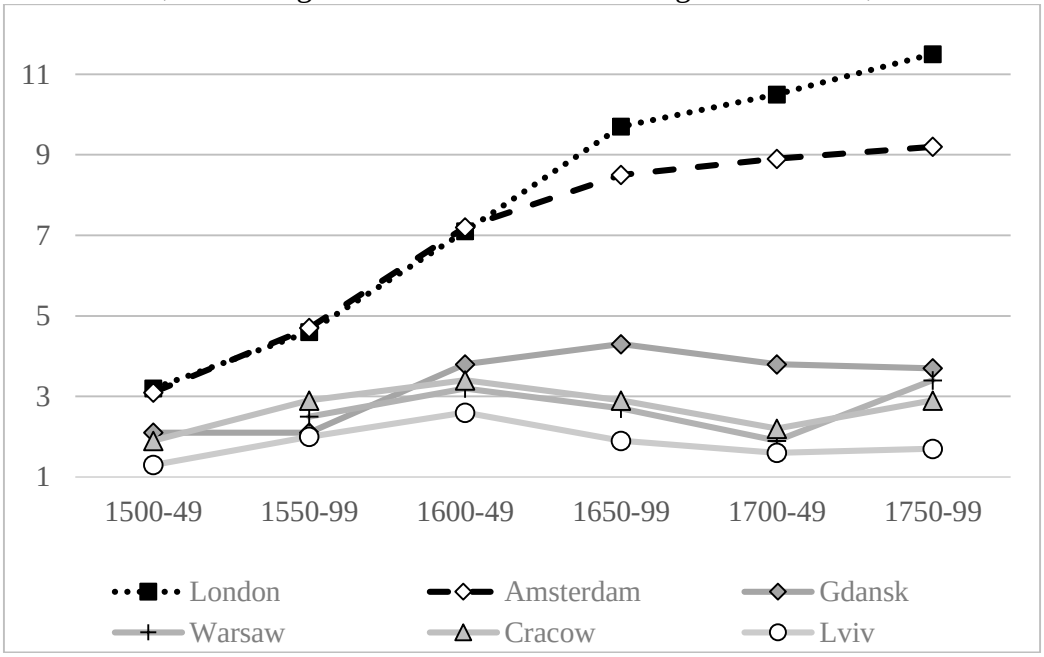
The main problem with comparing silver wages is that one gram of silver could have different purchasing power in different economies due to differences in prices. For this reason, wages are often represented in their purchasing power parity. Wages are standardised by dividing them by the cost of one commodity or a whole basket of different goods. Thus derived wages are known as real wages.

It is vital to mention the limitations of use of wages of urban workers as a measure of general standards of living in a country. First, due to the low level of urbanisation characteristic for the preindustrial period, wages of urban workers represent only a small percentage of the population (Malanima 2009: Table 5). Moreover, the wage gap between urban and agricultural workers differed across the European continent and was much higher in Eastern Europe than it was in England or Italy (see Chapter 2). Furthermore, the differences in average wages of skilled and unskilled urban workers, known also as the *skill-premium*, were much higher in Eastern Europe (Van Zanden 2009: Table 1). This means that material standards of living of unskilled urban dwellers in Poland may misrepresent the situation of both agricultural workers and skilled masters.

The silver wage, i.e. daily nominal wage represented in terms of its intrinsic silver content, has commonly been used to compare material standards of living around Europe. Regarding the comparison between Poland and the North Sea region, Figure 1 depicts average daily remuneration of unskilled workers for various time periods between 1500 and 1800 in London, Amsterdam, Warsaw, Gdansk, Cracow, and Lviv. The numbers come from the compilation made by Allen (2001: Table 2). The figure indicates that, since the second half of the 16th century, the wages of unskilled urban workers in London and Amsterdam were much higher than wages in Poland. Figure 1 also depicts differences in incomes within the country. Among the studied localities, Lviv was the poorest while Gdańsk was the richest. Moreover, in the localities shown in Figure 1, silver wages generally increased during the 16th century and into the early 17th century in both Eastern and Western Europe. This was a direct result of substantial silver flows from the New to the Old World, which resulted in a decrease in the value of the precious metal (Allen 2001: 424). For this reason, in order to gauge if the increase

in silver wages was indicative of an increase in living standards, it is necessary to examine real wages.

Figure 1: Average annual daily wage of unskilled construction workers in London, Amsterdam, and a range of Polish cities denoted in grams of silver, 1500-1800.



Source: Allen 2001.

Nominal or silver wages can be denoted in purchasing power parity terms if they are deflated by the cost of a basket of goods. A basket, in extreme cases, can be composed of just one staple or it can list a whole range of products. Composition of the basket used to deflate the wages affects the picture of The Little Divergence. There are three main baskets of goods used in the literature. They differ in their complexity. Moving from the modest to the richest basket, scholars represent real wages in terms of so-called *grain wages* if the wages are deflated only by prices of rye or wheat, the most important sources of calories in preindustrial Europe. Wages in this extreme case are therefore deflated only by prices of a single commodity rather than an actual basket composed of various goods. Real wages are also represented in (a) so-called *subsistence ratios* if the wages are deflated by a basket of goods known as a *bare-bones basket* (also known as subsistence basket) that, on top of grains, includes basic manufactured products and fuel or (b) *welfare ratios* (also known as respectability ratios) if the same wages are divided by the cost of a *respectability basket* that, in general, includes more of the same manufactured products and fuel than the bare-bones basket, but substitutes rye or wheat with processed grains, i.e. beer and bread. Whereas the bare-bone basket represents the biological minimum of consumption, the respectability basket wishes to denote a more accurate 'historical'

consumption (Allen et al. 2011; Allen 2001). Thus far, real wages in Polish cities were represented and compared with those in the North-West only in terms of grain wages (Van Zanden 1999) and welfare ratios based on the respectability basket (Allen 2001). These two studies suggest contradicting pictures of The Little Divergence.

Figure 2 shows the average number of litres of wheat or rye that could be bought by unskilled workers living in a range of European cities for their daily wage. The figure depicts grain wages in Warsaw, Cracow, Gdańsk, and Southern England. The figures for the Polish cities are based on prices of rye, the principal grain consumed in those localities, while the Western wages are deflated by the price of wheat, more widely consumed there (Wyczański 1969). In general, grain prices were substantially lower in Poland, which specialised in exports of raw materials and unprocessed foodstuffs, compared with the North-West, which specialised in exports of manufactured goods (Van Zanden 1999). Material standards of living were thus higher in the East than in the West. The only exception to this general rule was Gdańsk – the entrepôt of the grain trade in the Baltic Sea. Due to its close economic ties with the North Sea region, the city was characterised by much higher prices than other Eastern European localities (see Chapter 2). Whereas grain wages in Cracow and Warsaw depicted a clear downward trend between 1500 and 1800, wages in Western Europe remained at a stable and lower level through the period.

Figure 2: Grain wages, i.e. the average litre of grain that an unskilled worker could purchase with his daily wage, in Southern England, Poland, and Northern Italy.

Source: Van Zanden 1999.

In sum, grain wages suggest that the low silver incomes of workers in Poland were offset by the lower food prices. In other words, if we look at grain wages, workers in the country were poorer in absolute terms, but richer in relative terms than their counterparts in England. The composition of the basket, however, greatly affects our understanding of the relative poverty/richness of the people in the North-West.

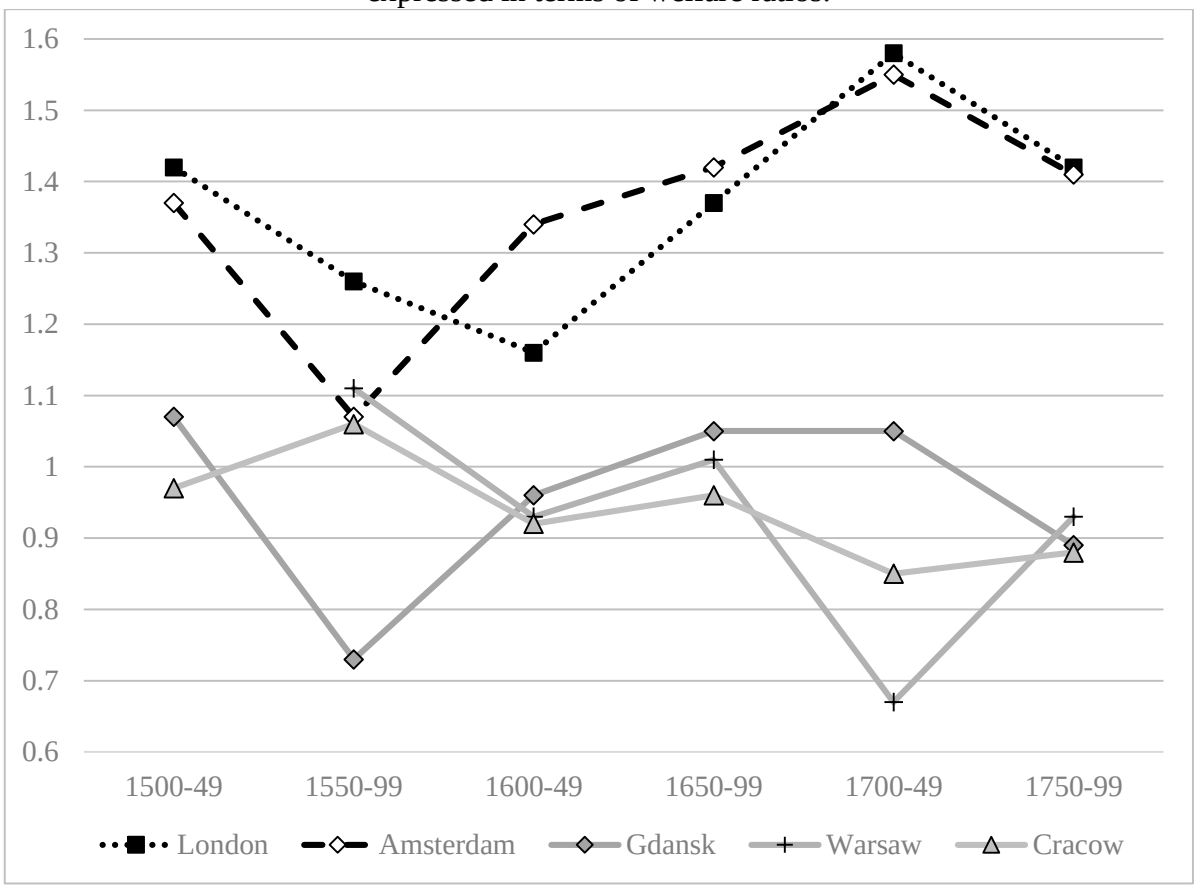
In more detail, grain wages are based on the daily incomes of labourers. Conversely, subsistence and welfare ratios are based on approximated annual income from wages deflated by an annual cost of a consumer basket for a predefined household composed of one woman, one man, and two children. In order to compute the annual income, the daily wage of a labourer is multiplied by 250, i.e. the number of days a worker is assumed to have worked per year. The methodology does not account for any other source of income. If the subsistence or welfare ratio is greater than unity, this hypothetical household was able to sustain itself and reproduce. Values below one are difficult to interpret. They may indicate that a family was forced to supplement its income with the labour input of the wife and children and/or adjust its size. Values much greater than one indicate a capacity to have more children, or to consume more meat or better clothing.

Figure 3 depicts real wages expressed in terms of welfare ratios based on the respectability basket. Substitution of grains with a whole basket of goods has a tremendous impact on the picture of The Little Divergence between Poland and North-Western Europe. According to the wages expressed in terms of welfare ratios, London and Amsterdam were clearly richer than any of the Polish cities. This supports the general conclusions based on silver wages. However, it contradicts the evidence based on grain wages that shows Poland in a much more favourable light. Figure 3 indicates that, at the beginning of the 16th century, cities representing the North Sea region already had higher standards of living than those situated in the East. However, whereas real wages in Poland stagnated around a low level equilibrium, relative incomes of unskilled workers living in Amsterdam and London increased through the 17th century.

Why does the composition of a basket impact the picture of The Little Divergence? According to Stephen Broadberry and Bishnupriya Gupta (2006: 24), due to the Balassa-Samuelson effect, income inequality between the West and the Rest (including Eastern Europe) should be greater if based on a comparison of wages deflated by manufactured and tradable products than it would be if measured with the use of baskets based on less-tradable grains and other basic but bulky commodities. This is because the North Sea region had a comparative

advantage in production of supposedly easily tradable manufactured and processed goods whereas the Rest, in general, specialised in relatively less tradable basic foodstuffs.

Figure 3: Average real wages of unskilled workers in London and a range of Polish cities expressed in terms of welfare ratios.



Source: Allen 2001.

2.2. Gross Domestic Product per capita

Gross Domestic Product is a measure of the annual flow of all goods and services in an economy. It can be measured from the production, income, and expenditure sides. In principle, all three measures should yield the same total. In historical national accounting, however, GDP is normally calculated primarily from the output side, but also making use of some income data, particularly on wages. It is worth distinguishing between the estimates of GDP for economies such as England and the Netherlands, where data are relatively abundant, so that the total can be built up from highly disaggregated data on individual sectors, and economies for which data are more limited, for which a 'short-cut' method has been developed. These GDP data can be combined with estimates of population to produce GDP per capita, which is often taken as a measure of the average standard of living. However, caution must be exercised

in using these estimates for international comparisons of living standards, since the distribution of income varies considerably across societies. This is a strong argument for considering the GDP per capita data together with the data on real wages of unskilled workers presented in the previous section. According to Luis Angeles (2008), dissimilarities between the two measures will occur if at least one of three conditions changes during the period of study: (1) the distribution of income within the studied population, (2) labour input, or (3) the relative prices of goods produced in different sectors of the economy.

The GDP per capita data for early modern Britain and the Netherlands have been constructed by Stephen Broadberry and collaborators (2015) and Jan Luiten van Zanden and Bas van Leeuwen (2012) respectively using a wide range of information on production and prices in each of the main sectors: agriculture, industry, and services. For the other European economies considered in this section, GDP per capita estimates have been constructed using the short-cut method (Malanima 2010; Álvarez-Nogal and Prados de la Escosura 2013; Pfister 2011). This involves the use of a more limited range of data, covering wages, prices, population, and urbanisation rates. Agricultural output per capita is estimated from a demand function, with the demand for food related to real wages and the relative price of food, and this is scaled up to total output per capita by using the urbanisation rate as a measure of the relative importance of the non-agricultural sector. By using the short-cut method for England and the Netherlands, for which direct estimates are also available, it is possible to demonstrate that the short-cut method captures the long run trends (Álvarez-Nogal and Prados de la Escosura 2013: 8).

Table 1 yields the available state-of-the-art GDP estimates for all studied European countries as proposed by the Maddison Project, a collaborative research effort on reconstruction of long-term accounts of income inequality around the world, initiated by a group of close colleagues of Angus Maddison, which aims to develop an effective way of cooperation between scholars to continue Maddison's work on measuring economic performance in the world economy. The yardstick of the analysis used in the project is the so-called Geary-Khamis international dollar in its purchasing power parity in the year 1990 (hereafter 1990$PPP). There are no estimates available of Polish preindustrial GDP that would be comparable with these international figures. The first account for the country denoted in this value is available for the year 1870 and was proposed by Angus Maddison (2001). According to the estimate, Poland was one of the poorest European countries at the time. However, it is undetermined whether Poland became relatively poorer than the North Sea region during, before, or shortly after the early modern period.

Table 1: GDP per capita in preindustrial Europe 1400-1870 in 1990$PPP.

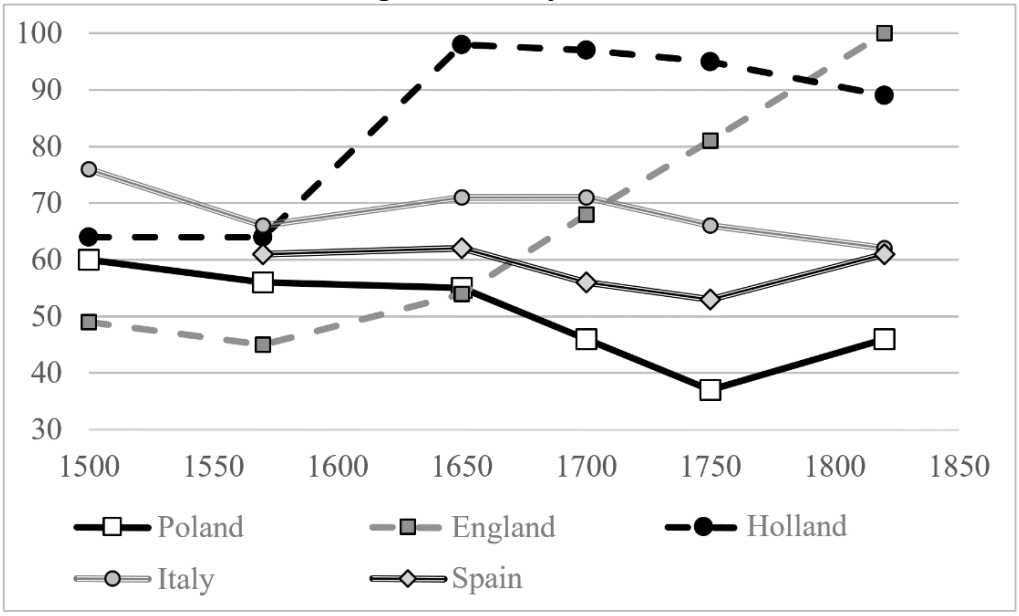
Year	England	The Netherlands	Northern Italy	Spain	Germany	Poland
1400	1,053	920	1,596	892		
1500	1,041	1,119	1,398	919	1,146	
1600	1,037	2,049	1,243	1,005	807	
1700	1,513	1.620	1,346	905	939	
1820	2.074	1,886	1,378	1,062	986	
1870	3,190	2,755	1,541	1,207	1,692	946

Source: Maddison 2001; Álvarez-Nogal and Prados De La Escosura 2013; Malanima 2010; Pfister 2011; Bolt and Van Zanden 2014; Broadberry et al. 2015; Van Zanden and Van Leeuwen 2012.

There have been two main attempts to reconstruct long-term series of preindustrial Polish GDP. None of them denoted the values in 1990$PPP. Furthermore, they have not been constructed with use of the standard methodologies common to the Maddison Project. These accounts were proposed by Jan Luiten van Zanden (2001) and Grzegorz Wójtowicz and Anna Wójtowicz (2009). Although these estimates are not directly comparable with the 'official' figures backed by the Maddison Project, they give some indication as to how long-term evolution of Polish GDP prior to 1870 could have looked, and thus merit a discussion.

In order to reconstruct long-term series of Polish GDP, Van Zanden (2001) linked estimates of agricultural production, put forward by Jerzy Topolski and Andrzej Wyczański (1982), with urbanisation levels in the country proposed by Jan de Vries (1984). The author produced his estimates by making several assumptions. First, building on Maddison's research the author assumed that the size of the Polish economy in 1820 was 46 per cent of the size of the English economy. In order to gauge the size of Polish economy at the time Van Zanden (2001: 75) arbitrarily assumed that '*GDP per capita in Poland in 1820 occupied a middle position between that of Russia and that of Czechoslovakia*'. Second, the author assumed that the secondary and tertiary sectors accounted for between 20 and 33 per cent whereas the primary sector constituted between 80 and 67 per cent of the Polish economy respectively. These assumptions allowed him to represent the size of the agricultural sector in 1820 in terms of the share of the English economy at the same time. Third, Van Zanden linked the point estimate for the relative size of the primary sector to the indexed estimates of agricultural production. This allowed the author to project the value of the primary sector backwards. Fourth, in order to estimate the historical values of the secondary and tertiary sectors, the author linked the estimate for 1820 to indexed values of urbanisation. These operations allowed Van Zanden to estimate long-term series of GDP per capita in Poland (and other countries) denoted as a percentage of the English economy in 1820.

Figure 4: GDP per capita in Poland, Holland, England, Italy, and Spain denoted as a share of English economy in 1820.



Source: Van Zanden 2001.

Figure 4 denotes Van Zanden's estimates of GDP per capita in Poland, England, the Netherlands, Spain, and Italy. The figure shows only the estimates based on the assumption that the agricultural sector accounted for 67 per cent of the economy. According to Van Zanden's figures, Poland has not always been poorer than the rest of the studied countries. In the first half of the 16th century, levels of GDP per capita in Poland might have been higher than the English and not much lower than the Dutch values. According to data presented in Figure 4, the divergence occurred only in the 17th and the 18th century as a result of growth of first the Dutch and then the English economy, mirrored by a contraction and subsequent stagnation/limited growth of Poland.

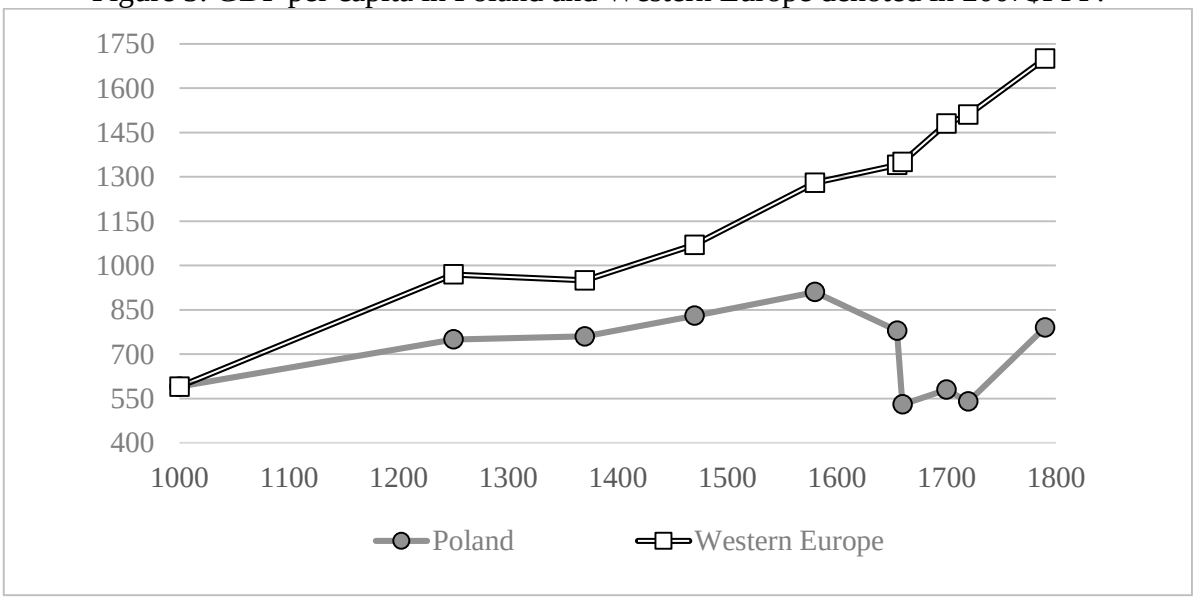
The alternative series of Polish GDP were proposed by Grzegorz Wójtowicz and Anna Wójtowicz in 2009 (the figures are based on calculations made by Grzegorz Wójtowicz in his earlier work from 2006). According to the authors, contrary to the abovementioned figures put forward by Van Zanden, the divergence occurred already before the early modern period. The authors expressed the figures in terms of 2007$PPP. However, because Wójtowicz followed a different and not sufficiently explained methodology, the estimates are not directly comparable with the findings of the Maddison Project. Moreover, Wójtowicz often did not include references to data on which he based his estimates. This makes them impossible to replicate. In spite of these limitations, Wójtowicz's work deserves a brief description.

Contrary to the majority of scholars, who estimated historical GDP by either building on data on volume of production or wages, Wójtowicz based his study on the Cobb-Douglas production function. He estimated Polish GDP with use of the equation:

$$Y = A * L^a * H^b * K^c * N^d$$

Where *Y* denotes GDP, *L* labour input, *H* human capital input, *K* physical capital input, *N* natural resources, *a-d* relevant parameters, and *A* total factor productivity. Wójtowicz (2006: 139) states that the parameters *a-d* were chosen '*as a result of subjective choice based on* [unexplained by the author] *empirical research*'. This means that it is impossible to assess their applicability. Labour input *L* was based on two arbitrary assumptions made by Wójtowicz (2006: 141): (a) that the active labour force accounted for 40 per cent of population and (b) that every labourer worked 60 hours per week. Human capital *H* was approximated by a loosely defined '*average level of education'*. Wójtowicz (2006: 143) says that *H* was derived from unexplained '*hypothetical calculations'*. The author did not explain the origin of the values for physical capital K. Natural resources *N* were approximated by the changing territory of the country. The author also did not explain how *A* was calculated.

Figure 5: GDP per capita in Poland and Western Europe denoted in 2007$PPP.



Source: Wójtowicz and Wójtowicz 2009.

Figure 5 yields the results of Wójtowicz and Wójtowicz's research. The authors juxtaposed their estimates for Poland with average values for 'Western Europe'. However, they failed to explain how this average was constructed. Wójtowicz and Wójtowicz (2009: Table 1.1) mentioned only that they based the values for the West on the figures proposed by Maddison.

Estimates for England and the Netherlands, however, have been revised upwards by the second generation of scholars (Bolt and Van Zanden 2014; Broadberry et al. 2015; Van Zanden and Van Leeuwen 2012). Having in mind the methodological shortcomings of the underpinning research, Figure 5 contradicts the findings of Van Zanden presented in Figure 4 and suggests that the divergence could have already occurred prior to the early modern period. The dissimilarity widened significantly in the 17th and the 18th centuries, both as a result of the economic expansion of the West but also due to the economic contraction and subsequent stagnation of Poland. The fact that Wójtowicz and Wójtowicz used the undervalued figures of GDP for England and the Netherlands reinforces the early divergence identified by their research.

2.3. Market conditions

Well-functioning markets are commonly seen as indispensable to economic development. Favourable market conditions are linked to a formation of an environment conducive to trade and economic specialisation within and between geographically separated markets that may lead to Smithian growth processes. Economic historians study the long-term development of markets in order to understand their role in initiating the transition to modern economic growth (Özmucur and Pamuk 2007; Bateman 2012). This issue will be discussed in more detail later in this introduction. Moreover, as already mentioned, according to Karl Gunnar Persson (1999: 91-130), well-developed markets are not only vital to economic growth but are themselves an aspect of the material standards of living. According to the author, well-developed and functioning markets might have promoted price stabilisation, which had a clear beneficial impact on the short-term well-being of hand-to-mouth workers living at the subsistence threshold.

Thus far, the majority of empirical historical research into market development in pre-industrial Europe focused on commodity (primarily grain) markets. The results of this research effort are discussed in detail in Chapter 4. The general conclusion of the existing research is that, when Western Europe is concerned, both domestic and international market conditions improved in the 16th century, worsened around the 17th century, and recovered in the 18th century (Bateman 2011; Studer 2008; Özmucur and Pamuk 2007).

Thus far, the only quantitative study of conditions on the Polish commodity markets has been conducted by Joerg Baten and Jacek Wallusch (2005), who analysed prices on the Polish grain market in the 18th century. Contrary to the aforementioned studies focusing on Western Europe that identified an improvement in market conditions, the authors identified

poor market conditions in Poland at the time. However, it is undetermined if Poland also experienced a growth in market conditions in the 16th century followed by a decline in the 17th, as was the case for many Western European countries, or followed a different trajectory of market development altogether.

3. Explanation of The Little Divergence[1]

3.1. Rise of the North Sea region

This section highlights three leading approaches to explaining the success of the North Sea area (1) the Malthusian approach, focusing on the balance between population and resources, (2) the Smithian approach, with its emphasis on access to markets and the division of labour, and (3) the Northian approach, which sees institutional change as the key to development. According to the Malthusian view, persistent economic growth in the preindustrial period was only possible if a society managed to regulate its population so as to remain within limits determined by its resources. According to Malthusian reasoning, assuming constant technology, due to diminishing returns to labour, there is a finite amount of resources that can be divided among the population. For this reason, if a population grows above a certain threshold the average standard of living begins to decrease. A society can limit its population either by a so-called 'positive check', for example a war over scarce resources or a plague resulting from malnutrition, or by a 'preventive check' i.e. by controlling the size of its population and maintaining it at the optimal level given the country's resources. This approach points to the family system in the North Sea area as a driver of development, with John Hajnal (1965) arguing for the emergence of what he called the European Marriage Pattern in North-West Europe. This (North-West) European Marriage Pattern involved late marriage for women, high proportions of singles, and nuclear families, which all helped to control fertility and prevent countries like England and the Netherlands from having wages driven down to subsistence levels.

Tine de Moor and Jan Luiten van Zanden (2010) linked the (North-West) European Marriage Pattern to their hypothesis that late-age marriage of women in North-West Europe

[1]This section has been co-authored with Stephen Broadberry and is based on: Broadberry, S. and Malinowski, M. The place of Central, East and South-East Europe in the Divergence debate. In: M. Morys (ed.), *The Economic History of Central, East and South-East Europe, 1800 to the present day.* (Commissioned by Routledge)

resulted from the strong position of women in those societies (what they call 'Girl Power'), as a result of inheritance patterns and labour market opportunities. This late-age marriage led to greater accumulation of human capital, both as a result of the labour market experience of women and the higher levels of education that could be afforded for the smaller number of children resulting from later marriage. This increased the productivity of labour and, in turn, economic growth. Despite its benefits, not all of Europe followed this fertility pattern, however. In particular, Hajnal (1965) proposed that there was a break point, known in the literature as Hajnal's line, stretching from St. Petersburg to Trieste that divided Europe into 'West' – characterised by the supposedly beneficial fertility regime – and 'East', with higher quantity but lower 'quality' of offspring. Polish historians problematised the claims made by Hajnal and provided a more nuanced picture of the 'backwardness' of Eastern Europe by putting forward examples of regions fitting into the (North-West) European Marriage Pattern located in the Polish-Lithuanian Commonwealth (see Guzowski and Kuklo 2014).

Turning to the Smithian approach, the origins of economic growth in England and the Netherlands can be linked to their access to international markets. Access to the Atlantic coast and active participation in the trans-continental trade could have affected economic growth by allowing England and the Netherlands to profit from market exchange, specialising according to comparative advantage and raising productivity through the division of labour. According to Robert Allen (2003: 432), who analysed determinants of real wages in early modern Europe, '*the intercontinental trade boom was a key development that propelled north-western Europe forwards*'. For example, due to the trade, the Netherlands, a country with limited natural resources but with relatively high population density and a skilled labour force, was able to specialise in its areas of comparative advantage, the production of a range of manufactured products and tradeable services with high added value (De Vries and Van der Woude 1997). This generated economic growth in the country. Moreover, due to their convenient position, the countries located in the North Sea area profited from being the 'middle man' between the Baltic and the Mediterranean trade zones (Van Tielhof 2002). In short, suitable geographical position gave access to markets that promoted economic growth in the North Sea area, while, for example, Eastern Europe remained too distant from those markets to reap the same benefits. This is also broadly consistent with the 'new economic geography' approach of Paul Krugman and Anthony Venables (1995) that will be described in more detail later in this chapter.

In the Northian framework, the key to development lies in institutional change. Institutions are defined as the 'rules of the game', which set the incentives for economic agents

so as to either encourage or discourage socially productive activities such as investment and innovation rather than socially unproductive or rent-seeking activities (North 1990: 3). Daron Acemoğlu and James Robinson (2012) argue that inclusive political institutions, which allowed for representation of the political interest of significant parts of the population and constrained the executive, brought about a fruitful balance between citizens and political elites. This argument has been especially well developed for England. According to Douglass North and Barry Weingast (1989), the English Glorious Revolution of 1688, a political change that weakened the king and reinforced the Parliament, was the breaking point between 'absolutism' and some form of 'parliamentary' government, and an important cause of the Industrial Revolution. However, it has also been argued that these growth-fostering institutions did not materialise from thin air, and that forms of power sharing between the ruler and his subjects go back to the Middle Ages (Van Zanden et al. 2012). The idea that constraints on the executive were predictors of economic growth has been challenged by Stephan Epstein (2000), who argued that far from constraining over-strong rulers, what was needed to break out of medieval stagnation was the strengthening of the central state so that sufficient tax could be raised to provide the public goods necessary for the integration of fragmented markets and the enforcement of property rights. According to Epstein, political centralisation deprives local elites of jurisdictional power and displaces rent-seeking from the local to the 'national' arena. This makes rent-seeking more transparent and, therefore, harder to implement. Transparency also mitigates the prisoner's dilemma problem. Furthermore, political centralisation reduces the costs of coordination, allowing for concerted decisions and policies. This should result in a convergence of legal, monetary, and measurement systems, which should lower transaction costs. Although the views of Epstein (2000) and North and Weingast (1989) may at first sight appear contradictory, Mark Dincecco (2011) shows that in early modern Europe, economic success depended on both fiscal centralisation and parliamentary control. The state needed to be strong enough to ensure market integration and enforcement of property rights, but not so powerful as to be able to intervene arbitrarily in business affairs. England and the Netherlands led early modern Europe in both the fiscal revenue per capita that they were able to raise, and also in the frequency with which parliaments met to exercise control over how those revenues were spent (Karaman and Pamuk 2010; Van Zanden et al., 2012). Conversely, parliamentarian activity declined in Poland through the early modern period (Konopczyński 1948).

3.2. Stagnation of Poland

Economic historians have been searching for an explanation for the underperformance of the Polish economy. The results of these efforts can be classified into three main themes that focus on various interconnected fundamental factors behind the retarded development of the Polish economy. These approaches link to the ideas described in the previous section. The first stream of the literature points to poor political institutions. The second stresses the importance of trade dependence towards the West. The third sees serfdom as the root cause of Polish underdevelopment.

The first narrative links the economic crisis and the collapse of the country in the late 18th century to the ineffectiveness of Polish political institutions. The Kingdom of Poland was a confederation of lands (*ziemie*). Only *szlachta*, i.e. landed nobility, had political rights in the country. At the central level, power was held by the king and the parliament (*sejm*) composed of representatives of the lands. According to Perry Anderson (2013 [1974]), the reason behind Polish economic underperformance was a lack of absolutism. In his view, the economic prosperity and development of early modern European proto-capitalism was associated with a firm executive and unified political structures that ensured the rule of law. According to Anderson (2013: 298), '*the paradoxical size of the szlachta and formal absence of any titles within it, produced a self-destructive caricature of a representative system'*. Seemingly, Epstein (2000: 51) argued that constraining the king at the turn of the 17th century, when the post became elective and the king was deprived of his judiciary prerogatives, affected Polish economic and market development negatively. Whereas Anderson concentrated on the lack of absolutism, Antoni Mączak (1987) focused on the collapse of the parliament as the prime cause behind the economic underperformance. He argued that without unified nobility capable of constraining the magnates, the landed elite was able to divide the country into quasi-mini-states where they ruled as independent feudal lords and followed their own geopolitical interests. This, to some extent, shifted the country back to the age of feudal dis-unification. The magnates behaved as medieval feudal lords and waged wars against one another and invited foreign parties to intervene. Furthermore, this power vacuum on the central level and political involvement of foreign monarchs on the local level increasingly led to the domination of foreign powers over Poland. Foreign pressure groups deliberately hampered the development of the country by promoting growth dampening policies (Grzybowski 2000). This process concluded with the partitions of the late 18th century.

Furthermore, numerous authors point to various other institutional constraints that prevented growth of the Polish urban sector. According to Maria Bogucka (1981), the relatively low levels of urbanisation were linked to low productivity of the cities, which were hampered by rent-seeking guilds that hindered innovation and competitiveness. The author states that, '*the guild system persisted in Central-Eastern Europe while its counterpart in the West gradually decomposed throughout the early modern period*. *Guilds* [in the East] *were too weak to combat the foreign competition* [i.e. imports of manufactured products from the West], *but strong enough to monopolize the production in the hands of a narrow elite of privileged masters who limited the capacity of workshops to expand as well as combated innovation* (Bogucka 1981: 13; translated from Polish). Others, in order to explain the lack of progressing urbanisation, point to the political conflict between the nobility and the cities. The nobility used its political influence to cut the growth of their potential urban competitors by prohibiting active engagement of the townsmen in international trade and limiting their rights to purchase land (Ptaśnik 1949; Kochanowicz 2006 [1991]). Moreover, according to Maria Bogucka and Henryk Samsonowicz (1986) monetary confusion and weak property rights together with the socio-political prestige of the nobility motivated urban elites to try to get into the ranks of the nobility and invest in land due to a lack of other sound investment opportunities. This hampered capital accumulation in the cities.

Regarding the second narrative, dependency theory emerged during the heyday of globalisation in the 1960s and 1970s. The question that bothered economists at the time was why, despite liberalisation of international trade and progressing economic specialisation, so many countries around the world were still not developing. A group of scholars was not convinced by the dominant explanation that the lack of growth in the underdeveloped countries was primarily a result of poor policies and corruption. They suggested an alternative explanation: that the underdevelopment and income inequality between countries was a result of a particular international 'system' that perpetuated economic stagnation of the poorer countries to the benefit of the rich ones. In particular, Immanuel Wallerstein (1974) put forward a hypothesis that the global economy was governed by a so-called World System that was exploitative in nature and was characterised by the political and economic dominance of some countries over others. Economic historians who shared this point of view, such as Marian Małowist (2010), argued that the system originated in the late Middle Ages and developed and expanded throughout the early modern period. As a result of this system, England and the Netherlands flourished economically at the time, whereas other regions – Eastern Europe in particular – remained stagnant.

Dependency theorists argue that there are different kinds of states within the World System. There are two ideal types of countries at both ends of the system's spectrum, the 'core' or 'centre' countries and their 'peripheries'. According to dependency theory, there is an international division of labour within the World System, with different roles assigned to different kinds of countries. The core countries dominate in terms of industry and technology, producing capital-intensive and high-value-added products. On the other hand, the peripheral countries specialise in resource extraction, agricultural production, and providing cheap labour. They supply raw materials and manpower, and create a demand for the high-end products from the core. As a result of this division, the peripheral countries serve the economic interests of the core states. The core countries have the political, economic, and military power to enforce unequal rates of exchange between the core and the periphery. Furthermore, according to dependency theorists, there is a class distinction within each country between the elite and the working class, with the elites, even in the poorer countries, having a vested interest in maintaining the status quo. In order to ensure the continuation of the system, the elites cooperate with one another internationally, and this perpetuates the underdevelopment of the periphery. According to dependency theorists, the whole system of international surplus extraction is made possible and reinforced by trade rather than formal political mechanisms, with trade in the system seen as a zero-sum game where the weaker side of the exchange loses to the stronger trade partner.

According to economic historians such as Jacek Kochanowicz (1989: 95-100), the trade that developed during the early modern era between the North and Baltic Seas had a tremendous impact on the development of economies on both sides of the trade route. Significant amounts of grain, wood, and other raw materials were shipped west in exchange for manufactured products. According to Bogucka (1981: 12), *'the trade relation prohibited development of domestic proto-industry* (…) *not only the nobility but also townsmen and rich peasants often preferred to buy foreign merchandise over domestic* [translation from Polish]'. On the other hand, the demand for raw materials and foodstuffs in the West are seen by Jerzy Topolski (1987: 125-136) as leading to an increase in exports from the East, which, according to the author, led to the reintroduction of serfdom in the region.

This World Systems approach is very much at odds with orthodox economic analysis, which sees specialisation according to comparative advantage leading to benefits for all, to be shared out through a competitive process determining the terms of trade. The World Systems approach has therefore been very much a minority view amongst western economic historians, but has had some influence in Eastern Europe, particularly during the socialist era

(Sosnowska 2004). However, the idea that market access can play a role in the success or failure of individual countries or regions has now been incorporated within the orthodox approach through the 'new economic geography'. Recognising the importance of agglomeration effects in a world of increasing returns, Krugman and Venables (1995) show how declining transport costs can lead to a reorganisation of activity so that industry concentrates in a rich core and agriculture in a poorer deindustrialising periphery. In these circumstances, being located in the wrong region can make it very difficult for a country to succeed, however good its institutions. Nicholas Crafts and Anthony Venables (2003) apply this approach to the historical record since 1750, concluding that this approach is helpful in understanding unequal growth from the 1870s, when transport costs declined sharply. However, this is too late to aid the understanding of the divergence of Eastern Europe during the early modern era.

Regarding the role of serfdom, according to Jerome Blum (1971: 8), serfdom essentially relates to any situation when '*the lord had complete legal jurisdiction over his peasants to the complete, or nearly complete, exclusion of the state'*. According to Boris Mironov (1996), landlords who had such a superior legal position tended to limit mobility of their enserfed peasants and charge them with high rents in money and/or labour. In the early Middle Ages, serfdom, the signature social relation of feudalism, was prevalent all over Europe. This system of surplus extraction from peasantry weakened gradually throughout the continent in the late Middle Ages. In Western Europe, the rise of powerful monarchs, towns, and an improving economy arguably weakened the manorial system through the 13th and 14th centuries. However, east of the River Elbe, in general, serfdom had never been fully abolished and coerced labour remerged in the late Middle Ages and in the early modern period (Cerman 2012). This created a crucial institutional division between the East and West, which is often regarded as one of the fundamental causes of underdevelopment of the region under consideration (Sosnowska 2004). Most notably, Acemoglu and Wolitzky (2011: 557) recently demonstrated that coercion is: '*always 'socially inefficient,' because it involves a (endogenously) costly way to transfer resources (utility) from workers to employers'*. A more detailed description of the leading ideas regarding the origins/persistence and the adverse economic impact of serfdom can be found in Chapter 5. This includes a discussion of the two major competing approaches towards the problem: (1) the geographical resource endowments hypothesis popularised by Evsey Domar (1970), and (2) the social conflict approach advocated by Robert Brenner (1976).

This negative assessment of the impact of serfdom on economic development in Eastern Europe remains the dominant view. However, a number of writers have also challenged

the orthodox view that serfdom was a very damaging institution that held back growth. According to Sheilagh Ogilvie (2007: 651) there is a growing revisionist tendency, opposed by the author that supports the conflict approach à la Brenner, to explain institutions as an 'efficient' and beneficial response to the needs of the economy. Ogilvie calls this tendency the 'whatever is, is right' approach to institutions. Sheilagh Ogilvie and Andre Carus (2014: 470) say that according to this view, '*the task of the economic historian is not to find out which institutions are most conducive to growth, but to discover how apparently inefficient and growth-discouraging institutions in past societies were actually efficient in their particular natural or cultural context, whatever the appearances'*. For example, it has been argued that serfdom was neither a result of certain exogenous resource endowments nor simply a rent-seeking practice, but it was an 'efficient' solution to various adverse economic and political conditions. One of the strongest statements of this view is by North and Thomas (1971; 1971). According to these authors, mandatory corvée duties were introduced to counterbalance the incentive of individual peasants to 'free-ride' on, among others, the military protection of the manor (North and Thomas 1971: 778). A related argument is that serfdom can be seen as an institutional response to market underdevelopment. According to Michael Bush (1996: 5), serfdom, although it delayed the development of a capitalist agriculture, provided alternative means of commercial production. The author states that '[serfdom] *promoted large-scale commercial farming in societies where various factors, such as a lack of suitable labour and primitive money economy, ruled out capitalist production'*. This could have been of crucial importance to the urban sector that dependent on a stable supply of food from the agricultural sector. Bush (1996) argues that '*the process of urbanizat*ion (…) *owed something to the productive capacity of serfdom (in grain)'*. These ideas are discussed in detail in Chapter 5.

4. Objectives

The overarching objective of the thesis is to improve our understanding of the place of Poland in The Little Divergence debate by quantitative investigation of the economic development of the country in the centuries between 1500 and 1800. In particular, this thesis aims to provide accounts of material standards of living (real wages, GDP) and market conditions in the country that would be comparable with the available international values. In the cases of GDP per capita and long-term market development, there have been no previous studies based on standard methodologies. In the case of real wages, given that existing accounts of grain wages and welfare ratios based on the respectability basket provided contradicting pictures of Polish

relative incomes, it is useful to investigate in detail how changes in composition of the basket affect the picture of The Little Divergence. This can be achieved by reconstructing the costs of the bare-bones basket, which includes less processed goods than the respectability one, and representing the wages in subsistence ratios, thus making Polish wages comparable with other international studies based on that methodology (for example Allen et al. 2011). Another objective of this thesis is to further develop the hypothesis that serfdom might have been an 'efficient' solution to various negative effects of adverse market conditions on commercialisation of agricultural production and urban growth. Whereas most of the objectives deal with identification of The Little Divergence between the North Sea region and Poland, the last objective speaks to the discussions regarding the explanation of the phenomenon.

In sum, each chapter of this thesis addresses one of the following research questions:

Chapter 2: Do real wages represented in subsistence ratios based on the bare-bones baskets identify a divergence between North-Western Europe and Poland and how do changes in composition of the basket affect the picture of The Little Divergence?

Chapter 3: When did levels of GDP per capita in Poland become lower than the North-Western values?

Chapter 4: What were the long-term trends in market conditions on the Polish commodity market and were they different to the trends identified previously for Western Europe?

Chapter 5: Was serfdom beneficial to growth of urban settlements under adverse market conditions?

Chapters 2, 3, and 4 will provide long-term series of various accounts of economic development. Chapters 2 and 3 will juxtapose levels of real wages and GDP per capita with corresponding values from England in the first case and England and the Netherlands in the latter. Chapter 3 will build on real wage series constructed in Chapter 2. Chapter 4 will only investigate trends in domestic market conditions by comparing them with the previously identified trends for Western Europe. It will not compare any levels internationally, due to methodological shortcomings (there is no standard measure of market integration that would be comparable between markets). Chapter 5 will move away from accounting. It will propose and empirically support a hypothesis regarding the possible beneficial effect of serfdom on urban growth. It will build on the measures of market conditions from Chapter 4.

It must be highlighted that, despite their partial overlap, all the chapters are intended for separate and independent publication. In fact, all the chapters have been already accepted for publication (Chapters 3 and 4 have been accepted for publication by *Cliometrica* and *Economic History of Developing Regions* respectively; Chapters 2 and 5 by have been accepted for publication by *the European Review of Economic History*). This PhD thesis is not a book in a sense that it does not put forward one coherent argument that is developed through the chapters. It is a collection of stand-alone articles with separate objectives that are linked by a common theme that is The Little Divergence debate and Polish economic development. The next section of this introduction discusses methodologies used to reach the abovementioned objectives.

5. Methodologies

5.1. Real Wages

In order to represent real wages in Poland in subsistence ratios based on the bare-bones basket, Chapter 2 will directly follow the standard methodology proposed by Robert Allen and collaborators (2011) that has been already outlined in this introduction. It will use a dataset proposed by Robert Allen (2001) that was constructed by the author to reconstruct real wages denoted in terms of welfare ratios based on the respectability basket. This dataset will be discussed later in this chapter. Chapter 2 will use information on prices and wages from Allen's dataset to estimate the cost of the bare-bones basket and annual incomes of workers in, inter alia, London, Gdańsk, Warsaw, Cracow, and Lviv. The use of the same dataset will ensure that differences between welfare and subsistence ratios will not result from differences in sources but from the dissimilarities between baskets. Furthermore, because Allen (2001) did not use all the available and already edited price and wage data for Polish cities, this study will compile and standardise wage and price data for Poznań (Więcławski 1989; Global Price and Incomes History Group, Unpublished, *Prices and Wages in Poznań 1493-1600*: Excel file downloaded from http://gpih.ucdavis.edu, based on a manuscript by Marjan Mika held in Beveridge Box M15 at London School of Economics archive, courtesy of David Jacks and Peter Lindert) and Lublin (Adamczyk 1935) that have not found its way to Allen's dataset. This will increase the number of Polish cities with available long-term estimates of standards of living.

In order to assess the impact of the composition of the basket on relative incomes, the study will investigate in detail how substitution of grain for beer, grain for bread, and an

increase in manufactured products affects the relative difference between real wages in London and various individual Polish cities.

Next to this primary objective, Chapter 2 will also look at Italian wages and international rural wages. It will move beyond cities. It will construct regional series of real wages. In order to construct uniform series of relative incomes, urban and rural wages will be weighted by occupational structures. The Chapter will only focus on accounting and identification of The Little Divergence, not on explanation of the phenomenon, however.

5.2. GDP

In order to provide the first inquiry into long-term development of Polish GDP per capita that would be comparable with the estimates proposed by the Maddison Project, Chapter 3 will conduct a pilot study into material standards of living in only one region of the country, the Voivodeship of Cracow. The investigation will be based on the short-cut method. The Voivodeship of Cracow was chosen for three reasons: (1) it is where the historical capital of the country, Cracow, was located, (2) for this reason the region has been relatively well-researched by historians who produced numerous accounts of regional incomes, and (3) the region, being located relatively far from the sea, was largely uninvolved in the Baltic grain trade that profoundly influenced the economic life of most of the regions north of the Voivodeship (Gierszewski 1982, Carter 1994). The last point is important because, in order to calculate the GDP with use of the short-cut method, it will be assumed that food production in the Voivodeship equalled food consumption. A detailed description of the representability of the Voivodeship for the Kingdom of Poland as a whole can be found in Chapter 3.

In more detail, the already-mentioned short-cut methodology uses known relations from a benchmark year from the statistical era for which detailed information on sectoral GDP are available. If one assumes that there were stable relations between population, urbanisation (proxy of industrialisation), prices, real income, and GDP, one can use these stable relations to project GDP backwards. As the first step, one estimates a stable relation between real wages and food consumption (agricultural output) in the base year. Second, historical urban real wages are used to estimate historical agricultural output. After that, one has to identify a stable relation between the size of the agricultural sector and the share of people employed in agriculture in the benchmark year. Knowing all the values, one can finally use data on historical agricultural output, population, and urbanisation to extrapolate the total GDP. In order to ensure comparability of the results, Chapter 3 will follow the methodology directly as it was outlined by Ulrich Pfister (2011). The main drawback of the methodology is that it uses real wages of

urban workers to gauge changes in the demand for food. This series, contrary to the corresponding series for Western countries, could have had little in common with the income and consumption of the enserfed agricultural workers that were 'locked' in the rural sector. Therefore, as in the case of any estimate of historical GDP, the results should be taken with pinch of salt.

Due to political (partitions of the late 18th century) and institutional (abolishment of serfdom in the mid-19th century) discontinuity between the early modern period and the 19th century, the point estimate for 1870 provided by Maddison cannot be used as the benchmark. Instead this study will reconstruct GDP per capita for the year 1578 and project the results backwards and forwards in time. This point was chosen due to relative availability of information on demographics and incomes of various occupational groups that together allow for construction of a social table. In particular, information of the incomes of the political elite will be based on research done by Jan Rutkowski (1938), incomes of urban workers were previously studied by Julian Pelc (1935), while incomes of farmers and agricultural workers were investigated by Piotr Guzowski (2008) and Anna Izodorczyk-Kamler (1990) respectively. GDP per capita in Poland will be converted into 1990$PPP via an international comparison of the purchasing power of the bare-bones baskets.

The short-cut method of projecting GDP estimates requires information on real wages and urbanisation. Real wages of urban workers in Cracow will be taken from Chapter 2. Population data will be based on a range of studies from Polish historical demography (Rusiński 1954; Vielrose 1957; Bogucka and Samsonowicz 1986: 120-121; Kuklo, 2009: 233).

5.3. Market conditions

Chapter 4 will investigate three different qualities of the Polish rye market – its integration, efficiency, and performance. The used methodology is discussed in detail in Chapter 4. Market integration relates to declines in transaction and transportation costs and a gradual transformation of a range of discrete independent markets into one economic unit. Markets integrate if, in the long-term, the costs of exchange between them decrease and prices converge. (see Jacks 2004; Federico 2012). Giovani Federico (2011) advocated the use of the coefficient of variation of all the prices across the common market at any given year to measure price convergence.

Furthermore, market efficiency is a quality of a market that consists of its access to information and its ability to reflect the information in prices (see Federico 2012: 476). According to Federico (2012: 480), the transfer of information between markets can be tested

by measuring if arbitrage forces prices to move together. David Weir (1989) proposes a method of measuring sympathetic movements of prices in a broad market composed of numerous local markets. The author claims that the variance of the mean of all the regional price series will increase with the progressing correlation across the individual series.

Lastly, market performance is an ability of a market to cope with shocks, i.e. effects of unexpected events (Van der Spek et al. 2015: 21). Peter Földvari and Bas van Leeuwen (2011: 169) argue that market performance can be directly affected by improvements in trade, storage, consumption diversification, and technological development. The authors also suggest observing market performance with a study of the residual variance of commodity prices through the use of an autoregressive conditional heteroscedasticity (ARCH) model.

In order to measure market conditions, Chapter 4 will use annual rye price data for eight cities located in or near Poland. Prices for Gdańsk, Cracow, Lviv, Warsaw, Cracow, Lublin, and Wrocław – the latter only until 1618 – will come from paperback editions of primary archival material (Hoszowski 1928; 1934; Furtak 1935; Adamczyk 1935; 1938; Siegel 1936; Pelc 1935; 1937; Wolański 1993). Most of this material has been produced by the so-called Bujak's School. It will be described in more detail in the next section of this introduction. The majority of the price data have been already standardised to a uniform measure by the Global Price and Income History Group.[2] Moreover, Prices for Wrocław, a city next to the Kingdom of Poland, for the 18th century will be taken from David Jacks' webpage.[3] Standardised prices for Koenigsberg, a city located in Ducal Prussia that was a fief of the Kingdom, will be taken from the Allen-Unger Global Commodity Prices Database.[4]

5.4. Serfdom

In order to investigate the link between serfdom, market conditions, and urban growth Chapter 5 will develop a testable hypothesis and reinforce it by estimating an empirical model with use of panel data regression analysis. In particular, Chapter 5 will develop a functional theoretical model of relations between market conditions, surplus extraction from the peasantry by the landlords, and urban population growth. It will derive a testable hypothesis that serfdom, understood as lack of legal protection of the peasantry by the state resulting in higher levels of surplus extraction, might have made urban settlements more resilient to a market crisis. Chapter 5 will propose that the effect was channelled via higher monetary and labour duties charged by

[2]http://gpih.ucdavis.edu/
[3]http://www.sfu.ca/~djacks/data/prices/Poland/index.html
[4]http://www.gcpdb.info/data.html

landlords to their enserfed tenant farmers. The higher duties might have fostered commercialisation of agricultural production that, otherwise, would not have found its way to a market. This might have aided urban population growth in a time of market crisis.

Chapter 5 will operationalise the abstract concept of market conditions by the more specific concept of market integration. It will divide the country into six regions and measure the degree of integration of the regions with the rest of the country that will proxy market conditions in the region. It will use the data compiled by Chapter 4. Furthermore, Chapter 5 will operationalise serfdom resulting in higher levels of surplus extraction with the ownership of a settlement and the domain where the settlement was located. After 1518, the Polish state had no legal jurisdiction over the peasants located in the private domains (Bardach 1957). This institutional change, according to above-mentioned Blum's definition, can be equated with a full installation of serfdom in these estates. At the same time, the king kept jurisdiction over the peasants located in the state's domain. This resulted in an institutional differentiation between the two types of landholdings. As discussed, according to Boris Mironov (1996), lack of legal protection typically results in surplus extraction. Chapter 5 will show that in the areas with private and unrestricted legal jurisdiction, monetary rents and corvée duties were indeed higher. Lastly, in order to estimate the empirical model, Chapter 5 will compile information on the populations of 264 urban settlements scattered around Poland. Discussion of the data can be found in the next section of this introduction and in Chapter 5.

6. Sources

This section provides a brief outline of the data used in this thesis. More detailed discussions can be found in the individual chapters. Because the thesis builds on a wide range of different kinds of data, this short section cannot provide a detailed critique of all the relevant information. Instead, this chapter focuses only on the main types of data utilised in the thesis, i.e. prices, wages, and urban populations. All the information comes from published editions of secondary material. The thesis will not use any new primary archival sources. The main reason for this is that the already published information has not yet been analysed with state-of-the-art methods. The focus of this thesis is, therefore, on compilation and analysis of the published material. The chapters provide new insights by bringing together various kinds of information for the first time.

All the chapters build on price and wage data. They make use of the seminal research output of the so-called Bujak's School, i.e. a group of colleagues of Franciszek Bujak that,

around the 1930s, edited and published primary archival material on historical prices and wages in a range of Polish cities. The initiative managed to produce figures for Gdańsk, Warsaw, Cracow, Lviv, and Lublin. The group used a standard methodology designed by Stanisław Hoszowski (1928), who produced the first edition in the series. The price and wage data are primarily based on records of incomes and expenditures of the municipalities. This is supplemented by records of hospitals and individuals. For the majority of the studied commodities, the editions report only the maximum, minimum, and the arithmetic average price for every year. In the case of wages and grain prices, the editors report the information quarterly. The editions do not report the raw data. The use of the arithmetic average, as opposed to the median, makes the estimates vulnerable to possible offshoots. Moreover, the averages are often based only on a handful of observations. This raises doubts about their representative qualities and may lead to an overestimation of the year-to-year volatility.

Municipal records typically reported prices and wages in terms of the moneys of account; 1 Polish Złoty equalled 30 Grosze. In the editions, prices and wages are expressed in terms of their nominal, silver, and golden value. Since Europe was mostly at the silver standard in the early modern era and use of golden coins was restricted to the elites, with the general public dealing mostly with silver coins (Kula 1963: 543), this thesis utilises information on prices and wages denoted in their value in silver. The silver content of the currency changed over time. This was common to all the European countries (Karaman and Pamuk 2010). The members of the Bujak's School put forward a conversion rate between the nominal and silver value (Hoszowski 1928: 50-58). It was built on two kinds of sources: regulations and exchange rates. The Polish parliament issued official regulations (*ordynacje*) of the silver content to be followed by the mints (Hoszowski 1928: 52). Information on the silver content from these normative documents may overestimate the actual values. Hoszowski (1928: 50) argues that the instructions were implemented relatively well in the 16th century. However, according to Adam Dylewski (2012: 194-195), in the 17th and 18th century, i.e. at the time of the weakness of the Polish central institutions, mint masters had an incentive to decrease the silver content of the coins below their face value and pocket the difference. For this reason, supplementary information on the silver value of the Polish currency was obtained from exchange rates with foreign coins with known silver content. The problem with this approach is that the rates differed across Poland (Hoszowski 1928: 52). In sum, the prices and wages expressed in terms of their silver equivalent put forward by the Bujak's School must be taken with a pinch of salt, especially for the 17th and 18th centuries. In the case of real wages, consequences of the possible mistakes resulting from the conversion from the nominal to silver values are nullified because

both the incomes and expenditures are converted into their equivalent in silver with use of the same rate. Because one of the values is divided by the other, the effects of the conversion cancel each other out.

As already mentioned, Chapter 2 utilises the dataset of continuous series of prices and wages around Europe built by Robert Allen (2001). The author based his Polish figures on the Bujak's School series. There are numerous gaps in the historical material. Allen predicted most of the missing information by assuming a linear trend between the last and the first known value. Due to this operation, Allen's dataset misrepresents the volatility that was typical to preindustrial markets (Persson 1999). Moreover, the author extrapolated missing information on prices of numerous commodities from prices of other goods. For example, in the case of Warsaw, the price of oil was used for the price of soap and the price of cheese was extrapolated with the price of meat (Allen 2001: 440). More importantly, Allen synthesised missing bread prices for most of the Polish cities. The author proposed a special equation that was used to predict the missing bread prices from prices of grains and wages (Allen 2001). Moreover, the scant available historical prices of bread were based on price regulations (*taxy wojewodzińskie*) rather than recorded transactions (Pelc 1935). All this combined indicates that, although Allen's dataset allowed for novel research that provided valuable insights into long-term development of real wages around Europe, the information is often speculative and the quality of the data is imperfect. As already mentioned, despite these shortcomings, this thesis builds on Allen's dataset in order to allow for comparability of the results. These issues are discussed in more detail in Chapter 2.

Chapter 3 and 5 build on urban population data. For the purpose of this thesis, a large dataset of populations of 264 urban settlements was constructed. The dataset is based on compilation of information reported in various other compilations. In particular, information on the bigger settlements comes from: Paul Bairoch and collaborators (1988), Tertius Chandler and Gerald Fox (1974), and Cezary Kuklo (2009). The information on the populations of towns, i.e. settlements having city rights but less than 5,000 inhabitants, is based on the '*Miasta Polskie w Tysiącleciu'* Encyclopaedia (Siuchniński 1965) and Bogucka and Samsonowicz (1986). These compilations build mostly on the rich body of monographs of the individual urban settlements. A detailed discussion of the dataset can be found in Chapter 5. Because Polish historical demographers did not form a single school, the monographs followed different methodologies and used different kinds of sources. In particular, the studies build on: (1) audits of the state's domain, (2) records of parishes, and (3) records of the poll tax (*pogłówne*). Additionally, the populations were also estimated indirectly from the number of houses in the

settlement (Bogucka and Samsonowicz 1986: 119). The use of different kinds of sources to estimate populations raises doubts about the comparability of the results. There has been no critique written of the different approaches and the size of potential biases of the estimates is unknown. Going back to each monograph and assessing the quality of each source material would be a tremendous research effort, which is beyond the capabilities of this thesis.

7. Results

The contribution of this thesis to The Little Divergence debate is two-pronged. First, it identifies The Little Divergence between the North Sea area and the Kingdom of Poland. In particular, it shows that GDP in the Voivodeship of Cracow was already lower than that in England and the Netherlands by the 15th century. There was a significant increase in income levels in Poland in the 16th century. However, the growth was not sufficient to close the income gap entirely. The period of economic expansion was followed by a crisis. The dissimilarity in income levels grew again in the 17th and the 18th century as a result of a contraction of the economy of the Voivodeship on the one hand, and continuous growth of the North-Western economies on the other. This general conclusion about the trends in income levels is reinforced by a comparison of real wages weighted by the occupational structures (see Chapter 2). Furthermore, this thesis identifies that there was a market crisis during the 17th century. Conditions on the Polish rye market remained poor after the crisis. As a result, the Polish rye market was more integrated, efficient, and performed better in the 16th than in the 18th century. Conversely, as already mentioned, Victoria Bateman (2011) and Roman Studer (2008) identified improvements in Western Europe's market conditions in the 18th century after a similar market contraction in the 17th century. Therefore, this thesis identifies that there was a divergence in the trends in market development between Poland and Western Europe in the 18th century. Moreover, the thesis compares real wages in London and in a range of Polish cities denoted in subsistence ratios based on the bare-bones basket. Thus defined wages indicate that London might have become richer than any of the Polish cities in the 18th century. More importantly, the analysis indicates that relative prices differ between the two regions. Therefore, the results of a comparative research on relative incomes can vary depending on inclusion of processed goods in a basket used to deflate the nominal wages. The more secondary products, tradable goods, and processed grains such as beer and bread are in a basket, the relatively poorer the East appears in comparison to the North-West. However, this simply reflects the fact that economic development involved the production and consumption not of

more basic grains but rather of more processed foodstuffs and other manufactured products. Excluding such products from the comparison may show the East in a more favourable light, but it does not remove the fact that Poland was falling behind economically. As already suggested by Broadberry and Gupta (2006), the identified effect could be possibly attributed to the specialisation of the North Sea region in production of manufactured, tradable goods mirrored by the specialisation of the East in production of bulky and less tradable grains. Furthermore, processed goods in Poland could have been relatively more expensive due to the high costs of the skills required in the process of production. Poland was characterised by a very high skill-premium, which indicates that skilled labour could have been in low supply. This, according to Władysław Adamczyk (1935), could be possibly explained by rent seeking of the Polish guild system. Lastly, the high relative price of beer could be possibly explained by the political economy of the country. Due to the political dominance of the landed nobility over cities, grain production and trade by the nobility was exempted from taxation. Conversely, taxes on beer, paid mostly by the burghers, were a substantial source of a state's revenue (Rybarski 1939: 257-282). Those issues require, however, further theoretical and empirical investigation. These possible explanations need to be regarded only as speculations rather than definitive claims.

Next to identification of The Little Divergence this thesis proposes an alternative interpretation of one of the main factors commonly regarded as a cause of the underdevelopment: serfdom. This thesis identifies a positive effect of the interaction between noble unconstrained legal jurisdiction over peasantry and market disintegration on urban population growth. However, because of numerous problems with the empirical analysis, including poor quality of the data and a possible endogeneity of both market conditions and surplus extraction, it must be stressed that the conclusions of this thesis are not definite and that they should be interpreted as correlations rather than causality. Moreover, given that levels of surplus extraction are not observed directly but proxied by legal jurisdiction, the hypothesis that the identified impact of private legal jurisdiction in agriculture on urban population growth was indeed channelled via higher levels of surplus extraction from the peasantry requires further empirical investigation.

At the first sight, the finding speaks to the 'whatever is, is right' notion that the 'backward' institutions could have been an 'efficient' solution to various adverse economic and political conditions. Economic underdevelopment in Poland, as well as other underdeveloped and feudal societies, might have been primarily caused by, for example, poor market conditions, and serfdom (as well as other feudal institutions) might have been

introduced and retained in order to cope with a growth-discouraging environment. However, serfdom might also have been introduced and retained by the landed nobility only for its own benefit, regardless of its impact on overall economic underdevelopment. Serfdom might have been imposed on peasants because of the superior political power of the elites, and not as a result of some sort of a 'social contract'. The beneficial impact of high rents charged to the peasants during a market crisis on urban growth could have been incidental and have had little to do with the 'intentions' behind the origins of the institution: serfdom in Poland was not abolished in the 16th century as a result of improvements in market conditions, nor reinstated in Western Europe during the market crisis of the 17th century. In sum, the hypothesis that serfdom might have helped urban growth in times of market crisis put forward by this thesis makes a contribution to the debate about the economic impact of the institution, not the discussion regarding its origins.

8. Future Research

This thesis moves the frontier of the knowledge about the underdevelopment of early modern Poland further. However, the controversy regarding the origins and the exact characteristics of the underdevelopment is far from being resolved. This thesis not only provides answers to the abovementioned research questions but also calls for further scientific inquiry. Regarding the identification of the underdevelopment, it is important to move away from the macro level of the whole economies and focus on investigation of the differences between sectors. This can be accomplished by bringing the rural sector into the picture. The current research on historical real wages focuses almost exclusively on the urban sector. Investigation of the rural sector could be crucial for our understanding of The Little Divergence because, next to the divergence between countries, there could have also been a divergence within countries, i.e. a point in time that the urban sector became significantly more prosperous then the rural one. This topic is especially interesting because it is unclear which economies should be characterised by a higher income gap. According to the classical model of the link between economic growth and income inequality developed by Simon Kuznets (1955), the urban sector should be characterised by much higher wages due to its higher productivity. This suggests that the West should have been characterised by higher inequality between sectors due to the greater productivity of its urban sector (well-developed protoindustry). Conversely, serfdom could have also resulted in the gap without the rise in productivity. Recently, Igor Zurimendi (2014) proposed a theoretical mechanism as to how costs (risks) involved with the change of sectors by the enserfed peasants

in Eastern Europe should have induced income inequality between sectors in the region. This intuition suggests that the East, not the West, could have been characterised by higher income inequality between sectors. Chapter 2 of this thesis, with use of only scanty wage data for agricultural workers, suggests that the income gap between sectors in Poland was higher than that in England and Italy. Conversely, Chapter 3 suggests that overall income inequality in Poland (Voivodeship of Cracow) was lower than in the North Sea area. This disparity calls for further research into the distribution of incomes within preindustrial economies based on more detailed sources, particularly on agricultural wages.

Furthermore, this thesis identifies that there was a market fragmentation in Poland. This suggests that various parts of the country might have developed differently, especially in the 18th century. Therefore, the inquiry into living standards in only a part of Poland potentially provides a misleading picture of the whole economy. In order to provide a coherent picture of the Polish economy, it would be crucial to probe the long-term trends in material standards of living in regions other than the Voivodeship of Cracow. For example, GDP per capita in Wielkopolska, Pomerania, and Mazovia (other major parts of the country) could be estimated with use of the short-cut method due to the availability of the real wages series for Poznań, Gdańsk, and Warsaw respectively (see Chapter 2). Instead of constructing point estimates for the 16th century and extrapolating the GDP forwards in time, the estimation could be based on linking the real wage series to regional GDP estimates for the 19th century. Such estimates are currently under construction by a group of researchers from the Economics Department of the Warsaw University. Moreover, the research on historical GDP could be advanced by moving away from the short-cut method towards the superior productivity-based approach that was used to study the North Sea region. New possibilities come from the recent pioneering study conducted by Adam Izdebski and collaborators (2013) on the trends in the volume of agricultural production in Poland based on palynological data (density of pollen in the sediment residing on the bottom of a lake). The results of the research conducted by Izdebski et al. are important because they challenge the identified contraction of the Polish economy in the 17th and 18th century by identifying an increase in the density of pollen at the time.

Regarding the explanation of Polish underdevelopment, this thesis identified a fragmentation of the Polish commodity market. According to the orthodox economic theory, market fragmentation should result in a decline in the material standard of living. Therefore, contrary to the claims made by the trade dependentists, it could have been market fragmentation not market development that contributed to Poland's economic decline. However, the alleged link between market conditions and improvement in real wages or GDP has never been proven

empirically for the preindustrial era. Moreover, in the latest study of the topic, Victoria Bateman (2012) compiled all available and relevant evidence and failed to identify the expected link. Conversely, Chapter 5 of the thesis identifies a correlation between market disintegration and decline in urban population. Moreover, Chapter 2 identifies a decline in real wages in Lviv and Lublin, the cities located off a navigable river, in the 17th and 18th century. Seemingly, Chapter 4 identifies a disintegration of the two cities from the common market at the time. This evidence combined suggests that the decline in standards of living in Lviv and Lublin could have been a result of the disintegration. However, this issue requires a detailed investigation that would model the mechanism, look at the movement of labour, and address changes in wages in prices separately. Furthermore, if the adverse market conditions indeed had a negative impact on urbanisation and real wages (the main components of the GDP extrapolation) as well as possibly contributed to the persistence of serfdom, it is crucial to examine the causes of the fragmentation. As already mentioned, Epstein (2000: 51) proposed that political centralisation is vital for market development and, without providing any detailed evidence, suggested that the weakness of the Polish state could have resulted in market fragmentation. Epstein's intuition could be tested empirically by linking the measures of market development from Chapter 4 to indicators of political centralisation. Jan Luiten van Zanden and collaborators (2012) proposed that state development in England could be measured by looking at the duration of parliamentary proceedings. After 1505, laws in Poland were made by the King, Senate, and the Parliament together in a joint session. This indicates a relevance of the measure for the Polish case. Detailed information about the beginning and the end of every session of the Polish parliament has been collected by Władysław Konopczyński (1948). This information could be used to study a correlation between market conditions and political institutions empirically. Poland makes an interesting case study for economic historians because, contrary to most of the Western European countries that centralised under some sort of absolutistic or parliamentarian regime, Poland followed a different development path that moved political power from the central to the local level. This political re-feudalisation, i.e. regression to a mode of regional decision-making that was more characteristic of the Middle-Ages than the modern era, together with the reinforcement of serfdom, make Polish history a useful background for identification of the factors crucial to the modernisation of its Western neighbours.

References

ACEMOGLU, D. and ROBINSON, J. (2012). *Why nations fail*. New York: Crown Publishing Group.

ACEMOGLU, D. and WOLITZKY, A. (2011). The economics of labor coercion. *Econometrica* **79(2)**, 555-600.

ADAMCZYK, W. (1935). *Ceny w Lublinie*. Lviv: Instytut Popierania Polskiej Twórczości Naukowej.

ADAMCZYK, W. (1938). *Ceny w Warszawie w XVI i XVII wieku*. Lviv: Instytut Popierania Polskiej Twórczości Naukowej.

ALLEN, R. (2001). The Great Divergence in European wages and prices from the Middle Ages to the First World War. *Explorations in Economic History* **38**, 411–447.

ALLEN, R. (2003). Progress and poverty in early modern Europe. *Economic History Review* **56(3)**, 403-443.

ALLEN, R., BASSINO, JP., MA, D., MOLL-MURATA, C. and VAN ZANDEN, J.L. (2011). Wages, prices, and living standards in China, 1738–1925: in comparison with Europe, Japan, and India. *Economic History Review* **64**, 8–38.

ÁLVAREZ-NOGAL, C. and PRADOS DE LA ESCOSURA, L. (2013). The rise and fall of Spain (1270–1850). *The Economic History Review* **66**, 1–37.

ANDERSON, P. (2013 [1974]). *The lineages of the absolutist state*. London-New York: Verso.

ANGELES, L. (2008). GDP per capita or real wages? Making sense of conflicting views on preindustrial Europe. *Explorations in Economic History* **45**, 147-163.

BARDACH, J. (1957). *Historia państwa i prawa Polskiego*. Warsaw: PWN.

BAIROCH, P., BATOU, P. and CHÈVRE, P. (1988). *La population des villes Européennes de 800 à 1850*. Genève: Librairie Droz.

BATEMAN, V. (2011). The evolution of markets in early modern Europe, 1350–1800: a study of wheat prices. *Economic History Review* **64**, 447–471.

BATEMAN, V. (2012). *Markets and growth in early modern Europe*. London: Pickering & Chatto.

BATEN, J. and SZOŁTYSEK M. (2014). A golden age before serfdom? The human capital of Central-Eastern and Eastern Europe in the 17th–19th centuries, Max Planck Institute for Demographic Research Working Paper 8,1–46.

BATEN, J. and WALLUSCH, J. (2005). Market integration and disintegration of Poland and Germany in the 18th century. *Economies et Societes* **33**, 1233-1264.

BLUM, J. (1971). *Lord and peasant in Russia: from the ninth to the nineteenth century*. Princeton: University Press.

BOGUCKA, M. (1981). Miasta Europy Środkowej w XIV -XVII wieku. *Roczniki Dziejów Społecznych i Gospodarczych* **62**, 5-24.

BOGUCKA, M. and SAMSONOWICZ, H. (1986). *Dzieje miast i mieszczaństwa w Polsce przedrozbiorowej*. Wrocław: Zakład Narodowy Im. Ossolińskich.

BOLT, J. and VAN ZANDEN, J.L. (2014). 'The Maddison Project': collaborative research on historical national accounts. *Economic History Review* **67**, 627–651.

BOSKER, M., BURING, E. and VAN ZANDEN, J.L. (2013). From Baghdad to London: Unravelling urban development in Europe, the Middle East, and North Africa, 800–1800. *The Review of Economics and Statistics* **95(4)**, 1418-1437.

BRENNER, R. (1976). Agrarian class structure and economic development in pre-industrial England. *Past & Present* **70**, 30–75.

BROADBERRY, S. (2015). Accounting for The Great Divergence. Nuffield College, Oxford.

BROADBERRY, S. and GUPTA, B. (2006). The early modern great divergence: wages, prices and economic development in Europe and Asia, 1500–1800. *Economic History Review* **59**, 2-31.

BROADBERRY, S., CAMPBELL, B., KLEIN, A., OVERTON, M. and VAN LEEUWEN, B. (2015). *British economic growth, 1270-1870*. Cambridge University Press.

BUSH, M. (1996). Introduction. In: M. BUSH (ed.), *Serfdom and slavery. Studies in legal bondage*. London-New York: Longman.

CARTER, F. (1994). *Trade and urban development in Poland. An economic geography of Cracow, from its origins to 1795.* Cambridge University Press.

CERMAN, M. (2012). *Villagers and lords in Eastern Europe, 1300-1800*. New York: Palgrave Macmillan.

CHANDLER, T. and FOX, G. (1974). *3000 Years of urban growth*. New York: Academic Press.

CRAFTS, N. and VENABLES, A. (2003), Globalization in History: A Geographical Perspective. In: M.D. BORDO, A.M. TAYLOR and J.G. WILLIAMSON (eds.), *Globalization in historical perspective*. University of Chicago Press.

DE MOOR, T. and VAN ZANDEN, J.L. (2010). Girl power: the European marriage pattern and labour markets in the North Sea region in the late medieval and early modern period. *Economic History Review* **63**, 1-33.

DE VRIES, J. (1984). *European urbanization, 1500-1800*, Boston: Routledge.

DE VIES, J. and VAN DER WOUDE, A. (1997). *The first modern economy: Success, failure and perseverance of the Dutch economy, 1500-1815.* Cambridge University Press.

DINCECCO, M. (2011). *Political transformations and public finances: Europe, 1650-1913*. Cambridge University Press.

DOMAR, D. (1970). The causes of slavery or serfdom: a hypothesis. *The Journal of Economic History* **30**, 18-32.

DYLEWSKI, A. (2012). *Historia pieniądza na ziemiach polskich*. Warsaw: Carta Blanka.

EPSTEIN, S. (2000). *Freedom and growth. The rise of states and markets in Europe, 1300-1750*. London: Routledge.

FEDERICO, G. (2011). When did European markets integrate? *European Review of Economic History* **15**, 93-126.

FEDERICO, G. (2012). How much do we know about market integration in Europe? *The Economic History Review* **65**, 470-497.

FÖLDVÁRI, P. and VAN LEEUWEN, B. (2011). What can price volatility tell us about market efficiency. *Cliometrica* **5**, 165-186.

FURTAK, F. (1935). *Ceny w Gdańsku w latach 1701-1815*. Lviv: Instytut Popierania Polskiej Twórczości Naukowej.

GIERSZEWSKI, S. (1982). *Wisła w dziejach Polski*. Gdańsk: Wydawnictwo Morskie.
GRZYBOWSKI, S. (2000). *Dzieje Polski i Litwy*. Cracow: Oficyna Wydawnicza.
GUZOWSKI, P. (2008). *Chłopi i pieniądze na przełomie średniowiecza i czasów nowożytnych*. Cracow: Avalon.
GUZOWSKI, P. and KUKLO, C. (eds.)(2014). *Struktury demograficzne rodziny na ziemiach polskich do połowy XX wieku. Przegląd badań i problemów*. Białystok: Instytut Badań Nad Dziedzictwem Kulturowym Europy.
HAJNAL, J. (1965). European marriage pattern in perspective. In: D.V. GLASS and D.E.C. EVERSLEY (eds.), *Population in history*. London: Edward Arnold.
HOSZOWSKI, S. (1928). *Ceny we Lwowie w XVI i XVII wieku*. Lviv: Instytut Popierania Polskiej Twórczości Naukowej
HOSZOWSKI, S. (1934). *Ceny we Lwowie w latach 1700-1914*. Lviv: Instytut Popierania Polskiej Twórczości Naukowej.
IZDEBSKI, A., SŁOCZYŃSKI, T., and TYCNER, M. (2013). Food production in Poland in the medieval and early modern periods: evidence from palynological data. Paper presented at FRESH Meeting in Warsaw.
IZYDORCZYK-KAMLER, A. (1990). Wynagrodzenie pracowników najemnych w folwarkach małopolskich w XVI i pierwszej połowie XVII wieku. *Przegląd Historyczny* **81**, 655-667.
JACKS, D. (2004). Market integration in the North and Baltic seas, 1500-1800. *Journal of European Economic History* **33(3)**, 285-329.
KARAMAN, K.K. and PAMUK, S. (2010). Ottoman state finances in European perspective, 1500-1914. *Journal of Economic History* **70**, 593-629.
KOCHANOWICZ, J. (1989). The Polish economy and the evolution of dependency. In: D. CHIROT (ed.). *The origins of backwardness in Eastern Europe*. Berkeley: University of California Press.
KOCHANOWICZ, J. (2006 [1991]). Could a Polish noble become an entrepreneur? In: J. KOCHANOWICZ (ed.), *Backwardness and modernizaisation: Poland and Eastern Europe 16th-20th centuries*. Aldershot: Ashgate Variorum.
KOEPEKE, N. and BATEN, J. (2005). The biological standard of living in Europe during the last two millennia. *European Review of Economic History* **9**, 61-95.
KONOPCZYŃSKI, W. (1948). *Chronologia Sejmów polskich*. Cracow: Polska Akademia Umiejętności.
KRUGMAN, P. and VENABLES, A. (1995). Globalisation and inequality of nations. *Quarterly Journal of Economics* **60**, 857–880.
KULA, W. (1963). *Problemy i metody historii gospodarczej*. Warsaw: PWN.
KUKLO, C. (2009). *Demografia Rzeczypospolitej przedrozbiorowej*. Warsaw: DiG.
KUZNETS, S. (1955). Economic growth and income inequality. *American Economic Review* **45**, 1-28.
MALANIMA, P. (2009). *Pre-modern European economy.* Leiden-Boston: Brill.
MALANIMA, P. (2010). The long decline of a leading economy: GDP in Central and Northern Italy, 1300-1913. *European Review of Economic History* **15,** 169-219.
MALANIMA, P. (2013). When did England overtake Italy? Medieval and early modern divergence in prices and wages. *European Review of Economic History* **17**, 45-70.

MADDISON, A. (2001). *The World Economy. A millennial perspective.* Paris: OECD.

MAŁOWIST, M. (2010). *Western Europe, Eastern Europe and world development, 13th-18th centuries: collection of essays of Marian Małowist*, J. BATAOU and H. SZLAJFER (eds.), Leiden – Boston: Brill.

MĄCZAK, A. (1987). The conclusive years: the end of the sixteenth century as the turning point of Polish history. In: E.I. KOURI and T. SCOTT (eds.), *Politics and society in reformation Europe*. London: Macmillan.

MIRONOV, B. (1996). When and why was the Russian peasantry emancipated? In: M. BUSH (ed.), *Serfdom and slavery. studies in legal bondage*. London-New York: Longman.

NORTH, D.C. (1990). *Institutions, institutional change, and economic performance*. Cambridge University Press.

NORTH, D.C. and THOMAS, R.P. (1970). An economic theory of the growth of the Western World. *The Economic History Review* **23**, 1-17.

NORTH, D.C. and THOMAS, R.P. (1971). The rise and fall of the manorial system: a theoretical model. *Journal of Economic History* **31(4)**, 777–803.

NOTH, D.C. and WEINGAST, B.R. (1989). Constitutions and commitment: evolution of institutions governing public choice in seventeenth-century England, *Journal of Economic History* **49**, 803-832.

OGLVIE, S. (2007). 'Whatever Is, Is Right'? Economic institutions in pre-industrial Europe, *The Economic History Review* **60(4)**, 649-684.

OILVIE, S. and CARUS, A.W. (2014). Institutions and economic growth in historical perspective. In: P. AGHION and S.N. DURLAU (eds.), *Handbook of economic growth*. Vol. 2. Burlington: Elsevier Science.

ÖZMUCUR, S. and PAMUK, Ş (2007). Did European commodity prices converge during 1500-1800? In: T.J. HATTON, K. 0'ROURKE and A.M. TAYLOR (eds.), *The new comparative economic history.* Cambridge University Press.

PELC, K. (1935). *Ceny w Krakowie w Latach 1369-1600*. Lviv: Instytut Popierania Polskiej Twórczości Naukowej.

PELC, K. (1937). *Ceny w Gdańsku w XVII i XVIII Wieku*. Lviv: Instytut Popierania Polskiej Twórczości Naukowej.

PERSSON, K. (1999). *Grain markets in Europe, 1500-1900*. Cambridge University Press.

PFISTER, U. (2011). Economic growth in Germany, 1500–1850. Paper presented at the Conference on Quantifying Long Run Economic Development, Venice, 22-24 March, 2011.

POMERANZ, K. (2000). *The Great Divergence: China, Europe, and the Making of the Modern World Economy*. Princeton University Press.

POMERANZ, K. (2011), Ten years after: Responses and reconsiderations. *Historically Speaking* **12(4)**, 20-25.

PTAŚNIK, J. (1949). *Miasta i mieszczaństwo w dawnej Polsce*. Warsaw: PIW.

RUTKOWSKI, J. (1938). *Badania nad podziałem dochodów w Polsce w czasach nowożytnych.* Cracow: Polska Akademia Umiejętności.

RUSIŃSKI, W. (1954). O rynku wewnętrznym w Polsce w drugiej połowie XVIII wieku. *Roczniki Dziejów Społecznych i Gospodarczych* **16**.

RYBARSKI, R. (1939). *Skarb i pieniądza za Jana Kazimierza, Michała Korybuta i Jana III*. Warsaw: Towarzystwo Naukowe Warszawskie.

SIEGEL, S. (1936). *Ceny w Warszawie w latach 1701-1815*. Lviv: Instytut Popierania Polskiej Twórczości Naukowej.

SIUCHNIŃSKI, M. (1965). *Miasta polskie w tysiącleciu*. Vol. 1-2. Wrocław: Zakład Narodowy Im. Ossolińskich.

SOSNOWSKA, A. (2004). *Zrozumieć zacofanie*. Warsaw: TRIO.

STUDER, R. (2008). India and the great divergence: Assessing the efficiency of grain markets in eighteenth- and nineteenth-century India. *Journal of Economic History* **68(2)**, 393-437.

VAN DER SPEK, B., VAN LEEUWEN, B. and VAN ZANDEN, J. L., (eds.) (2015). *A history of market performance from Ancient Babylonia to the Modern World.* London-New York: Routledge.

VAN TIELHOF, M. (2002*). Mother of all the trades*. Leiden-Boston-Koln: Brill.

TOPOLSKI, J. (1987). *Narodziny kapitalizmu w Europe*. Warsaw: PWN.

TOPOLSKI, J. and WYCZAŃSKI, A. (1982). Les fluctuations de la production agricole en Pologne XVIe-XVIIIe siecles, In: J. GOY and E. LE ROY LADURIE (eds.), *Prestations paysannes, dimes, rente, fonciere et movement de la production agricole a l'epque preindustrielle.* Paris: Editions de l'EHESS.

VIELROSE, E. (1957). Ludność Polski od X do XVIII wieku. *Kwartalnik Historii Kultury Materialnej* **1**, 3-49.

WALLERSTEIN, I. (1974). *The Modern World-System.* New York-London: Academic Press.

WEIR, D.R. (1989). Markets and mortality in France 1600-1789. In: J. WALTER and R. SCHOFIELD (eds.), *Famine, disease and the social order in early modern society.* Cambridge University Press.

WIĘCŁAWSKI, B. (1989). *Zaopatrzenie i konsumpcja w Poznaniu w drugiej połowie XVII wieku.* Warsaw-Poznań: UAM.

WOLAŃSKI, M. (1993). *The prices of corn, cereal products, fruits and vegetables in Wrocław from 1506 to 1618.* Wrocław: Wydawnictwo Uniwersytetu Wrocławskiego.

WÓJTOWICZ, G. (2006). *Trendy i ewolucja : dzieje gospodarcze ziem polskich.* Warsaw: Twigger.

WÓJTOWICZ, G. and WÓJTOWICZ, A. (2009). *Dlaczego nie jesteśmy bogaci.* Warsaw*:* Cedewu.

WYCZAŃSKI, A. (1969). *Studia nad konsumpcją żywności w Polsce w XVI pierwszej połowie XVII wieku.* Warsaw: PWN.

VAN ZANDEN, J.L. (1999). Wages and the standard of living in Europe, 1500-1800. *European Review of Economic History* **2**, 175-97.

VAN ZANDEN, J.L. (2001). Early-modern economic growth: a survey of the European economy, 1500-1800. In: M, PRAK(ed.) *Early-modern Capitalism, economic and social change in Europe 1400-1800.* London*:* Routledge.

VAN ZANDEN, J.L. (2009). The skill-premium and the 'Great Divergence'. *European Review of Economic History* **13**, 121-53.

VAN ZANDEN, J.L. and BURING, E. (2009). Charting the 'Rise of the West': Manuscripts and printed books in Europe, A long-term perspective from the sixth through eighteenth centuries. *The Journal of Economic History* **69(2)**, 410-446.

VAN ZANDEN, J.L., V., BURINGH, E. and BOSKER, M. (2012). The rise and decline of European parliaments, 1188-1789. *Economic History Review* **65(3)**, 835-861.

VAN ZANDEN, J.L. and VAN LEEUWEN, B. (2012). Persistent but not consistent: The growth of national income in Holland 1347–1807. *Explorations in Economic History* **49**, 119-130.

ZURIMENDI, I. (2014). Abolition of serfdom and the growth of cities in Eastern Europe. Paper presented at the ESSHC Vienna.

Chapter 2: Little Divergence revisited: Polish weighted real wages in a European perspective, 1500-1800[5]

Abstract: I contribute to the debate on the timing of The Little Divergence within preindustrial Europe. I add Polish real wages to the comparative framework by comparing them with the English and Italian series. I compile existing data for Poznań, Lublin, and the Polish agricultural sector. I add this information to the internationally available evidence for Cracow, Gdańsk, Warsaw, and Lviv. I demonstrate that the more processed grains, i.e. beer and bread, feature in a basket used to deflate wages, the greater the observed superiority of London over the Polish cities. I show that Poland was characterised by the widest income gap between the urban and rural sectors. I account for income differences between sectors by weighting the real wage series by occupational structures. The evidence suggests that England was richer than Poland by 1500. The countries converged around 1600. Subsequently, Poland began to lag behind from the 17th century onwards.

Keywords: Real wages, 'The Little Divergence', preindustrial economic growth, Poland

JEL codes: N33, N01

Publication process: Accepted for publication by the *European Review of Economic History*

---

[5] Earlier versions of this text were presented at: World Economic History Congress 2012, Long-Term Development of Real Wages Workshop at International Institute of Social History in Amsterdam, and seminars at: Warsaw University, Utrecht University, Humboldt University, and Oxford University. The author wishes to acknowledge a contribution of: Robert Allen, Joerg Baten, Piotr Guzowski, Fabian Hungerland, Jacek Kochanowicz, Michał Kopczyński, Peter Lindert, Paolo Malanima, Jaime Reis, Eric Schneider, Jan de Vries, Jeffrey Williamson, Jacob Weisdorf, Nikolaus Wolf, Jan Luiten van Zanden, Pim de Zwart, and the anonymous referees of the *European Review of Economic History*. All remaining mistakes are the sole responsibility of the author.

1. Introduction

The Little Divergence debate tries to identify the reasons behind, and the exact timing of, the onset of the economic superiority of the North Sea region over the rest of Europe. An important dimension of this discussion consists of an international comparison of real wages. The contribution of this article to this debate is three-fold. First, I add Eastern Europe to the comparative framework. Specifically, I propose new real wage evidence from the Polish agricultural sector as well as from Poznań and Lublin. Second, I demonstrate that the more processed grains, i.e. beer and bread, feature in a basket used to deflate wages, the greater the observed superiority of the North-West over the East. Third, I identify vast differences in income inequalities between the urban and the rural sectors across Europe. These dissimilarities necessitate accounting for both urban and rural incomes as well as urbanisation levels when attempting an international comparison of real wages. I demonstrate that if the wage series are weighted by occupational structures, England seems to have already been more economically advanced than Poland around 1500 due to high incomes in the English agricultural sector at the time. I also show that the relative incomes in the studied regions converged around 1600 due to a decline in real wages shared by the Polish, English, and Italian agricultural sectors. Furthermore, I find that Poland – proxied by the Voivodeship of Cracow – began to lag behind England from the 17th century onwards due to a decline in Polish urbanisation levels. Because of the low agricultural wages, the marginal urbanisation resulted in relatively low weighted real wages in the Voivodeship despite relatively high wages in Cracow.

Allen's (2001) seminal research into historical real wages in a range of European cities highlighted signs of sustainable economic growth in the North Sea region before the Industrial Revolution. His conclusions were supported by several additional studies (for example Van Zanden 2002; There are however also voices to the contrary, for example Clark 2007). Furthermore, additional findings based on a north-south comparison reinforced the conventional knowledge that the North Sea region was characterised by the highest income levels on the continent already prior to the Industrial Revolution and that it was the only European region of which the economy was developing positively in the early modern era (Malanima 2010; 2013). However, because Allen (2001) focused only on major cities in his comparison of relative incomes around Europe – which in Eastern Europe represented only a small fraction of the overall population – his findings cannot definitely disprove nor validate the supposition that the North Sea region was also better developed than Eastern Europe. In order to identify how Eastern European real wages fit into The Little Divergence debate, this

study offers a comprehensive comparison of Polish, English, and Italian relative incomes. It also refines the previous real wage estimates for Poland, England, and Italy and pushes the scholarly debate further by accounting for both urban and rural relative incomes.

In more detail, Allen (2001) constructed his real wage series for a range of European cities by deflating urban nominal wages by a broad basket of goods known as the 'respectability basket' including manufactured products, fuel, beer, and bread. He identified an economic superiority of the North Sea region over the rest of Europe including the East. According to the author, the dissimilarity originated already prior to the early modern period and widened after the 17th century. This study expands on Allen's approach. There are two pressing methodological problems that necessitate further investigation that are addressed in this article. First, the implicit assumption behind Allen's research on real wages of urban wage earners is that these are indicative of the standard of living of the entire economies. But, due to the dominance of the rural sector in preindustrial Europe, evidence based only on relatively few urban centres tells us little about the overall living standards. This would not be problematic if the income differences between urban and rural sectors were marginal and/or similar across countries. However, it has been theorised that the income gap between urban and rural sectors in the east could have been much wider due to serfdom. Coercive agricultural class structures are believed to have deepened the income gap by institutional limitations on peasants' mobility and surplus extraction (see Malinowski and Van Zanden 2015 on the impact of serfdom on income inequality). Furthermore, until around 1600 England and Poland were characterised by similar urbanisation levels. The series diverged during the 17th century when the Polish urban sector contracted whereas the English one continued to grow (Allen 2000). In order to revisit the issue of The Little Divergence and improve Allen's work on real wages, I investigate relative incomes from both urban and agricultural sectors in Southern England, Northern Italy, and Poland between 1500 and 1800. As expected, I find that Poland was characterised by a much wider wage gap between the sectors. This discrepancy necessitates the use of urbanisation data to aggregate the urban and rural income series. I account for the differences in income inequalities by weighting the series by occupational structures.

Second, according to Broadberry and Gupta (2006), due to the Balassa-Samuelson effect, international comparisons of historical incomes should be highly sensitive to changes in the exact composition of the basket used to deflate the wages. In order to assess the robustness of Allen's findings I move away from the 'respectability basket' and use the 'bare-bones basket' – a new basket proposed by Allen et al. (2011) that includes less manufactured products, is based on grain rather than bread and beer prices, and was especially tailored to study poorer

economies. Furthermore, since I investigate inhabitants of the agricultural sector - who generally baked their own bread - into the comparative framework, I believe that a basket that does not incorporate bread approximates the demand of the studied population better and is more suited for this study. In line with the argument made by Broadberry and Gupta (2006), I find that the change of the basket narrows the perceived difference between living standards in London and the Polish cities.

The rest of the paper is organised as follows. First, I outline the methodology. Second, I discuss the used sources for England, Italy, and the Polish urban sector. Third, I analyse the trends in the costs of living around Europe. Fourth, I measure urban real wages. I also discuss income inequalities within and between cities and the impact of the composition of a basket on the picture of the east-west dissimilarity. Fifth, I estimate real wages in the Polish agricultural sector and investigate income inequality between sectors across Europe. Sixth, I account for the income differences within and between sectors around Europe by weighting the wage series by occupational structures. In the last section I conclude.

2. The 'bare-bones basket'

A real wage is an annual income from wages deflated by a cost of a consumer basket. In this research I divide the wages by the 'bare-bones basket' proposed by Allen et al. (2011). The basket is composed of what the authors considered as indispensable for a single breadwinner to support a household of two adults and two children to survive a year in terms of nutrition and basic day-to-day items. Allen and his collaborators assumed that an adult requires at least 1,945 kilo-calories and 78 grams of protein each day. In addition to foodstuffs, he or she is assumed to be in need of soap, light, clothing, and fuel. The last ingredient of the basket is rent that is assumed to be an additional five per cent premium on top of the cost of the abovementioned commodities. The consumption needs of a child are assumed to be half of those of an adult. A household is assumed to need 3.15 times an adult's basket (one or the woman, one for the man, one for the two children, and 0.15 for housing). Costs of a basket are measured in grams of silver. I base the cost of the basket for Poland on rye as it was the most commonly consumed grain. Because there is no available series of rye prices for England and Italy, I base the English and the Italian baskets on wheat. The latter grain was more expensive, but it was also more nutritious.

Table 1: ‘Bare-bones basket’ for one adult.

	Unit	Quantity per year	Kilo-calories per day	Grams of protein per day
Rye/wheat	Kg	180/173	1626	63
Beans	Kg	20	185	12
Meat	Kg	5	34	3
Butter	Kg	3	100	
Soap	Kg	1.3		
Candles	Kg	1.3		
Lamp oil	Litre	1.3		
Linen	m^2	3		
Fuel	10^6 BTU’s	3		
Total			1945	78

Source: Allen et al. 2011.

In order to compute the annual income, a daily wage of a labourer is multiplied by 250 – the number of days a worker is assumed by Allen et al. to have worked per year. According to Molenda (1978), there were around 100 annual holidays in Poland. This observation suggests that the assumed 250 days of work a year can be a plausible approximation of the maximum labour input. Unfortunately, there has been no detailed research into historical work duration in Poland. A male worker is assumed to be a sole breadwinner in the household. The methodology does not account for any other source of income. The total annual income is also measured in silver.

‘Subsistence ratio’ – the standard measure of real wages based on the ‘bare-bones basket’ - equals the annual income divided by the final cost of a household’s basket. If the ratio is greater than unity, this hypothetical household was able to sustain itself. Values below one are difficult to interpret. They may indicate that a family was forced to supplement its income with labour input of the wife and the children and/or adjust its size. Values much greater than one indicate capacity to have more children, or to consume more meat or better clothing.

3. Sources

Regarding the Polish cities, price and wage data are available for Gdańsk, Warsaw, Lublin, Cracow, and Poznań. Prices and wages for Gdańsk, Warsaw, Cracow, and Lviv have been compiled and standardised by Allen (2001), who based his figures primarily on the information gathered by the International Scientific Committee on Price History. This study compiles and standardises prices and wages for Lublin (Adamczyk 1935) and Poznań (see the appendix). These cities have not been included in Allen’s sample. Most of the Polish price data come from the records of institutions such as monasteries or orphanages. This indicates that these are retail prices, which were usually higher than wholesale prices (Mączak 1972: 30-37). Only prices for

18th century Poznań are mostly based on price regulations issued by local officials, which might have been lower than market prices.

Southern English and Northern Italian price and wage data were also taken from Allen (2001). England is represented by price and wage series for London, Italy by Florence and, for the 18th century, Milan. Supplementary information on Italy was taken from Malanima (2008a; 2008b). These were the indexed accounts of: (1) consumer prices based on a differently specified basket and (2) wages of agricultural workers. These figures on the Italian consumer price index were used to estimate the cost of the Italian 'bare-bones basket'. The additional information on Italian wages were needed to fill the gaps in the series taken from Allen (2001) (see the appendix).

4. Nominal costs of living

Table 2 plots different costs of the 'bare-bones baskets' in grams of silver from Polish cities, Southern England (London), and Northern Italy (Milan/Florence). In general, Eastern European price levels were lower than elsewhere on the continent. Moreover, there were vast differences in the nominal costs of living between the Polish cities. The differences were mostly driven by the costs of food (i.e. mostly grain) in the cities. In general, the expensive – in absolute terms – Polish cities were: Gdańsk, Lviv, and Lublin whereas Cracow, Warsaw, and Poznań were cheaper. In the expensive cities, on average, rye accounted for 43, 40, and 45 per cent of the total basket respectively. Conversely, the cost of rye in the cheaper cities was lower and accounted for 26, 34, and 28 per cent of the basket respectively. Moreover, according to the available annual data on all the Polish cities for between 1500 and 1800 (1,125 simultaneous data points), the correlation coefficient between the cost of the basket and the share of food in the total cost of the basket across the cities was as high as 0.76.

Table 2: Cost of the 'bare-bones baskets' in Poland, Northern Italy, and Southern England denoted in grams of silver, 1501-1800.

	Gdańsk	Cracow	Lviv	Warsaw	Lublin	Poznań	CV (Poland)	London	Florence/Milan
1501-1525		33	32					91	109
1526-1550	58	39	38				0.25	84	146
1551-1575	84	50	59	66		98	0.27	126	174
1576-1600	106	57	80	70	115	112	0.27	213	232
1601-1625	117	83	91	83	136		0.23	268	235
1626-1650	139	91	106	99	161		0.25	322	209
1651-1675	142	86		81	155		0.33	310	172
1676-1700	116	52	143	75	124		0.37	307	191
1701-1725	113	51	106	88	152		0.36	278	188
1726-1750	110	58	139	110	160	97	0.31	250	196
1751-1775	139	65	167	107	188	107	0.35	317	227
1776-1800	168	79		135	201	128	0.32	386	294

Note: Table presents the average value for every sub-period.
Source: See the text.

According to Mielczarski (1962: 33-44), Polish grain and food prices could have depended on: (1) the degree of integration of the grain markets and (2) agricultural output in the region. Regarding the first proposition, according to the coefficient of variation (CV) of the cost of the Polish baskets between 1550 and 1800 presented in Table 2 (values of the CV before 1550 are based on an incomparable, smaller sample), Polish commodity markets seem to have been relatively integrated in the second half of the 16th century (CV values around 0.27), possibly became more integrated in the first half of the 17th century (CV values between 0.23 and 0.25), disintegrated in the second half of the 17th century (CV values between 0.33 and 0.37), and remained relatively disintegrated in the 18th century (CV values between 0.31 and 0.36). This is not the first inquiry into Polish market integration. Baten and Wallusch (2005) also demonstrated that Polish markets were poorly integrated in the 18th century.

Regarding the impact of the agricultural output on grain prices, Lviv and Lublin were located in the rye importing regions (Mielczarski 1962: 225-231). Therefore, the argued disintegration of markets around the 17th century, could possibly explain the increase in the prices in these cities. The high costs of living in Gdańsk were probably caused by integration of this city with the western and more expensive grain markets (Jacks 2004). Conversely, Cracow could have profited from being located in Małopolska – one of the more agriculturally developed regions (Mielczarski 1962: 225-231). The disintegration of the domestic market could have lowered Cracow's exports and decreased prices.

Overall, the costs of living in Poland, Southern England, and Northern Italy, grew through the 16th century and the first half of the 17th century. Prices decreased in the second

half of the 17th and in the first quarter of the 18th century. The rising trend in the prices returned in the first half of the 18th century and lasted until the end of the studied period.

5. Wages in the urban sector

I investigate two types of urban labour: (1) unskilled workers and (2) skilled masters. The wage data on unskilled workers in Poland come from numerous sectors of the urban economy. The wages for skilled labour are based on the incomes of master masons and carpenters. There is an issue of representativeness of the building industry. Allen (2001) argued that these wages might have been driven by factors specific only to this sector, i.e. supply of and demand for construction. Karpiński (1983: 140-141) demonstrated such differences in trends between sectors within 17th century Warsaw.

Table 3: Daily wages of unskilled workers and masters in Poland denoted in grams of silver, 1526-1800.

Period	Gdańsk	Cracow		Lviv		Warsaw		Lublin		Poznań
	Unsk.	Unsk.	Mast.	Unsk.	Mast.	Unsk.	Mast.	Unsk.	Mast.	Unsk.
1526-1550	1.9	1.3	5.7	1.1	2.6					
1551-1575	1.9	1.8	5.3	1.6	3.4	1.7	4.2			1.7
1576-1600	2.3	2.2	5.6	1.9	4.6	2.4	5.6	2.0	5.7	2.4
1601-1625	3.1	2.6	4.9	2.1	4.5	2.6	7.2	2.8	6.3	
1626-1650	4.4	2.6	5.3	2.4	4.0	2.9	8.4	2.9	5.4	
1651-1675	4.5	2.1	4.5	2.4		2.4	5.6	2.7	4.2	
1676-1700	4.0	1.7	4.2	2.0		1.9	4.3	1.8	3.0	
1701-1725	3.9	1.6	3.5	1.7	2.7	1.7	4.3	2.2	3.7	
1726-1750	3.6	1.6	3.8	1.6	2.7	2.1	5.2	2.5	3.4	2.8
1751-1775	3.5	1.6	4.1	1.7	2.9	3.2	6.2	2.4	5.2	3.6
1776-1800	3.9	1.7	4.1	2.5	4.6	3.6	7.3	2.4	4.2	3.0

Note: Table presents the average value for every sub-period.
Source: See the text.

The wage data for Gdańsk, Cracow, Lviv, and Warsaw was previously compiled by Allen (2001; see the appendix for a discussion of differences between the series). Table 3 juxtaposes this information with prices from Lublin and Poznań that may be unknown to the international audience. This broader sample allows a more in-depth study of the patterns in Polish nominal wages. A differentiation in levels between various cities similar to that observed for the costs of living can be also seen in the case of the studied wages. This indicates that the high costs could have been offset by high wages.

Furthermore, Van Zanden (2009) argued that Polish cities were characterised by the highest skill-premium in Europe, defined as the ratio of the wage of the skilled craftsmen to

the wages of the unskilled labourers minus one. The estimates provided here are even higher because Van Zanden aggregated the wages of masters with that of the journeymen, who had a lower premium. This study only focuses on masters (see the appendix). According to this study, the masters' premium was on average around 150 per cent. Cracow in the middle of the 16th century and Warsaw in the first quarter of the 17th century noted skill-premiums even higher than 200 per cent. This was most probably attributed to the constructions of the royal palaces in these cities. By comparison, the average skill-premium over the studied period in London and in the Italian cities was 43 and 87 per cent, respectively.

Table 4: Real wages of skilled and unskilled labour in the Polish urban sector denoted in the 'subsistence ratios', 1526-1800.

	Gdańsk	Cracow	Lviv	Warsaw	Lublin	Poznań	CV
			Unskilled labour				
1526-1550	2.85	2.79	2.52				0.06
1551-1575	1.93	2.92	2.21	2.13		1.44	0.25/0.18[a]
1576-1600	1.84	3.37	2.03	2.85	1.57	1.77	0.32/0.25[a]
1601-1625	2.29	2.67	2.01	2.65	1.75		0.18
1626-1650	2.67	2.37	2.01	2.47	1.52		0.21
1651-1675	2.80	2.02		2.47	1.50		0.26
1676-1700	3.01	2.74	1.13	2.26	1.30		0.40
1701-1725	2.99	2.77	1.33	1.73	1.25		0.40
1726-1750	2.77	2.35	1.01	1.62	1.31	2.41	0.37
1751-1775	2.17	2.04	0.86	2.48	1.12	2.80	0.40
1776-1800	2.00	1.78		2.30	1.01	1.94	0.27
			Masters				
1526-1550		11.41	5.90				
1551-1575		8.90	4.86	5.20			0.35
1576-1600		8.63	4.86	6.59	4.23		0.32/0.23[a]
1601-1625		4.95	4.14	7.34	3.99		0.30
1626-1650		4.85	3.28	7.18	2.99		0.42
1651-1675		4.37		5.89	2.31		0.43
1676-1700		7.06		5.07	2.09		0.53
1701-1725		5.89	2.21	4.28	2.05		0.51
1726-1750		5.57	1.71	4.08	1.81		0.57
1751-1775		5.32	1.48	4.86	2.43		0.53
1776-1800		4.37		4.76	1.75		0.45

Note: a) values excluding Cracow. Table presents the average value for every sub-period.
Source: See the text.

The analysis of Polish urban real wages presented in Table 4 yields several important generalisations. Both the series for unskilled labour and masters are characterised by a progressing dispersion. The coefficient of variation (CV) of all the figures indicates that in the 16th century most of the cities were characterised by relatively similar standards of living and

that the cities diverged in economic development in the second half of the 17th century. The main exception was Cracow, which did significantly better than the other cities in the second half of the 16th century, possibly due to on-going royal investment into grand architectural projects in the city (the royal castle) at the time. For this reason, incorporating Cracow in the second half of the 16th century significantly increases the CV of the wages in all the cities. This has an impact on the results of the analysis. Accounting for Cracow suggests a more U-shape trend in dispersion with the CV values for the second half of the 16th century significantly lower than those for the 18th century, but higher than those for the 17th century. In general, the CV series that exclude Cracow in the late 16th century suggest a much more linear trend. However, there was a conversion in the wages in the last quarter in the 18th century.

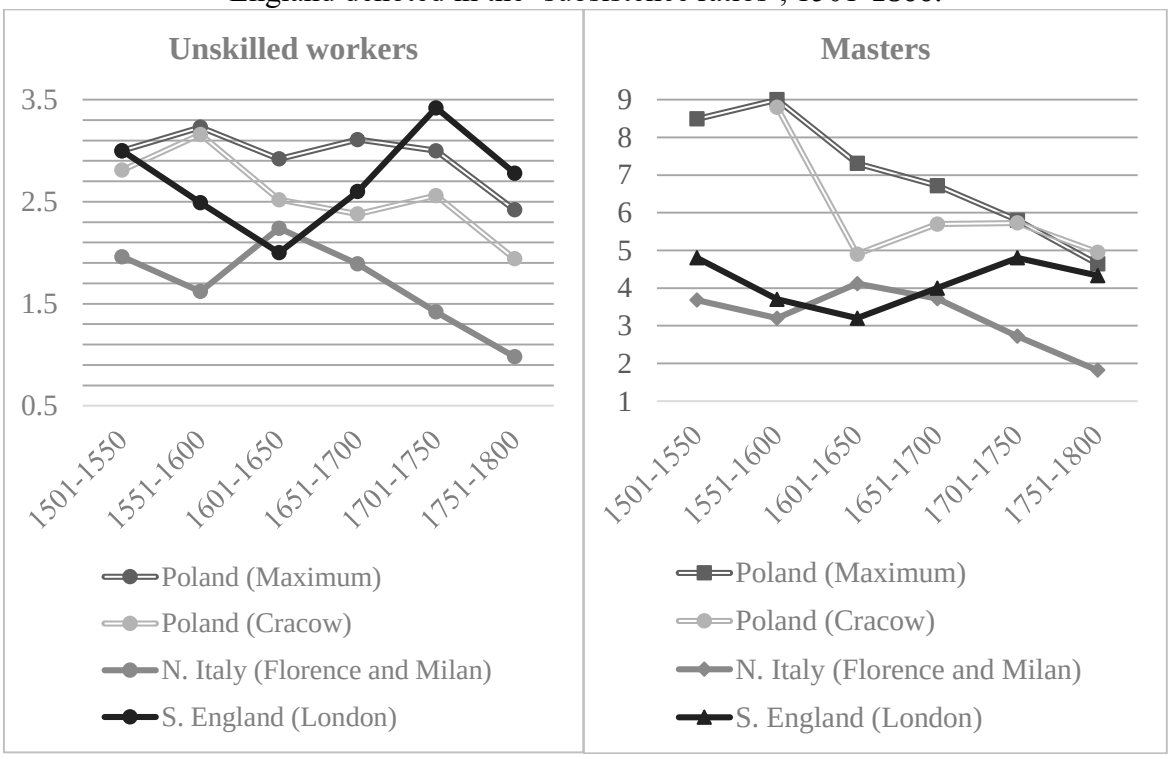
For both the unskilled and skilled series, the dissimilarity in real wages increased in the second half of the 17th century. This was a result of the formation of two groups of cities, namely (1) 'robust' composed of Cracow, Gdańsk, and Poznań, which managed to sustain their standards of living and (2) 'poor' formed by Lviv and Lublin, where real wages dropped continuously until the end of the early modern era. The progressing decay of the standards of living in Lviv would later result in the infamous and well-documented poverty of the Galicia region in the 19th century. Warsaw seems to have been in the 'robust' group until the turn of the 17th century when it joined the 'poor', only to return to the better off company around the middle of the 18th century. This could have been linked to the destruction of the city during the Great Northern War (1704-1721). Furthermore, between 1733 and 1764 king August III reigned mostly from Saxony, which negatively affected the city as it lived partially off the court's consumption.

In more detail, for the 'robust' group, the first half of the 16th century and the period between the second quarters of the 17th century to the middle of the 18th century were characterised by relatively higher incomes. Conversely, lower levels of real wages dominated the second half of the 16th century, excluding Cracow and Warsaw, as well as the last decades of the 18th century. These correspond to the periods of the pan-European increase in prices presented in Table 2.

I analyse how Polish urban real wages looked in a European perspective. I compare two sets of cities. I compare: (1) the highest urban real wages in Poland, Southern England, and Northern Italy and (2) the average urban real wages in Poland and urban wages in the localities in Southern England other than London. Regarding the first approach, usually an international comparison of real wages consists of contrasting the capitals that are assumed to enjoy the highest wage in a region – the so-called prime city assumption. According to this approach, a

divergence in real wages occurs if all the cities in the poorer country begin to lag behind the economic leader of the superior country. This method of comparison is often motivated by scarcity of data. I follow this approach and compare the richest cities from the studied regions in order to investigate income inequalities between economic leaders. London was clearly the richest city in England and can be used as a 'champion' representing the region (Allen 2001). Similarly, Florence and Milan were among the economic powerhouses of Northern Italy and therefore can represent the region. To the contrary, as shown in Table 4, none of the Polish cities enjoyed a constant supremacy. In order to compare maximum Polish urban wages internationally I look at two series. I (a) construct separate series for Poland based on the maximum value from all cities in every year and (b) choose Cracow as the representative for Poland as it was the historical capital.

Figure 1: Comparison of the highest urban real wage in Poland, Northern Italy, and Southern England denoted in the 'subsistence ratios', 1501-1800.

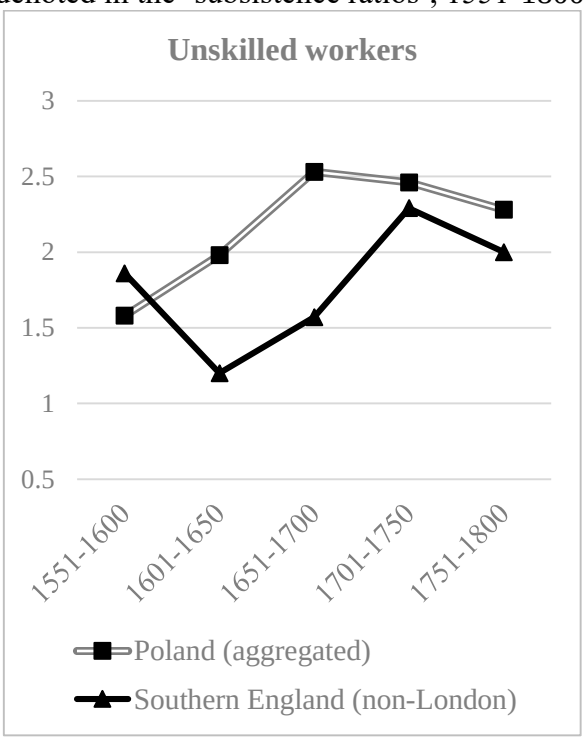


Note: Figure presents the average value for every sub-period.
Source: See the text

According to Figure 1, standards of living in the richest of the Polish cities in the 16th and the 17th century were not lower than they were in London. Unskilled labourers in London enjoyed slightly higher incomes only in the 18th century. Also, according to the data, real wages of the richest Polish masters were always higher than wages of the masters/carpenters in London.

Regarding the unskilled labour, there was a superiority of London over Cracow observable after 1700. Moreover, as a result of their continuous decline, real wages of unskilled labour in Florence/Milan began to lag behind London in the 18th century.

Figure 2: Comparison of the mid-range urban real wages from Poland and Southern England denoted in the 'subsistence ratios', 1551-1800.



Note: English figures present the average value for every sub-period.
Source: See the text and Appendix 1 and 2.

Whereas Figure 1 focused on economic leaders, Figure 2 juxtaposes real wages from settlements located in Southern England other than London with a 'national' Polish series. The relevant English series of nominal wages was taken from Allen (2001). Due to the lack of a corresponding dataset on prices, I deflate the wages by London's basket. In order to represent Poland, I construct an aggregate measure of real wages from all the studied cities. I use a method similar to that proposed by Clark (2005, p. 1322). I estimate the following equation:

$$W_i = \sum_{l=1}^{6} \sum_{m=1}^{5} \theta_{lm} CITY_l PERIOD_m + \sum_{n=1}^{25} \emptyset_n D_n + \epsilon_i \qquad (1)$$

Where W_i is the real wage; CITY is a dummy variable for each of the six Polish cities; PERIOD is an indicator variable for each of the five periods 1501-1550, 1551-1600, …, 1751-1800. D_n

is a set of dummy variables corresponding to the decades between 1550s and 1790s; ϵ_i is the error term. The exact estimation of this regression model can be found in Appendix 2.

The comparison of the Polish and English series indicates that real wages in the Polish urban sector in the late 16th century were at par with the English values. In the 17th century unskilled workers in the Polish cities were on average richer. However, the values gradually converged again in the 18th century. To my knowledge, there is no wage series for mid-range Northern Italian cities that could be used in this analysis.

This evidence based on the 'bare-bones basket' contradicts the north-western outperformance identified by Allen (2001) who used the 'respectability basket'. Table 5 compares different measures of relative incomes in London and Cracow. It shows that the more processed goods there are in a basket used to deflate wages the greater the superiority of the North-West over the East. Comparisons of 'grain wages' that deflated wages only by prices of rye or wheat – and should be considered only as a very rough proxy of living standards – even identified a striking superiority of Poland – a grain exporting country – over England (see Mączak 1995 [1983]; Van Zanden 1999). The 'respectability basket wages' were taken from Allen (2001: Table 6). The author based his estimates of the nominal wages of building labourers in the Polish cities on the average wage of unskilled workers and journeymen. Therefore, he grouped together skilled and unskilled workers or, in other words, incorporated building craftsmen into his labourers series. This overestimated the Polish series (see Appendix 1 for a detailed discussion). Table 5 presents the 'bare-bones basket wages' based on the series including (based on Allen's 2001 building labourers series) and on the series excluding journeymen (based only on the unskilled urban workers series). Both specifications support the main conclusion.

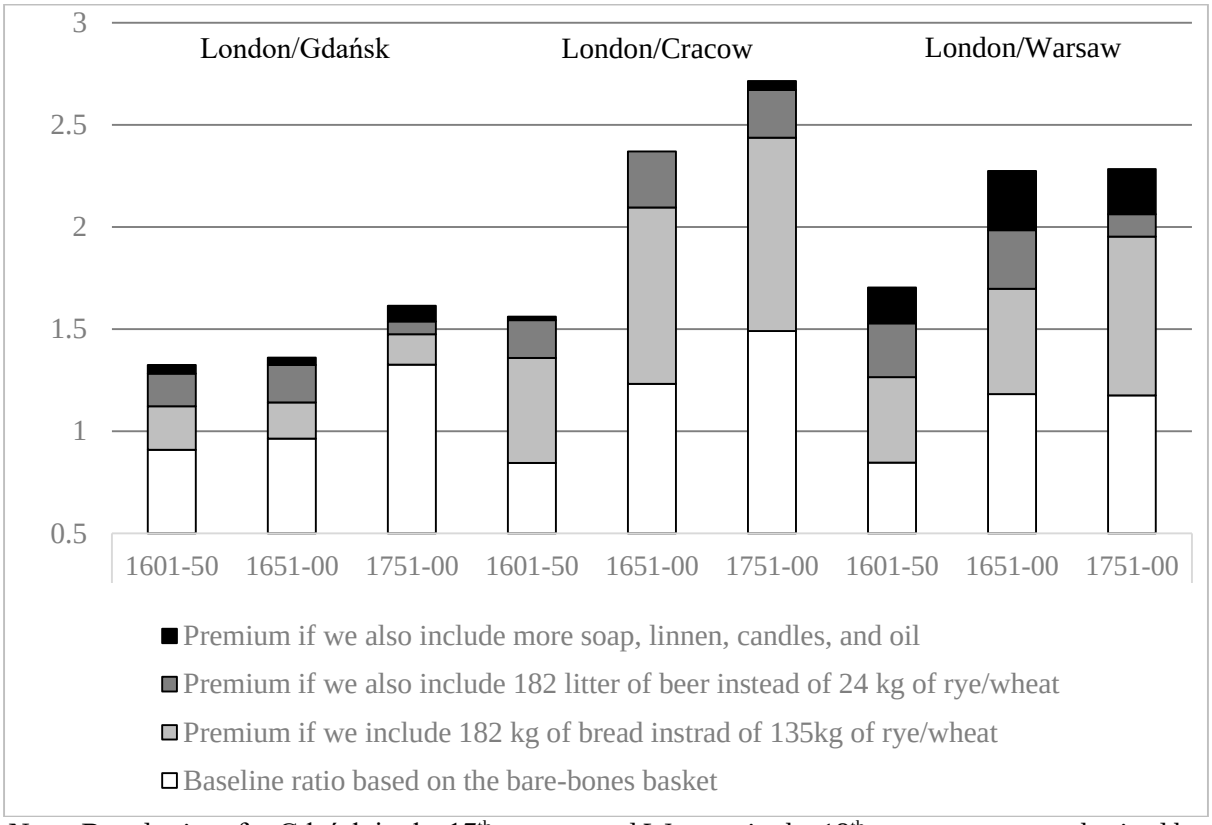
Table 5: Comparison of the different results of the income dissimilarities between unskilled workers from Cracow and London due to the use of different deflators of the wages, 1501-1800.

	1501-1550	1601-1650	1651-1700	1751-1800
Cracow 'grain wages'	45.1	31.1	21.1	18.3
Cracow 'bare-bones basket wages'	2.8[a]/4.26[b]	2.51[a]/4.68[b]	2.38[a]/3.28[b]	1.94[a]/3.53[b]
Cracow 'respectability basket wages'	0.97	0.92	0.96	0.88
London 'grain wages'	13.2	6.0	8.1	8.1
London 'bare-bones basket wages'	3	2.06	2.69	2.78
London 'respectability basket wages'	1.42	1.16	1.37	1.42
Ratio Cracow to London				
'Grain wages'	3.42	5.18	2.6	2.26
'Bare-bones basket wages'	0.93[a]/1.42[b]	1.22[a]/2.27[b]	0.89[a]/1.21[b]	0.70[a]/1.26[b]
'Respectability basket wages'	0.68	0.79	0.70	0.62

Note: a) based on incomes of unskilled workers; b) based on incomes of unskilled workers and journeymen. Cracow chosen as Allen 2001 used, for after 1600, the historical bread prices (rather than the prices synthesised with use of the 'bread equation') to compute the city's 'respectability basket'. Van Zanden presented the data using 20- not 50-year-long periods. All metrics for London are based on wheat and for Cracow on rye.
Source: Van Zanden 1999; Allen, 2001; See the text.

In more detail, Figure 3 demonstrates that substitution of rye or wheat with processed grains, i.e. beer and bread, as well as inclusion of more manufactured products in a basket changes the picture of The Little Divergence. The figure compares real wages of unskilled building labourers in London with relative incomes of unskilled workers in a range of Polish cities. It shows that the relative prosperity of London increases with substitution of the grains with 182 kg of bread and 182 litres of beer. Londoners also appear to have been more prosperous if an additional 1.3 kg of soap and candles, two square meters of linen, and 1.3 litres of lamp oil (the amounts based on the richer basket used by Allen 2001) are incorporated into the basket. The increase in the ratio of English to Polish wages is caused by the fact that the abovementioned goods were relatively more expensive in the East than they were in the North Sea region. For example, in London the average ratio (for all the years between 1501 and 1800) between the price of a litre of beer and the price of a kg of wheat in the same year was 0.30. In the cases of Gdańsk, Lviv, and Warsaw the corresponding average ratios between prices of beer and prices of rye were much higher, i.e. 1.05, 1.40, and 0.87 respectively.

Figure 3: Real wages of unskilled workers in London based on different baskets of goods divided by real wages of unskilled workers in a range of Polish cities based on the same baskets.



Note: Bread prices for Gdańsk in the 17th century and Warsaw in the 18th century were synthesised by Allen 2001. Conversely, values for Cracow, Gdańsk for the period 1751-1800, and Warsaw for the 17th century are based on historical bread prices. Additionally, in Allen's dataset Gdańsk's textile prices refer to white linen, which was not used for ordinary clothes. This results in an upward bias. Sources: See the text and Appendix 1.

Relative prices of secondary products could have been high in Poland for several reasons. First, according to Broadberry and Gupta (2006), due to the Balassa-Samuelson effect, income inequality between the West and the East should be greater if based on a comparison of wages deflated by manufactured and tradable products than it would be if measured with the use of baskets based on less-tradable grains. This is because the North Sea region had its comparative advantage in production of supposedly easily-tradable manufactured and processed goods such as beer, soap, candles, linen, and oil, whereas Poland specialised in grains.

Second, processing grains into bread, which is not easily tradable, as well as production of the more tradable commodities, could have been relatively more expensive in Poland also due to the high costs of the skills required in the process. As discussed earlier, the skill-premium in Poland was much higher than in England. This could have contributed to the high relative cost of secondary products. According to Adamczyk (1935: 41), the high skill-premium in

Poland could be explained by the guild system that controlled the supply, and therefore the cost, of labour.

Third, the relatively large gap between the prices of rye and beer in Poland could have resulted from the political economy of the country. Taxes in Poland were agreed on by the regional Dietines and the Parliament. Those institutions were dominated by the landed nobility. The bargaining position of the cities in Poland was very weak as they had hardly any representation in those institutions. As a result, taxation in the country favoured the interest of the landed nobility over that of the townsmen. Grain production and trade by the nobility in the country was exempted from taxation by the state (Rybarski 1958). Conversely, production and retailing of beer was heavily taxed. According to Rybarski (1939: 257-282), the tax on beer (*czopowe*) was set at 11.5 per cent *ad valorem*. This permanent tax was often supplemented by additional taxes on alcohol such as *składne winne*, *kolekta piwna*, *szelężne*, and *akcyza*. The revenue of the Polish treasury from those taxes was substantial. According to data assembled by Rybarski (1939: 517-520), in the second half of the 17th century, the income of the Polish treasury from those taxes was around 25 per cent of the total ordinary revenues (*proventy ordynaryjne*). The issues of the impact of the rent seeking of the guilds and the political economy of the country on the relative prices in Poland, however, require more theoretical and empirical investigation, which is beyond the scope of this text.

On a different note, as discussed, English real wages in this study are deflated by more expensive wheat prices, whereas Polish figures are based on cheaper rye. This can potentially underestimate the English real wages and distort the comparison. The use of different grains for different locations is a common feature of real wages research. It is determined by the data availability and the knowledge of the historical diet (Allen et al. 2011). For Italy and England there is little information on historical rye prices available. This disallows use of rye as the cornerstone of the English and Italian baskets. According to the data on Dutch prices compiled by Allen (2001), calories obtained from wheat, on average, were 16 per cent more expensive than those obtained from rye. The relations in England could have been similar due to a high degree of market integration of the country with the Netherlands (Jacks 2004). Given that, on average, the cost of wheat accounted for 63 per cent of the price of the English basket, the wage series based on rye could have been 10 per cent (0.63 * 16) higher than the ones based on wheat.

6. Wages in the agricultural sector

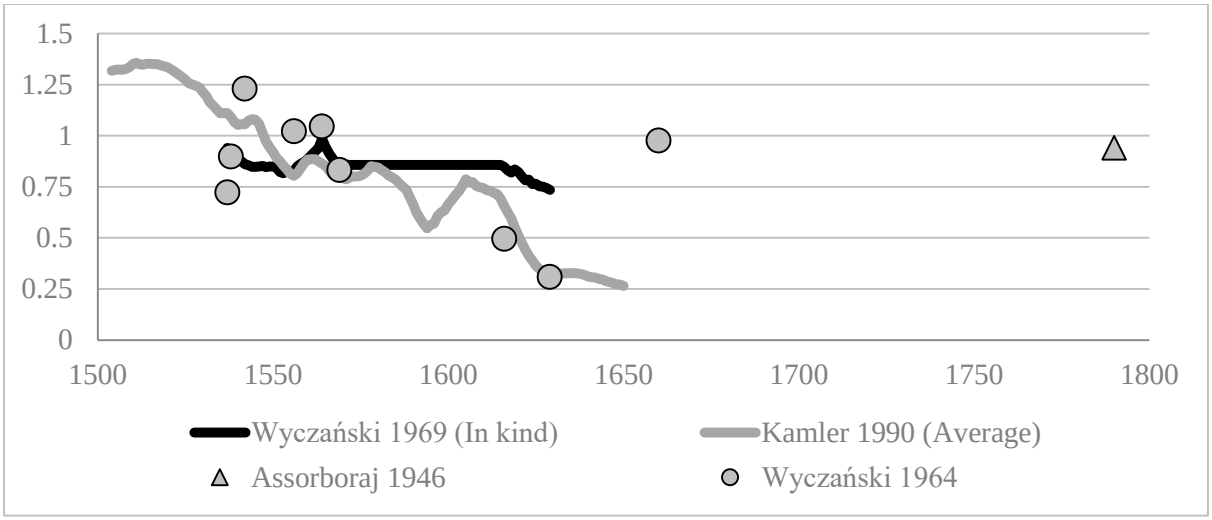
gricultural labour in Poland under second serfdom consisted of both corvée and wage-earning workers. According to Trzyna (1969: 65-138), in the Voivodeship of Cracow only one third of peasants paid rent in corvée duties. According to Izodorczyk-Kamler (1990), most of the landlords hired workers from the market. Moreover, peasants often hired help to serve the corvée duties for them. They also employed paid servants to work on their individual plots of land. In short, the Polish rural sector developed an active labour market.

The available data allows construction of two specifications of agricultural real wages: (1) a series of real wages of workers with known partial payments in kind, who probably lived with their employers and (2) those for whom I know only the expenses made on their employment and thus have to assume that they consumed the 'bare-bones basket'. The first specification better represents the standard of living of the agricultural workers. The second is consistent with the metrics for the urban sector and the foreign agricultural workers and therefore is more suited for international comparison.

Concerning the first specification of agricultural workers with the known partial payment in kind, Wyczański (1964: 180-181; 1969: 37) studied employees working at manors in the Nowe Miasto Korczyn region located in the Małopolska province. He gathered information on: (1) the stable nourishments provided by the employers including their caloric value, (2) the changing cost of this food as recorded by the employers, and (3) the size of changing supplementary payments in money. According to Wyczański, the food given by landlords to their workers provided them with 3698 kilo-calories daily. Information on the number of calories in the food provided for workers and the cost of this food paid by employers allows us to estimate the price of the calories on the rural market. Together with the information on the prices of manufactured products from the closest city – Cracow – these data allow the computation of a price of a rural basket. As in the case of the 'bare-bones basket', households are assumed to need 5835 kilo-calories daily (namely three times 1,945). The missing calories are assumed to be bought by the workers on the market. Workers in this specification are assumed to have a right to free housing and free use of firewood from their employer's forest (see Trzyna 1963: 65-138). In sum, the total cost of living of a worker's household is equalled to the cost of 5835 kilo-calories plus the cost of linen, soap, candles, and oil in Cracow. The annual income of the workers with known payment in kind is equalled to the annual supplementary payment in money plus the expense paid by the lord on each worker's nourishment.

The second specification of agricultural real wages paid only in money is based on the data provided by Assorboraj (1946: 104), Wyczański (1964: 180-181), and Izodorczyk-Kamler (1990: 663). The first author provided the information on the daily agricultural wages in the Wizna region located in the north of the country. The two latter scholars tell us how much money landlords spent per worker annually in various locations in the Małopolska region located in the south. With this data I approximate the annual average market earnings of the agricultural workers and relax the assumption of 250 days of work. Because the exact nourishment of these labourers is unknown, their income is deflated solely by the cost of the 'bare-bones basket' from the closest studied city – Cracow. The only exception is the data from Assorboraj, which is linked to Warsaw's basket.

Figure 4: Real wages of the agricultural workers in the Polish rural sector denoted in the 'subsistence ratios' and grouped by the source of the wage data, 1500-1800.



Note: Only the (Izodorczyk-)Kamler 1990 series was smoothened by 11-year centred moving average. All the series but the Wyczański 1969 series were deflated by the 'bare-bones basket'.
Source: See the text.

Figure 4 juxtaposes the two specifications. It yields several important generalisations. First, real wages of agricultural workers with known payment in kind were relatively stable. Conversely, the series deflated by the urban 'bare-bones basket' were clearly affected by the rising trend in prices (compare Table 2). A comparison between the two series supports the claims of Hagen (1986: 150-151), who argued that the standard of living of workers who consumed many non-purchases was relatively resilient to price volatility.

Moreover, there could have been a dramatic change in living standards in rural areas between the 1650s and the 1660s. This observation is, however, based only on one data point from the 1660s. The mid-17th century was a period of political turmoil and numerous war-

related calamities that decimated the population and thus could have affected the real wages (on the 17th century calamities see Przypoś 1957). Notably no such increase occurred in the urban sector despite sharing the same shock. This issue requires a further empirical and theoretical investigation.

Table 6: Agricultural real wages in Poland, Northern Italy, and Southern England denoted in the 'subsistence ratios', 1501-1800.

	Poland	Northern Italy	Southern England
1501-1550	1.23[d] / 0.87[c]	1.47	2.51
1551-1600	0.76[d] / 0.87[c]	1.12	1.93
1601-1650	0.48[d] / 0.79[c]	1.04	1.37
1651-1700 (1660)	0.98[ad] / 1.27e[ac]	1.2	1.56
1701-1750		1.18	1.81
1751-1800 (1790)	0.94[be]	0.86	1.4

Note: Table presents the average value for every sub-period. a) single value for 1660; b) single value for 1790; c) based on 'partial payment in kind' specification (Wyczański 1969); d) based on 'paid only in money' specification (Izodorczyk-Kamler 1990); e) based on 'paid only in money' specification (Assorboraj 1946).
Source: See the text

Table 6 compares Polish, Northern Italian, and Southern English agricultural real wages. Polish values in the table were taken from Figure 4. The table demonstrates both the specifications of the agricultural real wages, if available. Due to the data limitations the Polish values for the benchmark years 1660 and 1790 are based only on single data points. The comparison suggests that by 1500, English and Italian wages were much higher. This could have been an outcome of the difference in the levels of surplus extraction from the peasantry by the landlords between Eastern and Western Europe resulting from divergent institutional responses of the two regions to the Black Death and depopulation in the 14th century. According to Postan (1966: 566), the Black Death caused the decline of corvée duties in England because it made landlords compete for scarce agricultural workers by offering higher earnings. Conversely, in Poland landlords managed to band collectively, cooperate with the coercive power of the state, and introduce limitations on peasants' mobility, which in turn allowed them to increase surplus extraction (see Brenner 1976, Domar 1970, and Ogilvie and Carus 2014 for a detailed discussion). The issue of the causes and consequences of serfdom requires, however, an individual investigation and is beyond the scope of this study. Table 6 also shows that, through the early modern period, all of the series share an overall downward trend interrupted only by an increase after the

middle of the 17th century. This resulted in a gradual convergence of agricultural real wages between Poland and the rest of Europe.

Lastly, Table 7 compares ratios between urban and rural wages internationally. It suggests that the income gap between the sectors in Poland was exceptionally large. This links to the idea that serfdom and limitations on peasants' mobility could have resulted in a high wage gap between sectors (Malinowski and Van Zanden 2015; Chapter 3). The visible convergence between urban and rural wage series in Italy was presented and discussed by Malanima (2010). The data gathered by Allen (2001) and used in this text indicate an earlier take-off by the cities in England than the alternative data used by Clark (2007). In short, England, Poland, and Italy followed different trends in the formation of the income gap between occupational sectors.

Table 7: Ratios between real wages of urban unskilled workers' and agricultural workers' in Poland, Southern England, and Northern Italy, 1501-1800.

	Poland	Southern England	Northern Italy
1501-1550	2.43	1.20	1.47
1551-1600	4.25	1.29	1.12
1601-1650	6.08	1.51	1.04
1651-1700 (1660)	3.17[a]	1.74	1.23
1701-1750		1.89	1.18
1751-1800 (1790)	2.57[b]	1.99	1.15

Note: Table presents the average value for every sub-period. Values for Poland based on the ratio between the maximum observed value in the urban sector in every year and the agricultural data based on the Kamler 1990 series; a) comparison for only 1660, agricultural data based on the Wyczański 1964 series; b) comparison for only 1790, agricultural data based on the Assorboraj 1946 series.
Source: See the text.

7. Wages weighted by occupational structures

Thus far the comparison of the Polish urban skilled and unskilled real wages based on the 'bare-bones basket' with the English series did not show the alleged superiority of the north-west over the east of Europe. Furthermore, the new evidence from the Polish agricultural sector suggested a progressing convergence due to the pan-European downward trend in agricultural wages. This evidence combined suggests a widening income gap between sectors in England, a persistently deep gap in Poland, and convergence between urban and rural workers in Italy. This gap puts urbanisation in the spotlight, as it might be crucial for understanding the East-West dimension of The Little Divergence. I now weight the skilled, unskilled urban, and

agricultural real wages by the data on occupational structure. I propose upper and lower band estimates of the weighted series.

Table 8: Occupational distribution in the Voivodeship of Cracow, 1500-1776, in thousands.

	1500	1578	1662	1776
Towns	57(10%)	133 (28%)	61 (12%)	64 (15%)
Cities	20 (3%)	34 (7%)	8 (2%)	24 (6%)
Villages	498(87%)	309 (65%)	428 (86%)	330 (79%)
Total	575 (100%)	476 (100%)	497 (100%)	418[a] (100%)

Note: a) population estimated by multiplication of the total teritory before the 1772 partition (20,800 squere km) by the average population density in the Małopolska province where the Voivodeship was located (20.1).
Source: Rusiński 1954; Vielrose 1957; Bogucka and Samsonowicz 1986: 120-121; Kuklo 2009: 233.

The data on the occupational structure in England was taken from Wrigley (1987: 117). Corresponding estimates for Italy came from Allen (2000). These two series divide the population into three major sectors (1) cities, (2) rural agricultural, and (3) rural non-agricultural. In order to reveal similar relations in Poland, I compile various studies and propose a uniform dataset on the occupational distribution in the Voivodeship of Cracow – the historical core of the country (see Malinowski and Van Zanden 2015 and Chapter 3 on the representativeness of the Voivodeship). The Polish accounts divide the population slightly differently than the English and the Itialian ones. Table 8 shows the distribution between (1) cities, (2) towns, and (3) villages. In all cases cities are defined as dwellings with more than 5,000 inhabitants. Towns are defined as settlements with less than 5,000 people, but with city rights.

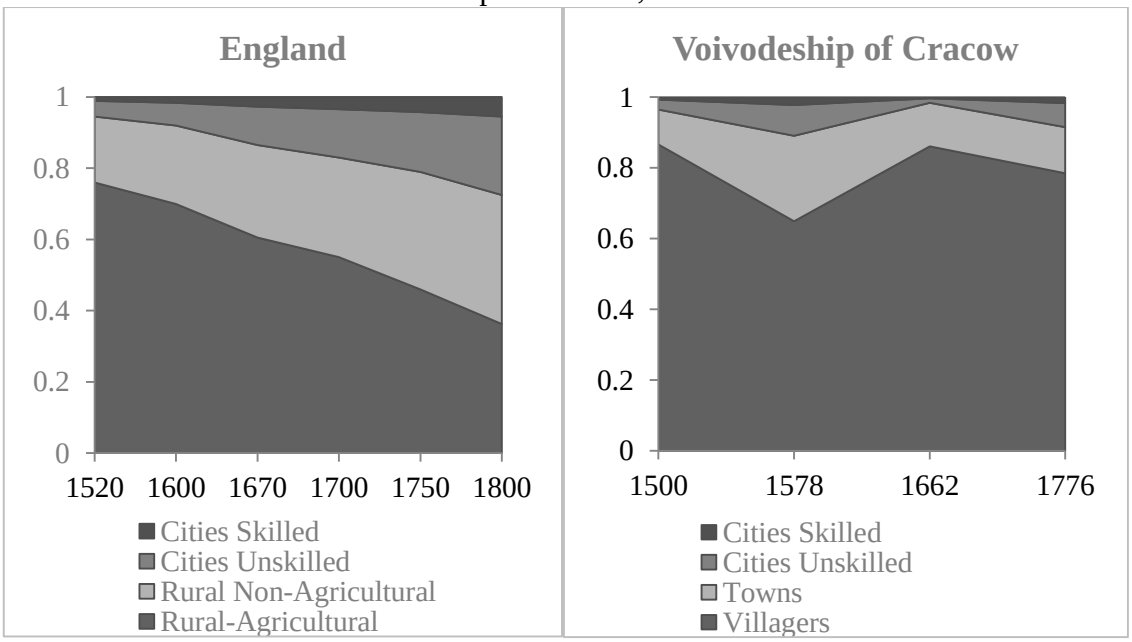
Table 9: The share of skilled labour in the populations of selected early modern Polish cities.

	Number of workshops I	Total population II	Number of households III	Share of skilled labour in cities I / III
Gdańsk in 1650	2,644	53,000	13,250	0.20
Cracow in 1581	577	17,000	4,250	0.14
Cracow in 1650	909	20,000	5,000	0.18
Cracow in 1760	834	26,000	6,150	0.14
Toruń in 1650	624	15,000	3,750	0.17
Nowy Sącz in 1581	137	5,000	1,250	0.11
Average				0.15

Note: Assuming four people in a household and one master per workshop.
Source: Małecki 1963; 1984; Bogucka 1956; Cackowski 1994.

The population sources for all three regions do not report the share of the skilled labour. Table 9 reports that, on average, 15 per cent of labour in Polish cities was skilled. If I assume that skilled labour clustered only in cities, I can compute their share in the total population. I also assume that the skilled labour in Poland, England, and Italy accounted for 15 per cent of the labour force in the cities. The results for England and Italy are not sensitive to changes in this assumption because of the low skill-premium in these countries.

Figure 5: Occupational distribution between the main sectors in England and in the Voivodeship of Cracow, 1500-1800.



Note: 15 per cent of the population of the cities is assumed to be skilled.
Source: Wrigley 1987: 117; Table 8.

Figure 5 compares English and Polish occupational structures. It yields that until 1600 both economies had similar urbanisation levels. The series diverged around the 17th century. Throughout the 17th and the 18th century Southern England continued to develop its urban sector. Conversely, the destructive wars of the 17th century decimated the Polish urban population, which failed to recover after this calamity (Bogucka and Samsonowicz 1986).

Equation 2 proposes how to weight the real wages (*WI*). The core idea is to link different sectors *i* with the different wage series *I*. For every benchmark point-in-time *t* one could sum the products of multiplication of all the individual shares of each of the sectors S_i in the total population with the real wage I_i from the wage series that corresponds to that sector.

$$WI_t = \sum_i (S_{i,t} * \mathrm{I_{i,t}}) \qquad (2)$$

The main problem is linking sectors to real wage series. To solve the problem I propose upper band and lower band estimates. Should comparisons of both the deliberately overestimated and underestimated average incomes indicate the same dissimilarity, it would strongly suggest that there was an income gap between counties. The exact sectoral pairs are presented in Table 10.

Table 10: Paired sectors and real wage series

Sectors			Real wage series	
	England/Italy	Poland	Upper band specification	Lower band specification
	S_i	S_i	I_i	I_i
i_1	Rural agricultural	Villagers	Agricultural	Agricultural
i_2	Rural non-agricultural	Towns	Unskilled urban	Agricultural
i_3	Cities unskilled		Unskilled urban	Unskilled urban
i_4	Cities skilled		Skilled urban	Skilled urban

The pairing of unskilled and skilled urban labour wages and sectors is straightforward. Other pairs, however, require some explanation. In the Polish case, villages were partially inhabited by people who did not work in agriculture. According to data provided by Kamińska (1964: 139), wages in rural manufactures owned by Polish landlords were similar to the remuneration of agricultural workers. Therefore, real wages typical for the Polish villagers can be represented by the agricultural wage series.

According to Bogucka and Samsonowicz (1986: 329-392), many Eastern European towns were partially populated by agricultural workers. For this reason, the remuneration of town inhabitants probably varied between that of agricultural workers and that of unskilled labour from the cities. There is not enough data to gauge the income of this group more closely. A more optimistic estimate of weighted wages would assume that all of the breadwinners in towns earned the urban unskilled wage. The pessimistic specification would assume that all of these households had to go by the agricultural wage.

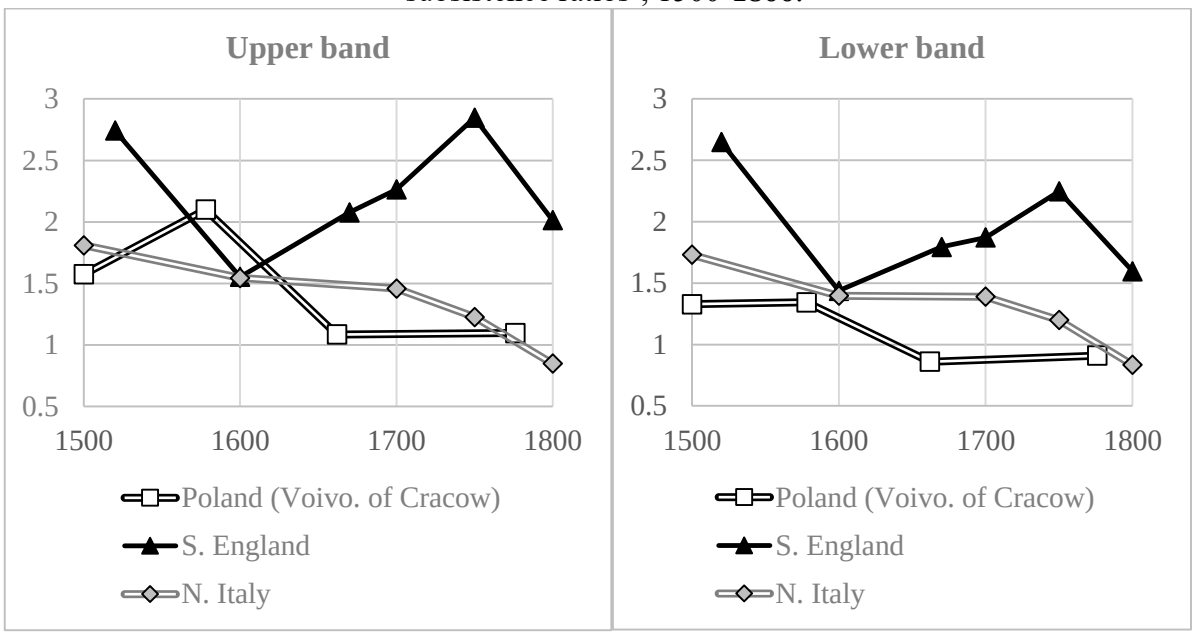
In the cases of England and Italy, I can relatively easily assume that the rural agricultural sector can be approximated by the agricultural wage. The problem lies in the rural non-agricultural sector. This category breaks into two main subsets: The first set consists of craftsmen and workers living in semi-urban dwellings with populations below 5,000 inhabitants. The second group are rural craftsmen and villagers employed in rural manufactures or putting-out systems. One branch of the literature sees the rural non-agricultural sector as a transitory step from agriculture towards industry associated with an increase in income levels. Conversely, others see it as a sign of proletarianisation of the peasantry, i.e. separation from

their means of production, which was supposedly not beneficial for their standards of living (for the debate see Ogilvie and Cerman 1996). I cannot solve this debate here. Instead, in the cases of England and Italy I assume the wage typical for this sector was between the agricultural and the urban-unskilled one.

Regarding the choice of the wage data, for England and Italy there is only one available series representing each of the three types of labour. For Poland, I weight the urban wage series from Cracow with agricultural wage data from the Małopolska region, where the Voivodeship of Cracow was located. The only exception is the agricultural wage for the late 18th century, which comes from the Wizna region located in northern Poland. The Polish agricultural wage data used for weighting is based on the previously discussed 'paid only in money' specification, which is consistent with the English and Italian accounts. Apart from the Polish agricultural wage for 1660 and 1790 all the used wage data are based on centred 11-year averages.

Figure 6 juxtaposes the weighted real wages in the Voivodeship of Cracow, Southern England, and Northern Italy. The lower band estimates show that Poland had the lowest standard of living in the sample through the early modern era. Conversely, the upper band estimates indicate that the country enjoyed a rapid growth in the 16th century known as the Golden Age of Poland. Nonetheless, both the upper and lower bands provide the same picture of The Little Divergence. According to the real wages weighted by occupational structures, between 1500 and 1800 England enjoyed higher standards of living in two sub-periods separated by a period of convergence. England seems to have been more economically advanced than Poland already around 1500. This links to study performed by Pamuk (2007) who linked The Little Divergence to the Black Death in the 14th century. However, according to this inquiry, relative incomes in the studied regions converged around 1600. Subsequently, Poland began to lag behind England from the 17th century onwards.

Figure 6: Weighted real wages in the Voivodeship of Cracow, Southern England, and Northern Italy according to the upper and the lower band estimates denoted in the 'subsistence ratios', 1500-1800.



Source: See the text.

In more detail, English superiority around 1500 was caused by the exceptionally high agricultural wages in the country. The general convergence of Polish, English, and Italian series around 1600 was a result of the decline of wages in the English and Italian agricultural sectors. The second and persistent divergence that formed around the 17th century was not caused by the superiority in urban nor in agricultural wages, but by an increase in English urbanisation levels.

These findings contradict the insights provided by Allen (2001) based only on his study of the urban sectors. I demonstrated that standards of living in Poland could have been at par or perhaps even greater than standards of living in England around 1600, and that the country began to lag in economic development in the 17th century. What is known about historical heights – often used as an alternative measure of standards of living – seem to support this motion. Koepke and Baten (2005: Table 3) demonstrated that Eastern European health and nutrition levels could have been similar to those of western and Southern Europe. In more detail, according to their estimates, during the 16th century the average height of Eastern European men (169.71) could have been very close to that of their English (UK) counterparts - 170.41 cm. The authors also argue that in the 17th century the average height of Eastern Europeans was lower. According to the results of their analysis, the average stature of the first group decreased to 165.13 cm. Conversely, the latter population seems to have defended its standards of living as it shortened only down to 169.83 cm on average.

8. Conclusion

Thus far, The Little Divergence debate, which focuses on identification and explanation of the onset of the economic superiority of the North Sea region, has been dominated by comparisons of the region with the south of Europe. I added Poland to this comparative framework. My findings indicate that, since relative prices differ between regions, the results of a comparative research on relative incomes can vary depending on inclusion of processed goods in a basket used to deflate the nominal wages. The more secondary products, tradable goods, and processed grains such as beer and bread are in a basket, the relatively poorer the East appears in comparison to the North-West. This could be possibly attributed to the specialisation of the North Sea region in production of manufactured, tradable goods mirrored by the specialisation of the east in production of bulky and less tradable grains. Furthermore, processed goods in Poland could have been more expensive due to the high costs of the skills required in the process of production. Poland was characterised by a very high skill-premium, which indicates that skilled labour could have been in low supply. This could be possibly explained by rent seeking of the Polish guild system. Lastly, the high relative price of beer could be possibly explained by the political economy of the country. Due to the political dominance of the landed nobility over cities, grain production and trade by the nobility was exempted from taxation by the state, while taxes on beer were a substantial source of state's revenue. Those issues require, however, further theoretical and empirical investigation.

I also show that Poland was characterised by the highest income inequality between the urban and the rural sectors. It could be possibly also explained by the political domination of the landed nobility that resulted in serfdom and limitations on peasants' mobility in the country. Differences in income gaps between the sectors imply the crucial importance of urbanisation levels. According to real wages weighted by occupational structures, during the early modern period, England outperformed the rest of the continent twice – at the beginning of the 16th and after the 17th century. The first superiority was caused by exceptionally high agricultural wages and was lost over the 16th century. The second and lasting supremacy originated during the 17th century due to an increase in the English and a decline in the Polish urbanisation levels. Identification of these dissimilarities invites future research into their origins.

Map 1: Location of the Voivodeship of Cracow and the studied Polish cities within the Kingdom of Poland.

Note: The thick line represents the borders of the kingdom of Poland around 1570. The map does not include the vast territories located east of Lviv as they were not analysed in the text. Lviv is located slightly more to the east than indicated on the map.

References

ADAMCZYK, W. (1935). *Ceny w Lublinie.* Lviv: Instytut Popierania Polskiej Twórczości Naukowej.

ALLEN, R.C. (2000). Economic structure and agricultural productivity in Europe, 1300-1800. *European Review of Economic History* **3**, 1-25.

ALLEN, R.C. (2001). The Great Divergence in European wages and prices from the Middle Ages to the First World War. *Explorations in Economic History* **38**, 411–447.

ALLEN, R.C., BASSINO, J.P., MA, D., MOLL-MURATA, C. and VAN ZANDEN, J.L. (2011). Wages, prices, and living standards in China, 1738–1925: in comparison with Europe, Japan, and India. *Economic History Review* **64**, 8–38.

ASSORBORAJ, N. (1946). *Początki klasy robotniczej. Problem rąk roboczych w przemyśle polskim epoki stanisławowskiej.* Warsaw: Czytelnik.

BATEN, J. and WALLUSCH, J. (2005). Market integration and disintegration of Poland and Germany in the 18th century. *Economies et Societes* **33**, 1233-1264.

BOGUCKA, M. (1956). *Gdańskie rzemiosło tekstylne od XVI do połowy XVII wieku*. Wrocław: Zakład Im. Ossolińskich.

BOGUCKA, M. and SAMSONOWICZ, H. (1986). *Dzieje miast i mieszczaństwa w Polsce przedrozbiorowej*. Wrocław: Zakład Narodowy Im. Ossolińskich.

BRENNER, R. (1976). Agrarian class structure and economic development in pre-industrial England. *Past & Present* **70**, 30–75.

BROADBERRY, S. and GUPTA, B. (2006). The early modern great divergence: wages, prices and economic development in Europe and Asia, 1500–1800. *Economic History Review* **59**, 2-31.

CACKOWSKI, S. (1994). Życie gospodarcze. In: M. BISKUP (ed.), *Historia Torunia.* Toruń: Wydawnictwo Towarzystwa Naukowego, 47-92.

CLARK, G. (2005). The condition of the working class in England, 1209–2004. *Journal of Political Economy* **113(6)**, 1307-1340.

CLARK, G. (2007). The long march of history: farm wages, population and economic growth in England, 1209-1869. *Economic History Review* **60,** 97-136.

DOMAR, D. (1970). The causes of slavery or serfdom: a hypothesis. *The Journal of Economic History* **30**, 18-32.

HAGEN, W. (1986). Working for the junker: the standard of living of manorial labourers in Brandenburg, 1584–1810. *Journal of Modern History* **58**, 143–58.

JACKS, D. (2004). Market integration in the North and Baltic seas, 1500-1800. *Journal of European Economic History* **33(3)**, 285-329.

KAMIŃSKA, Z. (1964). *Manufaktura szklana w Urzeczu 1737-1846.*Warsaw: PWN.

IZODORCZYK-KAMLER, A. (1990). Wynagrodzenie pracowników najemnych w folwarkach małopolskich w XVI i pierwszej połowie XVII wieku. *Przegląd Historyczny* **81**, 655-667.

KARPIŃSKI, A. (1983). *Pauperes, o mieszkańcach Warszawy XVI i XVII wieku.* Warsaw: PWN.

KOEPEKE, N. and BATEN, J. (2005). The biological standard of living in Europe during the last two millennia. *European Review of Economic History* **9**, 61-95.

KUKLO, C. (2009). *Demografia Rzeczypospolitej przedrozbiorowej*. Warsaw: DiG.
MALANIMA, P. (2008a). *Consumer price index (1250-2007),* www.paolomalanima.it/DEFAULT_files/Page646.htm
MALANIMA, P. (2008b) *Wage rates (1290-1990),* www.paolomalanima.it/DEFAULT_files/Page646.htm
MALANIMA, P. (2010). The long decline of a leading economy: GDP in Central and Northern Italy, 1300-1913. *European Review of Economic History* **15,** 169-219.
MALANIMA, P. (2013). When did England overtake Italy? Medieval and early modern divergence in prices and wages. *European Review of Economic History* **17**, 45-70.
MALINOWSKI, M. and VAN ZANDEN, J.L. (2015). National income and its distribution in preindustrial Poland in a global perspective. EHES Working paper No. 76.
MAŁECKI, J. (1963). *Studia nad rynkiem regionalnym Krakowa w XVI wieku.* Warsaw: PWN.
MAŁECKI, J. (1984). *Kraków w wiekach XVI-XVIII.* Cracow: Wydawnictwo Literackie.
MĄCZAK, A. (1995 [1983]). Development levels in early-modern Europe. In: A. MĄCZAK (ed.), *Money, Prices and Power in Poland*. Norfolk: Variorum.
MĄCZAK, A. (1972). *Między Gdańskiem a Sundem.* Warsaw: PWN.
MIELCZARSKI, S. (1962). *Rynek zbożowy na ziemiach polskich w drugiej połowie XVI i pierwszej połowie XVII wieku*. Gdańsk: GTN.
MOLENDA, D. (1978). Ludzie pracy. In: W. HENSEL and J. PAZDURA (eds.), *Historia kultury materialnej Polski.* Vol. III. Wrocław*:* Zakład Narodowy Im. Ossolińskich, 206-214.
OGILVIE, S. and CARUS, A.W. (2014). Institutions and economic growth in historical perspective. In: P. Aghion and S.N. Durlau (eds.), *Handbook of economic growth*. Vol. 2. Burlington: Elsevier Science.
OGILVIE, S. and CERMAN, M. (1996). The theories of proto-industrialization. In: Idem (eds.), *European proto-industrialization*. Cambridge University Press, 1-12.
PAMUK, Ş, (2007). The Black Death and the origins of the 'Great Divergence' across Europe, 1300–1600'. *European Review of Economic History* **11**, 289-317.
POSTAN, M.M. (1966). Medieval agrarian society in its prime: England. In: M.M. POSTAN (ed.), *The Cambridge Economic History of Europe*. Vol. 1. Cambridge University Press, 548–632.
PRZYBOŚ, A. (ed.) (1957), *Polska w okresie drugiej wojny północnej* 1655–1660. Warsaw: PWN.
RUSIŃSKI, W. (1954). O rynku wewnetrzynym w Polsce w drugiej połowie XVIII wieku. *Roczniki Dziejów Społecznych i Gospodarczych* **16**, 113-149.
RYBARSKI, R. (1939). *Skarb i pieniądza za Jana Kazimierza, Michała Korybuta i Jana III.* Warsaw: Towarzystwo Naukowe Warszawskie.
RYBARSKI, R. (1958). *Handel i polityka handlowa Polski w XVI stuleciu*. Warsaw: PWN.
TRZYNA, E. (1963). *Położene ludności wiejskiej w królewszczyznach Województwa Krakowskiego w XVII wieku.* Wrocław: Zakład Narodowy Im. Ossolińskich.
VIELROSE, E. (1957). Ludność Polski od X do XVIII w. *Kwartalnik Historii Kultury Materialnej* **1**, 3-49.
WRIGLEY, E.A. (1987). *People cities and wealth.* New York-Oxford: Basil Blackwell.

WYCZAŃSKI, A. (1964). *Studia nad gospodarką starostwa Korczyńskiego, 1500-1660*. Warsaw: PWN.

WYCZAŃSKI, A. (1969). *Studia nad konsumpcją żywności w Polsce w XVI pierwszej połowie XVII wieku.* Warsaw: PWN.

VAN ZANDEN, J.L. (1999). Wages and the standard of living in Europe, 1500-1800. *European Review of Economic History* **2**, 175-197.

VAN ZANDEN, J.L. (2002). 'The Revolt of Early Modernists' and the 'first modern economy': an assessment. *Economic History Review* **55**, 619-641.

VAN ZANDEN, J.L. (2009). The skill-premium and the 'Great Divergence'. *European Review of Economic History* **13**, 121-153.

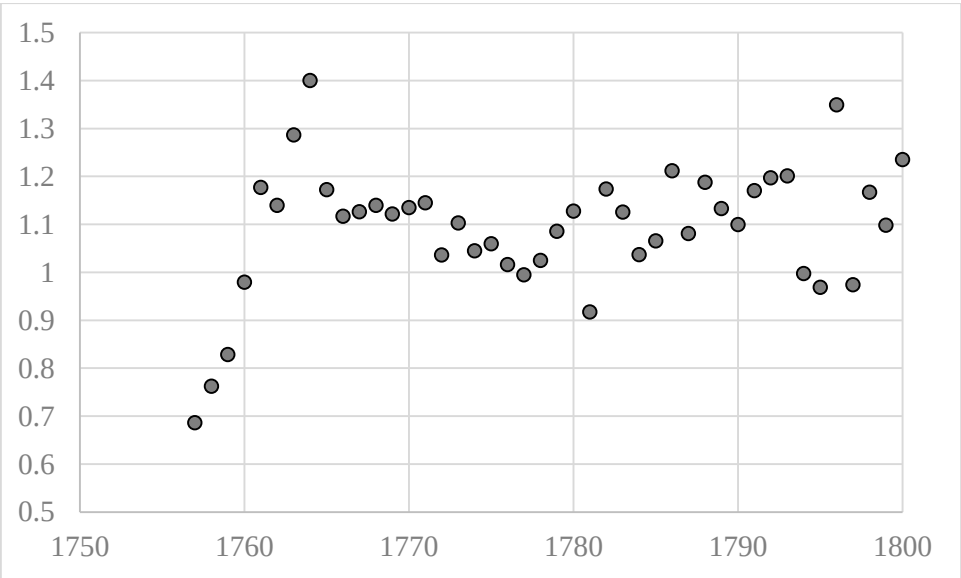
Appendix 1: Data standardisation and estimation

This study utilises historical information on prices and wages in Poland, Southern England, and Northern Italy. It investigates major cities and agricultural sectors from these regions. The data for prices and wages in Cracow, Lviv, Gdańsk, Warsaw, London, Milan, Florence, and the English and Italian agricultural sectors were taken from Allen (2001). Allen compiled and interpolated already standardised data from various previous editions. In the case of Poland, he made use of data published in the so-called Bujakowska series of prices and wages (Hoszowski 1928; 1934; Furtak 1935; Adamczyk; 1938; Siegel 1936; Tomaszewski 1934; Pelc 1935; 1937, Wolański 1993). Allen, however, did not compile the available data for Lublin (Adamczyk 1935) and Poznań (Więcławski 1989; Global Price and Incomes History Group, Unpublished, *Prices and Wages in Poznań 1493-1600*: Excel file downloaded from http://gpih.ucdavis.edu, based on a manuscript by Marjan Mika held in Beveridge Box M15 at London School of Economics archive, courtesy of David Jacks and Peter Lindert). For this reason, the price data for Lublin and Poznań used in this research required standardisation. Moreover, in Allen's dataset, wheat prices for London were denoted in price per litre. They had to be converted into price per kg. In order to standardise the data, I used information on conversion ratios provided by Adamczyk (1935), Allen (2001), and Global Price and Income History Group (http://gpih.ucdavis.edu; particularly the *Weight vs. volume* data file). In more detail, in the conversions a quarter of beef was assumed to weigh 60kg and a car (*wóz*) of firewood was assumed to weigh 162 kg (Adamczyk 1935). The density of rye and wheat was assumed to be 0.721 and 0.772 kg per litre respectively (GPaIHG). 100kg of firewood was assumed to provide 9,254 million BTUs (Allen 2001). In some cases, in order to fill the gaps in the Lublin and Poznań series, I interpolated the data by assuming a constant linear trend between the last and the first known value. Missing rye and wage data were interpolated if gaps were no longer than 11 years. Other commodities than rye were interpolated if gaps were no longer than 40 years. Furthermore, on some occasions I extrapolated the missing price data from known price information on a commodity that was likely to have been correlated with the unobserved commodity. In order to do so, I performed a simple OLS regression of the prices of interest on the prices of the correlated commodity ($\text{Price\_from\_investigated\_series}_t = \text{Constant} + \text{Price\_from\_correlated\_series}_t + \text{Error\_term}_t$). I predicted missing observations. I incorporated the predicted observations into the dataset. I never substituted the available historical observations with the synthetic predictions.

In the case of Lublin, missing observations of rye were first extrapolated from wheat and then from oats. Missing prices of butter were extrapolated from meat. Missing prices of meat were first extrapolated from prices of calf and then from cow. Missing observations of oil and whole series for soap were taken from the Warsaw series. For Poznań, missing prices of the manufactured products and fuel were taken from the Warsaw series. For the 16th century, prices of rye came from the Warsaw series.

I also make use of bread prices. The majority of bread prices come from Allen's 2001 dataset. These were mostly synthesised by the author with use of the so-called bread equation. The only series of historical bread prices in Poland in Allen's dataset are prices for Cracow between 1600 and 1800. Allen did not make use of available information on historical bread prices for Gdańsk between 1750 and 1800 edited by Furtak (1935, pp. 240-243) and Warsaw for 1600-1700 edited by Adamczyk (1938, p. 176). The historical information is based on price regulations. I standardised Furtak's and Adamczyk's data and used the information in my study. In the case of Gdańsk, I looked at the price cups for *Hausbackenbrodt* – the cheapest type of bread reported by Furtak. The author denoted the price in grosz per one *funt*. According to Furtak (1935, p. 41), one *funt* in Gdańsk was equal to 435 grams. Furtak (1935, p. 48) also reported the silver content of one grosz. Figure 1 plots the ratio of the historical bread prices used in this study to Gdańsk's bread prices synthesised by Allen. It shows that, on average, the historical bread prices were slightly higher than the synthesised ones.

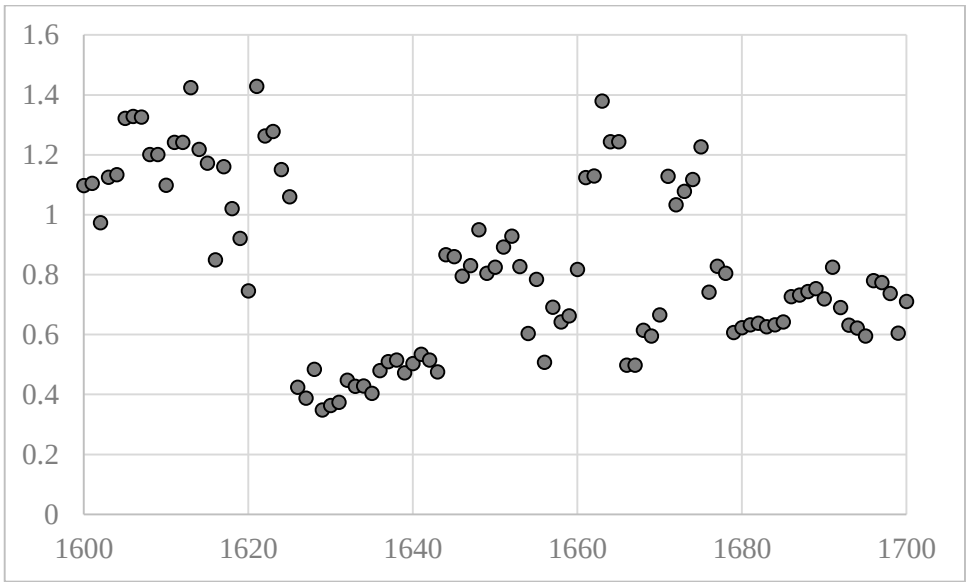
Figure 1: Ratio of the historical price of *Hausbackenbrodt* to the synthesised bread price in Gdańsk, 1750-1800.



Sources: See the text.

In the case of Warsaw, Adamczyk already represented prices of wholemeal rye bread (*chleb żytni razowy*) in grams of silver per one *funt* equalled 405 grams. Figure 2 shows the ratio of the historical bread prices in Warsaw to prices synthesised by Allen. It yields that the author could have slightly overestimated the prices.

Figure 2: Ratio of the historical price of rye bread to the synthesised bread price in Warsaw, 1600-1700.



All the original editions of the Polish unskilled urban wages that were compiled by Allen (2001) grouped the data into two or four seasons. There are numerous missing observations. Allen constructed an annual wage series for every city by estimating a simple average of the existing observations. The gaps created biases in Allen's series due to seasonal volatility. For this reason this study refined the aggregated annual wage series. The gaps were filled in with use of the OLS regressions. Namely, all the observations for each of the seasons were regressed on those for all the other seasons as independent variables separately. These regressions – up to 12 for a city – were performed for every century separately to account for possible long-term changes in the seasonality. The missing observations were filled in with the averages of all the predictions resulting from all the combinations of the seasons. The arithmetic average of thus obtained complete wage series was used to represent a wage in any given year. Despite the conversions, the difference between the wage series used in this study and the wage series of unskilled workers from Allen's dataset are not bigger than two per cent points on average.

Allen based his 2001 study of real wages on two types of wage series: wages of building labourers and wages of building craftsmen. The author did not define the difference between these two groups explicitly. I assume that building labourers represent the unskilled labour and

that building craftsmen represent the skilled labour. The same assumption was made by Van Zanden (2009), who used similar data to investigate skill-premiums in a range of European cities. In Allen's 2001 dataset for London, it is clearly stated which series denotes building labourers and which denotes building craftsmen. This is not the case for the Polish cities. Allen in his dataset reports five different series: 'Carpenter', 'Carpenter's Assistant/Aid', 'Mason', 'Mason's Assistant/Aid', and 'Unqualified Worker'. If we investigate the series closely and compare them with the values in Allen's paper we can conclude that, for his 2001 study, Allen based the series for Polish building craftsmen on the 'Carpenter' and 'Mason' series. He based the series for Polish building labourers on the 'Carpenter's Assistant/Aid', 'Mason's Assistant/Aid', and 'Unqualified Worker' series. The latter is an incorrect approximation of the nominal wages of the unskilled labour in Poland. The confusion probably came from an incorrect translation of the names of the groups presented in the original Polish paperback editions of wages. Series 'Carpenter' and 'Mason' indeed denote master carpenter and master mason respectively. Therefore, the series for building craftsmen for Poland approximates the earnings of the skilled workers correctly. However, according to the original paperback editions, 'Carpenter's Assistant/Aid' and 'Mason's Assistant/Aid' denote remuneration of the journeymen (*czeladnicy*) who were called in Polish *ciesielczyk* and *mularczyk* respectively. Adamczyk (1935, p. 41) clearly states that the two groups were skilled craftsmen. Therefore, they should not be grouped together with unskilled building labourers. Van Zanden (2009), when researching Poland, grouped these incomes of the journeymen with the incomes of the masters in order to investigate the skilled-craftsmen. In this study, I base the analysis of real wages of unskilled workers in the Polish cities only on the 'Unqualified Worker' series. I exclude journeymen's wages from the study. This is motivated by the fact that their wages are not available for all the studied Polish cities. Moreover, Boulton (1996, p. 275), who composed the dataset on English wages that was used by Allen, explicitly states that he excluded journeymen from the series for English building labourers and craftsmen. This correction results in a difference between Allen's 2001 series (see Table 2 of his study) for building labourers and my series for unskilled labourers (see Table 3 in Chapter 2). Table 1 below juxtaposes wages of unskilled labourers and journeymen in the studied Polish cities. It shows that the skill-premium of the journeymen in Cracow, Lviv, Warsaw, and Lublin was 72, 73, 27, and 18 per cent respectively, on average. As a result, Allen overestimated the nominal wages of unskilled urban workers in these Polish cities by 36, 36, 14 per cent respectively, on average (note that Allen did not study Lublin). The author did not overestimate the series for unskilled workers in Gdańsk, because there is no available series for journeymen for this city.

Table 1: Daily wages of unskilled workers and journeymen in Poland denoted in grams of silver, 1526-1800.

Period	Gdańsk		Cracow		Lviv		Warsaw		Lublin	
	Unsk.	Journy.	Unsk.	Journy.	Unsk.	Journy.	Unsk.	Journy.	Unsk.	Journy.
1526-1550	1.9		1.3	2.07	1.1	1.9				
1551-1575	1.9		1.8	2.97	1.6	2.8	1.7	2.9		
1576-1600	2.3		2.2	3.77	1.9	3.8	2.4	2.7	2.0	2.5
1601-1625	3.1		2.6	3.82	2.1	4.1	2.6	5.2	2.8	4.0
1626-1650	4.4		2.6	4.11	2.4	4.0	2.9	5.2	2.9	4.1
1651-1675	4.5		2.1	4.00	2.4	3.6	2.4	2.7	2.7	3.1
1676-1700	4.0		1.7	3.05	2.0	3.0	1.9	2.3	1.8	2.1
1701-1725	3.9		1.6	2.65	1.7	2.7	1.7	1.9	2.2	2.7
1726-1750	3.6		1.6	2.93	1.6	2.7	2.1	2.1	2.5	2.6
1751-1775	3.5		1.6	3.19	1.7	2.9	3.2	2.9	2.4	2.6
1776-1800	3.9		1.7	3.20	2.5	4.8	3.6	3.2	2.4	1.9

Note: Table presents the average value for every sub-period.

In the case of Northern Italy, the cost of a 'bare-bones basket' was calculated for 1750 with use of Allen's data. The basket was based on wheat. The cost of the basket for the other years was estimated by connecting the cost of the basket in 1750 to Malanima's index based on a different basket (Malanima 2008a). A constant linear relation was assumed between the 'bare-bones basket' and the basket constructed by Malanima. Wages in Italian agriculture were taken from Allen (2001). The missing observations were extrapolated by an OLS regression of Allen's agricultural wage data on Malanima's agricultural wage index (Malanima 2008b). There are 75 simultaneous observations of Allen's agricultural wages and Malanima's agricultural wage index. The correlation coefficient of the two is equal 0.85.

References

ADAMCZYK, W. (1935). *Ceny w Lublinie*. Lviv: Instytut Popierania Polskiej Twórczości Naukowej.

ADAMCZYK, W. (1938). *Ceny w Warszawie w XVI i XVII wieku*. Lviv: Instytut Popierania Polskiej Twórczości Naukowej.

ALLEN, R.C. (2001). The great divergence in European wages and prices from the Middle Ages to the First World War. *Explorations in Economic History* **38**, 411–447.

BOULTON, J. (1996). Wage Labour in seventeenth-century London. *Economic History Review* **49(2)**, 268-290.

FURTAK, F. (1935). *Ceny w Gdańsku w latach 1701-1815*. Lviv: Instytut Popierania Polskiej Twórczości Naukowej.

HOSZOWSKI, S. (1928). *Ceny we Lwowie w XVI i XVII wieku*. Lviv: Instytut Popierania Polskiej Twórczości Naukowej

HOSZOWSKI, S. (1934). *Ceny we Lwowie w latach 1700-1914*. Lviv: Instytut Popierania Polskiej Twórczości Naukowej.

MALANIMA, P. (2008). *Consumer price index (1250-2007),* www.paolomalanima.it/DEFAULT_files/Page646.htm

MALANIMA, P. (2008) *Wage rates (1290-1990),* www.paolomalanima.it/DEFAULT_files/Page646.htm

PELC, K. (1935). *Ceny w Krakowie w Latach 1369-1600*. Lviv: Instytut Popierania Polskiej Twórczości Naukowej.

PELC, K. (1937). *Ceny w Gdańsku w XVI i XVII Wieku*. Lviv: Instytut Popierania Polskiej Twórczości Naukowej.

WIĘCŁAWSKI, B. (1989). *Zaopatrzenie i konsumpcja w Poznaniu w drugiej połowie XVII wieku.* Warsaw-Poznań: UAM.

SIEGEL, S. (1936). *Ceny w Warszawie w latach 1701-1815*. Lviv: Instytut Popierania Polskiej Twórczości Naukowej.

TOMASZEWSKI, E. (1934). *Ceny w Krakowie w latach 1601-1795*. Lviv: Skład Główny.

VAN ZANDEN, J.L. (2009). The skill-premium and the 'Great Divergence'. *European Review of Economic History* **13**, 121-153.

Appendix 2: Time series of Polish national real wages

In order to measure changes in relative incomes in the whole observable Polish urban sector I estimate the following equation:

$$W_i = \sum_{l=1}^{6}\sum_{m=1}^{5}\theta_{lm}CITY_l PERIOD_m + \sum_{n=1}^{25}\emptyset_n D_n + \epsilon_i \qquad (1)$$

Where W_i is the real wage; *CITY* is an indicator variable for each of the six Polish cities; *PERIOD* is an indicator variable for each of the five periods 1501-1550, 1551-1600, …, 1751-1800. D_n is a set of dummy variables corresponding to the decades between 1550s and 1790s; ϵ_i is the error term. Table 1 shows the results of the estimation equation. Figure 1 plots the final results.

Table 1: Results of estimation of Equation 1.

Period dummies D	Coef. $\emptyset_n$	P	Period dummies D	Coef. $\emptyset_n$	P
1550's	1.4	1.20	1680's	2.88	0.00
1560's	1.51	0.09	1690's	2.42	0.00
1570's	1.76	0.05	1700's	2.7	0.00
1580's	1.77	0.04	1710's	2.43	0.00
1590's	1.5	0.09	1720's	2.55	0.00
1600's	2.11	0.00	1730's	2.4	0.00
1610's	2.05	0.00	1740's	2.22	0.00
1620's	1.77	0.01	1750's	2.71	0.00
1630's	1.99	0.00	1760's	2.57	0.00
1640's	2.07	0.00	1770's	2.13	0.00
1650's	2.6	0.00	1780's	2.1	0.00
1660's	2.19	0.00	1790's	1.91	0.00
1670's	2.58	0.00			
N	1,119				
R^2	0.96				

Note: Based on the pooled OLS estimation method. P-values based on heteroscedasticity robust standard errors (based on the Huber-White estimation method).

Chapter 3: Income and its distribution in preindustrial Poland[6]

With Jan Luiten van Zanden (Utrecht University)

Abstract: This text presents per capita GDP and income distribution estimates for preindustrial Poland. It is based on a social table for the Voivodeship of Cracow in 1578. Our evidence indicates that income in Poland was distributed more equally than in contemporary Holland. However, the extraction rate was much higher than in the North Sea area. Furthermore, income inequality in the countryside of the Voivodeship was higher than inequality in Cracow. This can be explained by the demesne economy based on serfdom that was prevalent in agriculture. Using trends in real wages and urbanisation, we also project Polish GDP forwards and backwards in time. Our results indicate that Polish per capita GDP was below that of Western Europe as early as the 15th century. This gap persisted despite moderate growth of the Polish economy in the 16th century. In the 17th century, Poland impoverished and became even poorer than Asian economies for which similar estimates are available. Poland recovered slightly in the 18th century but continued to lag behind Western Europe.

Keywords: economic growth, income inequality, 'The Great Divergence', Poland, extraction ratio, serfdom

JEL codes: N13, N33

Publication process: Accepted for publication by *Cliometrica*

[6] The authors wish to acknowledge contributions by Branko Milanović, Sevket Pamuk. Alex Klein, Nikolaus Wolf, Jacek Kochanowicz, Michał Kopczyński, Fabian Hungerland, and Piotr Guzowski. All remaining mistakes are the sole responsibility of the authors.

1. Introduction

This article seeks to establish how the Polish historical experience relates to the debates on income inequalities within and between countries in the early modern period. We reconstruct a social table for one of the economic and political centres of Poland, the Voivodeship of Cracow, and on this basis also explore the level of per capita GDP of Poland in this period (we discuss the representativeness of the region for Poland as a whole later in the text), and compare the results internationally between 1410 and 1910. These findings confirm the impressions provided by previous comparative studies of preindustrial Poland that the country lagged behind compared with England and the Netherlands (Allen 2001; Van Zanden 2001; Wójtowicz and Wójtowicz 2009; Baten and Szołtysek 2014). This growing apart of Poland and the North Sea region happens especially in the 17th and the 18th century. With this evidence we validate the hypothesis known as 'The Little Divergence', which proposes that relative income levels in north-western Europe increased vis-à-vis the rest of the continent through the early modern era (Allen 2001; Van Zanden 2001; Broadberry et al. 2015). We also confirm the claims made by Milanovic et al. (2011) about the link between the level of real income and income inequality. We demonstrate that income inequality in the Polish agricultural sector was constrained by the inequality possibility frontier. However, contrary to the theoretical model proposed by Kuznets (1955) and in opposition to the relations identified empirically for Western Europe (for example for Holland by Van Zanden 1995 and for Northern Italy by Alfani and Ammannati 2014), income in the Polish agricultural sector was distributed less equally than in the urban sector. We link this finding to the demesne economy based on serfdom, which defined class relations in the country.

This is not the first study that tries to chart the long-term growth curve of the Polish economy in the early modern period (Van Zanden 2001; Wójtowicz and Wójtowicz 2009), but our reconstruction is based on new data and on the methodology used in similar articles on GDP in pre-1800 Spain (Alvarez-Nogal and Prados de la Escosura (2013), Italy (Malanima 2010) and Germany (Pfister 2011), making the results comparable to those of these (and other) European countries. The methodology uses changes in real wages and urbanisation to gauge shifts in real income. Thanks to recent work by Malinowski (Forthcoming; Chapter 2), who estimated real wages in preindustrial Poland, we can use this methodology to make estimates for GDP per capita for the benchmark years 1500, 1578, 1662, and 1776. The results indicate a moderate growth in the economy in the 16th century, a strong contraction in the 17th century, and a stagnation in the 18th century. In the 16th century Polish per capita GDP was already

below that of Western Europe. After the 17th century crisis Polish real income went down to a level below that of India or Japan.

Positioning Poland in the debate on early modern growth is one objective. The other is to test ideas about the determinants of income inequality. According to Kula (1983), in the Polish demesne economy based on serfdom surplus generated by the peasants was extracted by their landlords. This suggests the existence of a wide income gap between the top and the bottom levels of Polish society, which could have resulted not only in high levels of income inequality but also in a high extraction rate (see Milanovic et al. 2011 for a definition of the concept), particularly in the agricultural sector. Contrariwise, according to Kuznets (1955) and Milanovic et al. (2011), poor and agrarian societies should be characterised by relatively low inequality. The latter authors propose that, for every value of per capita GDP there exists a maximum potential inequality, determined by real income and the subsistence minimum below which people cannot survive. This relationship is known as the inequality possibility frontier. The frontier is low in poor preindustrial societies, regardless of their political setup, and high in rich societies. Milanovic et al. (2011) built on the ideas of Kuznets (1955), who famously argued that early economic growth should result in a rise in income inequality. The latter author argued that, due to low productivity, agriculture should be characterised by low levels of income inequality. Kuznets theorised that economic growth is related to shifts of labour from agriculture to industry that is characterised by higher productivity. According to his model, due to the productivity gap between the rural and urban sectors and the arguably higher income inequality within the more productive sector, industrialisation/urbanisation makes societies richer, but it also makes them more unequal (Kuznets 1955: 7-8). Van Zanden (1995) suggested that Kuznets's model could be also applied to explain preindustrial economic growth (so-called 'Super Kuznets's Curve'). He demonstrated that, in the case of Holland, income in the Dutch agricultural sector was relatively evenly distributed, and that early modern economic growth went together with an increase in income inequality. In this article we try to put the Polish experience into the Western European perspective, and investigate if (A) demesne economy based on serfdom in early modern Poland resulted in relatively high levels of income inequality and extraction or (B) if inequality in the country was constrained by the small size of its agricultural economy. We conclude that, contrary to Western Europe, the agricultural sector in Poland could have been more unequal than the urban one. Our evidence also indicates that income in Poland was distributed more equally than in contemporary Holland. However, the extraction rate in the Voivodeship was much higher than in the North Sea area.

The rest of the article is organised as follows. First, we discuss two opposing hypotheses regarding Polish income inequality in the early modern era. Second, we create a social table for the Voivodeship of Cracow for 1578. Third, we compare inequality levels in different sectors of the Voivodeship and juxtapose our results with other preindustrial economies. Fourth, we estimate the Polish GDP per capita in 1500, 1578, 1662, and 1776 and compare the values with what is known about real income in other countries in this period. We also propose a very tentative continuous series of the Polish GDP in the very long run, i.e. between 1410 and 1910. The final section concludes.

2. Hypotheses

In this section two contrasting hypotheses regarding Polish preindustrial inequality are presented, one stressing economic constraints to income inequality, the other suggesting that political institutions and agricultural class structures determine the level of income inequality.

We propose Hypothesis A that income inequality in Poland was relatively low, in comparison with other preindustrial societies, due to the low level of real income and the dominance of the agricultural sector. Milanovic et al. (2011) suggested a strong relationship between real income and the maximum feasible inequality. The authors assumed that every society has to ensure that the poorest classes receive enough resources for subsistence. The subsistence threshold is typically set at 300 1990 international, purchasing power parity dollars, also known as Geary-Khamis dollars (hereafter 1990$PPP), although some authors argue that it may be as low as 250 (Bolt and Van Zanden 2014). According to Milanovic et al. (2011) only surplus above the 300 1990$PPP threshold can be extracted by the elite. As a result, the richer an economy, the bigger the potential inequality. Building on these assumptions, Milanovic et al. (2011) formally defined the inequality possibility frontier G^* as:

$$G^* = \frac{1-\varepsilon}{\mu}(\mu - s)*100 \qquad (1)$$

Where s is the subsistence minimum equal to 300 1990$PPP, μ is GDP per capita, and ε is the proportion of the population belonging to the upper class (the authors assume that this elite accounts for one per cent of the total population). G^* is the Gini index. It ranges from zero (perfect equality) when GDP per capita is at the level of subsistence to 100 (perfect inequality) when GDP per capita approaches infinity. The most important feature of the inequality possibility frontier is that its relation with the GDP per capita is not linear. G^* rises sharply at

the initial stages of economic growth – particularly between 300 and 1000 1990$PPP – and nearly plateaus thereafter (see Figure 3). For this reason the concept is crucial for preindustrial economies, which are in transition between the Malthusian subsistence regime and modern economic growth.

The inequality possibility frontier does not dictate that inequality should always increase with growth. It only means that there is little space for income inequality in poor societies. According to Kuznets (1955), economic growth, at its early stages, results in a rise in income inequality. According to his model, the urban/industrial sector is characterised by a higher productivity and thus greater income inequality than the agricultural one (Kuznets 1955). Therefore, poor and agricultural societies (like preindustrial Poland) should be characterised by low income inequality. According to Kuznets, the higher the share of people working outside agriculture the greater the mean income, but also the greater the inequality (Kuznets 1955: 7-8). Inequality is expected to diminish after the point when a sufficiently high share of the labour force has moved to the secondary sector and, as a result of economic growth, relative incomes of the poorest industrial workers have increased and thus narrowed the income gap within the sector (Kuznets 1955: 17). This is the second phase of the well-known 'inverted U-curve' that was proposed by Kuznets. We will assess how well Kuznets's ideas relate to the Polish case by comparing income inequality in the agricultural and the urban sectors of the country. Was income in preindustrial and agrarian Poland indeed distributed relatively equally? Was income inequality in the urban sector indeed higher than in the agricultural one?

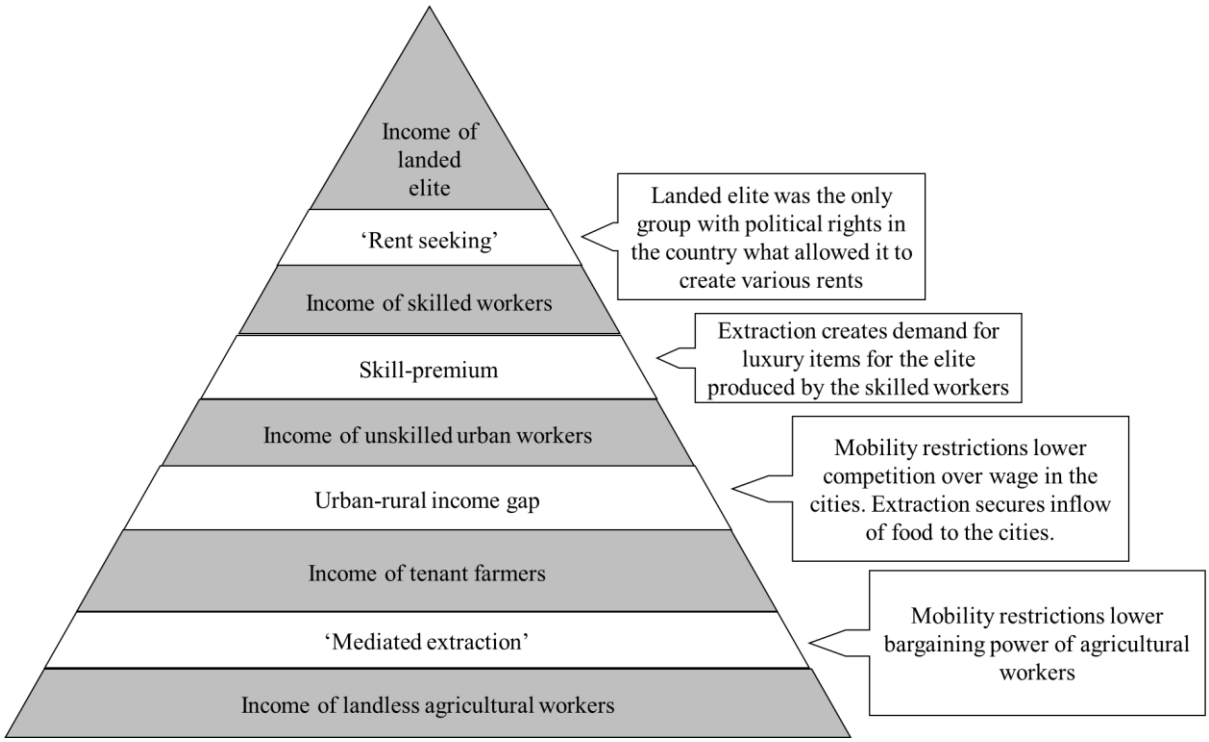
Kuznets focused on the economic mechanisms behind inequality. We are also interested in the impact of the institutions. In particular, we look at political privileges and agricultural class structures. We propose Hypothesis B that Poland had relatively high income inequality due to its highly unequal political structure, in which only the landed nobility had full political and property rights. We hypothesise that a demesne economy based on serfdom could have coincided with relatively high income inequality within the agricultural sector, within the urban sector, and between the sectors. Landlords profited from their position via 'direct' and 'mediated exploitation' (for detailed discussions of these different forms see Kula 1983, Peters 1970, and Melton 1988). Regarding 'direct exploitation', political privileges allowed for one-sided changes in contractual obligations by the landlords and subsequent surplus extraction from their tenant farmers. According to Kula (1983) and Topolski (1965), weak property rights in agriculture allowed landlords to enlarge their demesnes by incorporating land that had been previously leased to their tenant farmers, and modify the rents to extract their surplus production. According to this conventional knowledge, the demesne economy was based on

the compulsory labour of the tenant farmers (corvée duties). However, Izydorczyk-Kamler (1990) demonstrated that the majority of Polish demesnes were also operated by paid workers. This labour was hired directly by the landlords or indirectly by the tenant farmers. According to Domar (1970: 20), the limitations on labour mobility imposed by the landlords/state on the peasants could have curbed wages in the agricultural sector. The author writes, '(…) *so long as the workers are free to move, competition among the employers will drive the wage up to the value of the marginal product of labor, and since the latter is still fairly close to the value of the average product (because of the abundance of land) little surplus will remain.* (…) *With labor tied to land or to the owner, competition among employers ceases. Now the employer can derive a rent, not from his land, but from his peasants by appropriating all or most of their income above some subsistence level'*. Moreover, according to Melton (1988: 336), who studied the economic implications of similar labour relations in Prussia and Livonia, tenant farmers were 'labour brokers' who hired landless agricultural labourers to fulfil their labour duties. Therefore, the Polish demesne economy relied partially on the mediation of the tenant farmers (see more on a similar system in Prussia: Dwyer 2013: 116). This might have had significant economic implications. According to our interpretation of Melton's ideas, the author implicitly, although not explicitly, implies a high income gap between the landless workers and the farmers who took advantage of their relatively privileged position at the expense of the workers. Melton (1988: 336-337) places this relationship in a broader system of 'mediated extraction' proposed by Peters (1970), according to which it was the tenant farmers – as agents of the landlords – who exploited the landless workers. In sum, one would expect significant income gaps between the landed nobility, tenant farmers, and landless agricultural workers.

Moreover, according to Zurimendi (2014), the same mobility restrictions also limited the inflow of new workers into the urban sector. This, in turn, hampered competition between the sectors and made urban wages relatively higher than they would have been on a free labour market. Furthermore, according to Bush (1996: 5), serfdom, although it delayed the development of a capitalist agriculture, *promoted large-scale commercial farming in societies where various factors (...) ruled out capitalist production'*. This stimulated urban growth. Therefore, surplus extraction redirected resources from the agricultural to the urban sector, making not only the landlords, but also the cities richer at the expense of the peasants. In sum, limitations on labour mobility and surplus extraction could have resulted in a high income gap between the urban and the rural sectors. Such a dissimilarity has been identified empirically for preindustrial Poland by Malinowski (Forthcoming; Chapter 2).

Regarding inequality within the urban sector, in line with Engel's law, the richer a person the less the share of income he or she devotes to basic consumables. For this reason, the higher the degree of extraction by the landlords the more money is redirected from relatively poor peasants to the landlords and the bigger the relative demand for high-value added manufactured products (see Kula 1976 on the consumption patterns of the landlords). For this reason, a demesne economy based on serfdom may be correlated with a high skill-premium and income inequality within the cities. According to Van Zanden (2009), Poland was characterised by an exceptionally high skill-premium, which supports this supposition. Figure 1 summarises the abovementioned ideas about the probable impact of demesne economy based on serfdom on income inequalities between the main income groups.

Figure 1: Suspected impact of demesne economy based on serfdom on income inequality.



3. Social table in the Voivodeship of Cracow in 1578

In this section, a social table of the Voivodeship of Cracow in 1578 is presented, based on estimates of the population and the number of households in various income groups. For practical reasons – the availability of sources – we concentrate on this part of the Polish Kingdom. This begs the question: was it representative for Poland as a whole? In general, the Voivodeship of Cracow was one of the more developed regions. It was well-endowed with natural resources like salt, lead, and silver. It was also located on major trade routes and was

well-connected to economically prosperous cities like Prague and Breslau (for discussion of Cracow's trade see Carter 1994). According to the available information on the special distribution of economic activity in 16th century Poland (Jankowiak-Konik 2011), the region had, in comparison to other regions of the kingdom, a relatively diverse proto-industry. Whereas, other regions mostly specialised in only one type of industry (for example the Voivodeship of Mazowia in grain trade and the Voivodeships of Poznań and Kalisz in textile production), the area around Cracow (on top of mining salt, lead, and silver) produced leather, iron, calamine, sulphur, and textiles (see Carter 1994: 219). The region, being located relatively far from the sea, was largely uninvolved in the Baltic grain trade that dominated the economic life of most of the regions north to the Voivodeship (Gierszewski 1982). Cracow was the historical capital of the country and one of the centres of its intellectual and cultural life. In the second half of the 16th century (the so-called Golden Age of Polish cultural development) workers in Cracow enjoyed the highest wages in the country (in real terms) (Malinowski Forthcoming; Chapter 2). Due to the demand for skilled craftsmen related to the royal investment, the city at the time was also characterised by the highest skill-premium in the kingdom.

Our social table and GDP estimates depend heavily on urbanisation levels. Malinowski (Forthcoming; Chapter 2) proposed estimates of the degree of urbanisation of the Voivodeship in the early modern period. He based the estimates on the urban population data assembled by Kuklo (2009) and the demographic data proposed by Rusiński (1954), Vielrose (1957), and Bogucka and Samosonowicz (1986). A comparison of Malinowski's figures with the urbanisation estimates for the whole country proposed by Bosker et al. (2013) indicates that the trends in urbanisation levels in Poland and in the Voivodeship were similar. The only exception is the 18th century. According to Malinowski's data, there was an increase in urbanisation levels in the Voivodeship at the time. Conversely, Bosker et al. (2013) – as well as estimates proposed by Wójtowicz and Wójtowicz (2009) and Malanima (2009) – indicate a stagnation in Polish urbanisation levels in the 18th century. In short, by focusing on the Cracow region we may perhaps somewhat overestimate real income (and inequality) of the kingdom as a whole, but other studies (of Holland by Van Zanden and Van Leeuwen 2012 and Italy by Malanima 2010) have similarly concentrated on the more advanced parts of the country. The long-term trends in the region seem to run closely parallel to those in the kingdom as a whole.

The starting point of our reconstruction of the social table is the estimate of the population of the Voivodeship provided by Vielrose (1957). According to this author 476,000 people were living in the Voivodeship of Cracow in 1578, of which 309,000 people in villages

and 167,000 in settlements with city rights. Given that these settlements could vary from few hundred inhabitants – an agricultural town – to several thousand people – a city – we classify the urban population into several categories. Bogucka and Samsonowicz (1986) grouped the towns and cities into four different categories: (A) one city with more than 10,000 inhabitants, Cracow, (B) 16 settlements with populations between 2,000 and 10,000, (C) 30 with population between 600 and 2,000, and (D) 25 below 600 inhabitants. According to urban population data collected by Kuklo (2009), Cracow in the late 16th century had 19,000 inhabitants. Moreover, Kuklo reported populations of three other big cities – Olkusz, Wieliczka, and Nowy Sącz – in the Voivodeship that had 5,000 inhabitants each; there were no more cities above 5,000 inhabitants in the Voivodeship. This brings the number of settlements between 2,000 and 5,000 to 13.

Bogucka and Samsonowicz (1986) estimated the shares of different income groups in the four different categories of urban settlements. Their data relate to the turn of the 15th and the 16th century, but we assume that these relations persisted through the 16th century. In order to decompose the rural population, we use information provided by Cackowski (1961: 103) about the structure of the labour force in the villages belonging to the bishopric of Chałmno in 1614. We assume that the same structure existed in the Voivodeship of Cracow. The share of nobility in the population living outside the cities was taken from Kula (1951). The summary information on the occupational distribution of heads of households in the Voivodeship can be found in Table 1.

Table 1: Occupational distribution of heads of households in the Voivodeship of Cracow around 1578 (shares).

Category	Cities		Rural towns		Villages	Total
	10,000+ (Cracow)	10,000-2,000	2,000-600	Less than 600 with city rights		
Total population	19,000	77,250	55,750	15,000	309,000	476,000
Nobility and clergy	0.01	0.01	0.06		0.048[a]	
Merchants	0.12	0.15	0.2	0.13		
Beggars	0.02	0.01	0.04			
Total wage-earning population and farmers	16,150	64,117	39,025	13,050	294,168	436,510
Artisans	0.81	0.8	0.63	0.38	0.12	
Servants	0.05	0.04	0.03	0.02	0.045	
Agricultural workers	0.01	0.1	0.33	0.6	0.045	
Free labourers	0.13	0.06	0.01			
Tenant farmers					0.79	

Note: a) according to an alternative estimate by Laszuk (1999) the nobility accounted for 1.66 per cent.

Source: Kuklo 2009; Bogucka and Samsonowicz 1986; Cackowski 1961; Vielrose 1957; Kula 1951.

The next step is to establish how many households were involved. We make different assumptions regarding the households of the tenant farmers and all the other households. Following Guzowski (2008), we assume that all tenant farmers lived in households composed of six people. Guzowski (2008: 121), following Laslett (1983: 528) and Kopczyński (1998: 90) argued that in the case of Eastern Europe, due to the tradition of cohabitation between agricultural workers and farmers, rural households should be identified as entities composed of the biological family plus lodgers. These lodgers, being at the early stages of their life-cycle, have not yet formed their own households. Guzowski (2008: 121), building on an empirical analysis conducted by Kopczyński (1998), assumed that, on average, such a household was composed of the farmer, his wife, two infants, and two live-in lodgers. For the sake of simplicity, in this study we will assume that the lodgers were a part of the household. They lived, worked, and ate with the biological family. Although the lodgers often received a monetary compensation for their contributions to the households, we define these as internal transfers within a household.

Table 2: Distribution of different family types between all households in selected cities in preindustrial Voivodeship of Cracow.

Cities and regions	Year	Family types					
		Singles	non-family	nuclear-family	extended-family	multiple-family	Other
Urban areas							
Olkusz	1791	11.9	.	79.4	7.9	0.8	.
Cracow	1791	18.5	5.9	67	7.2	1.1	0.3

Source: Kuklo 1998: 77-82.

In all other cases we assume that households were composed of four people – one male, one female, and two children. According to Borowski (1975), who studied age distribution in Dobre Miasto in the 17th century, people below 19 years of age accounted for 45 per cent of the population. According to Karpiński (1983), workers had on average a little less than two children in contemporary Warsaw. This reinforces the idea that, on average, children accounted for around half the population. According to the data presented in Table 2 (which presents information on the 18th century), nuclear families were prevalent in the cities located in the Voivodeship. We furthermore assume that each household had only one (male) breadwinner. In so doing, we consciously overlook female labour participation and thus, most probably, underestimate the total GDP. However, due to scarce available historical information on female

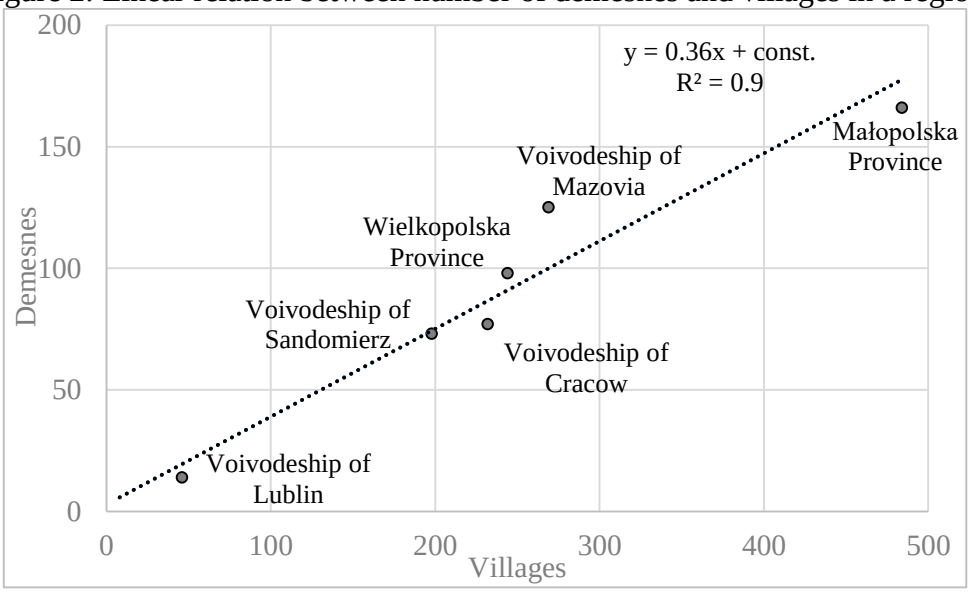
wages and their labour input we are – at the current stage of Polish historiography – unable to remedy this problem.

3.1. Income of king, nobility, and clergy

Poland was an elective monarchy and its public finances were based on the extensive properties of the king – the royal domain. Most of the remaining land was owned by the nobility or the Church and was in turn leased to their tenant farmers. The income of the political elites consisted of rents from towns and villages as well as the proceeds of production on their own demesnes. The income of the king came from two main sources: the domain (income from demesnes and rents from towns and villages) and mines. Regarding the royal domain, H. Rutkowski (2008) reported the number of villages (477) and towns (40) belonging to the king in the Voivodeship around 1580. J. Rutkowski (1938) also studied audits of the royal domain conducted in the 1560s. The auditors reported incomes from royal demesnes, towns, and villages. J. Rutkowski (1938: 270) compiled the results of the audit of 77 royal demesnes, 27 royal towns, and 232 royal villages located in the Voivodeship. We use this data to estimate the average income from a demesne, a town, or a village (see Table 3).

H. Rutkowski did not provide information on the total number of demesnes in the Voivodeship. We estimate the number of demesnes from the number of villages in the region. According to the audit data from the whole country, there was a constant 1:3 ratio between the number of demesnes and villages located in every region (see Figure 2). Given that the king owned 477 villages, building on this stable relation, we assume that he also owned 159 demesnes in the Voivodeship.

Figure 2: Linear relation between number of demesnes and villages in a region.



Source: Based on data from J. Rutkowski 1938.

Next to the income from rents and demesnes, the king had claims on the revenue from mining. We compile the information on the income generated by mines located in the Voivodeship. Molenda (1972a) argued that the silver mine in Olkusz produced around 300 kg of silver and 823 tons of lead in 1577. The value of the output of silver can directly be measured in this way, as we know the silver contents of the currency. We consciously overlook the minting costs. According to Adamczyk (1935), the price of one funt of lead in nearby Lublin was 0.875 Grosze in 1580. Since one funt was equal to 406 grams (Adamczyk 1935), the king earned 58,978 ZŁP from lead. Additionally, according to J. Rutkowski (1938) the king earned 66,000 ZŁP annually from his salt mines in Wieliczka.

Regarding the nobility and the Church, we assume that the income of this group came only from their domains. H. Rutkowski (2008) reported the number of towns (33) and villages (2,100) that belonged to the nobility and the Church (Table 3). On the basis of the 1: 3 ratio previously discussed, we estimate that the nobility and the Church owned about 700 demesnes. We assume that the average income from demesnes, towns, and villages located in the land belonging to the Church or the nobility was the same as in the royal domain.

According to J. Rutkowski (1938), the aim of the auditors was to focus only on stable and reliable incomes. For this reason, they often did not note down the income from forestry, which was very volatile. This means that the income from demesnes is underestimated. In order to fill this gap, we estimate the minimum income from firewood in the Voivodeship. We assume this was the same as its consumption. According to Allen et al. (2011), a household needed nine BTU's of energy. Allen (2001) compiled information on the price of energy in

Cracow around 1580. The information on the total population in the Voivodeship, the number of households, their consumption requirements regarding energy and the price of firewood together allow us to estimate the income from this product. We assume that it was sold only by the demesnes, because use of forests by peasants for commercial purposes was often restricted by their landlords (Trzyna 1963). We divide the total number of the predicted demesnes (159+700) by the total predicted income from firewood to compute the expected average income of a demesne from forestry (165 ZŁP).

When we group all income of the nobility and the Church together and divide it by the number of households allocated to this group, we estimate that the elite earned on average 145 ZŁP. This value is below the income from a demesne because many nobles did not possess a demesne. The issue of inequality within the nobility around the 16th century was studied by Mączak (1982) and Wyczański (1977); our estimates, following the logic of the social table which assigns an average income to each social group, does not take this into account, however.

Table 3: Average income of the elite from demesnes, towns, and villages.

Source of income	Average income per unit in ZŁP	No. of royal	No. of noble and ecclesiastical
Demesne (production)	420 (basic) + 165 (forestry) = 585	159	700
Town (rent)	491	40	33
Village (rent)	45	477	2100

Source: H. Rutkowski 2008; see the text.

3.2. Income of tenant farmers

Guzowski (2008) analysed the economic situation of tenant farmers in the Małopolska Province, in which the Voivodeship of Cracow was located. He reconstructed the distribution of plot sizes, average harvests of rye, wheat, oats, and barley, and the seed used for it. He demonstrated that around 40 per cent of the land holdings were one-łan (11.6 ha) and 60 per cent were half-of-łan. He proposed two different budgets for these two different sizes of farms. We build on Guzowski's research. In our reconstruction, the total net income from grains is rescaled to represent the total gross income before tax. The prices of rye, wheat, oats, and barley are based on the averages of the Cracow series from between 1558-1608. The data on prices was taken from a compilation made by Malinowski (Forthcoming; Chapter 2; Chapter 4).

Guzowski did not account for animal production (although he subtracted grains used to feed the livestock). Żytkowicz (1962) analysed the animal stocks of peasantry living in the grounds belonging to the Cathedral chapter of Gniezno located in Wielkopolska, a province adjacent to the Voivodeship of Cracow. A household cultivating a one-łan farm (11.6 ha) had

on average a certain stock of horses, cows, pigs, and sheep (Table 4). We assume that farmers living in the Voivodeship of Cracow had the same stock of animals and that a household operating on a half-of-łan farm had half that stock. We divide the value of the animals by the typical life span of each species and compute the net yield for the stock. This value could be equated with the annual animal production of a household.

Table 4: Stock of animals in a one łan household and its annual produce.

	Stock	Price per unit in grams Ag	Value of stock in grams Ag	Life span	Annual produce in grams Ag
Cows	6	84	504	15	33.6
Pigs	34	23	782	8	97.8
Sheep	11	12	132	10	13.2
Total					144.6

Source: Żytkowicz 1962, Adamczyk 1935, Hoszowski 1928; Tacutu et al. 2013.

Now that the production of the two main components of the farmers' income – grains and animals – are accounted for, one can also consider the remaining agricultural products like: hay, fibres, fruit, vegetables, hop, poultry and eggs, dairy products, wool, and feathers. According to J. Rutkowski (1938), in the Voivodeships of Mazowia and Rawa located in central Poland, grains and animals accounted for 89 per cent of the income of the demesnes, and all other products accounted only for the remaining 11 per cent. We multiply the total income from grain and animals by a 1.12 mark-up factor to account for this ca. 11 per cent income from the other products. In sum, the gross income/output of farms with one łan was 34 ZŁP and that of half-a-łan 17 ZŁP.

3.3. Income of agricultural workers

Corvée duties – a signature institution of serfdom that does not involve use of money – were a form of payment for the right to use land and therefore affected tenant farmers. However, there was a significant group of the population that did not have land and was hired by the landlords to work on their demesnes next to the tenant farmers or who were employed by the tenant farmers to fulfil corvée duties in their place. The income of such agricultural workers is based on the data provided by Izodorczyk-Kamler (1990). The author argued that agricultural workers in demesnes located in the Voivodeship of Cracow were paid, in money and kind, around 158 Grosze annually (around 5 ZŁP). Agricultural workers in villages, towns, and cities are assumed to earn the same. According to Malinowski (Forthcoming; Chapter 2), such a nominal income was barely enough to sustain a family of four. According to our estimates, the gross income of the landless agricultural workers was several times lower than that of the tenant

farmers. This supports the already-discussed ideas of Melton (1988) and Peters (1970) regarding the system of 'mediated extraction'.

3.4. Income of masters, unskilled artisans in the cities, and artisans in the rural areas

Artisans are divided into three groups: (a) masters, (b) artisans in the cities, and (c) artisans in the rural areas. Małecki (1963) gathered information on the number of workshops in the Voivodeship of Cracow. He based this study on tax registers from 1581. According to his research, there were 3,442 workshops in the Voivodeship. We assume that each workshop had one master. We assume that masters' wages were similar to the wages of the masters in Cracow's construction sector. According to the data compiled by Pelc (1935), in the last quarter of the 16th century the average daily nominal wage in silver of master masons and carpenters was 5.4. According to the same data, the average daily nominal wage in silver of the unskilled workers at the time was around two grams of silver. According to Molenda (1978b), there were around 100 holidays a year. We assume that all waged labourers worked full time, i.e. 265 days a year. We assume that the so-called free workers – for the most part artisans that were not part of the guild system – enjoyed the same wage as the unskilled labourers inside the guilds. Regarding the artisans from the rural areas, we equal the income of this group with that of the agricultural workers. We equate agricultural workers with rural artisans because the level of the skill required to construct the basic products was not significant. Second, we assume seasonality of employment and economics of makeshift between basic manufacturing and crop cultivation. In sum, according to our estimations, masters, urban artisans, and rural artisans annually earned around 58, 21, and 5 ZŁP respectively.

3.5. Income of servants in the cities

We assume that servants who lived in the cities had the same annual income as unskilled workers (ca. 21 ZŁP).

3.6. Income of servants in the countryside

We assume that servants who lived in the countryside had the same annual income as agricultural workers (ca. 5 ZŁP).

3.7. Income of beggars

We assume that beggars' income was equal to the lowest identified income among all the observed income groups, i.e. that of the agricultural workers (ca. 5 ZŁP). This is motivated by the fact that we cannot assume null income for any group, as it would imply its starvation.

3.8. Income of merchants in Cracow and other merchants

Merchants are by far the most difficult income group to measure. We divide the merchant population into two categories: (a) elite merchants living in Cracow (the economic centre of the Voivodeship and the only city with more than 10,000 inhabitants) and (b) poorer merchants in Cracow and those living in other smaller cities and towns. We propose that all merchants from the latter category earned annually as much as the unskilled artisans from Cracow (ca. 21 ZŁP). This is motivated by the fact that these people were primarily small retailers.

Table 5: Social table of Cracow around 1578.

Group	Nr. households	Mean income in ZŁP	Total income of a group in ZŁP	% households	% total income
Beggars	95	5	501	2%	0%
Agricultural workers	40	5	211	1%	0%
Servants	202	21	4,335	4%	2%
Free labour	525	21	11,270	11%	5%
Masters	577	58	33,896	12%	17%
Unskilled artisans	2,693	21	57,832	57%	28%
Nobility	47	160	7,520	1%	5%
Retail merchants	332	21	7,139	7%	3%
Elite merchants	238	357	84,776	5%	40%
Total	4,750		207,524	100%	100%

Note: Numbers rounded up or down to the closes full number.
Source: Table 2, see the text.

All the prominent merchants are assumed to have clustered in Cracow, the commercial centre of the Voivodeship. In order to gauge the average earning of this group, we use information on wealth inequality in the city in the mid-17th century provided by Wagner (2013) and based on rich historical data on a tax on wealth. According to the property tax data gathered and analysed by the author, the top five per cent of the population paid around 40 per cent of the total collected tax. We assume that this observation provides us with information about the merchant elite. We also assume that the levels of wealth and income inequality were similar. Given that wealth inequality, due to savings, tends to be usually higher than income inequality, we expect that this operation overestimates the between-groups inequality in the city. Building on Wagner's research, we assume that the top richest merchants were five per cent of Cracow's population in 1578 and that their income amounted to 40 per cent of the total income of the city. Using the data on occupational structure from Table 5 we estimate that there were 570 merchant households in Cracow. We assume that the merchants – not nobles – were the people

with the highest incomes in the city, as the rich nobles tended to live in the countryside. We conclude that the richest merchants' annual income must have been 357 ZŁP per household in order to account for 40 per cent of the total income in Cracow.

Table 6: Social table of the Voivodeship of Cracow around 1578.

#	Income category	Income in ZŁP			Population	
		Value	Share in category	Share in total	Absolute	Share
		King				
1	Total	268,603	100	10	1	0
	Demesnes	92,978	35			
	Towns	16,194	6			
	Villages	21,465	8			
	Salt	66,000	24			
	Silver	12,987	5			
	Lead	58,978	22			
		Nobility and the Church				
2	Total	703,797	100	25	19,140	4
	Demesnes	587,705	84			
	Towns	21,593	3			
	Villages	94,500	13			
		Tenant farmers				
	Total	922,505	100	33	232,393	49
3	Half-of-łan	395,359			139,436	
4	One-łan	527,146			92,957	
		Agricultural workers				
5	Total	53,350	100	2	40,519	8
		Industry				
	Total	558,774	100	20	129,220	27
6	Masters	202,199	36		13,768	
7	Artisans cities	271,659	49		50,608	
8	Artisans non-cities	84,916	15		64,845	
		Servants				
	Total	68,488	100	2	24,378	5
9	Cities	48,698	71		9,319	
10	Rest	11,874	29		15,059	
		Merchants				
	Total	212,198	100	8	26,968	6
11	Elite in Cracow	84,776	40		2,280	
12	Other in Cracow	7,139	3		952	
13	Rest	120,283	57		24,688	
		Beggars				
14	Total	3,145	100	0	3,383	1
		Total				
	Total in ZŁP	2,790,861		100	476,001	100
	In ZŁP per capita	5.86				
	In grams Ag per capita	135				

Note: One ZŁP = 30 Grosze = 23.1 grams of silver; Numbers rounded up or down to the closes full number.

Table 6 presents the social table for the whole Voivodeship. The results indicate that 70 per cent of the total income came from the primary sector (including rents from villages and towns and income from mining), 20 per cent came from (proto-)industry/artisans, and 10 per cent was generated by services. The results also show that productivity from demesnes rather than rents was the main source of income for the landed elite. Due to the agrarian character of the country, despite the fact that towns generated much more revenue, the villages brought more revenue than the cities. These findings are consistent with the conventional knowledge that Poland, at the time, was a primarily agricultural society.

4. Income inequality in 1578

In this section we calculate Gini coefficient of the inequality of the distribution of incomes in the Voivodeship of Cracow around 1578. We measure income inequality in (a) the whole of the Voivodeship, (b) only in Cracow, and (c) in the non-urban/agricultural/primary sector. We compare our results internationally.

The approach of the social table assumes equal income between the households in the various social categories. As it would be expected, there was high income inequality within the nobility and the Church. In order to identify the households with the highest income, and thus construct a more reliable measure of inequality, we look at the sizes of the biggest noble and ecclesiastical landholdings. H. Rutkowski (2008) compiled data on the number of towns and villages belonging to the 26 richest noble families and all of the 48 ecclesiastical estates located in the Voivodeship in the late 16th century. Using the data from Table 3 and the 1:3 ratio between demesnes and villages, we can calculate the incomes of these top 74 households. According to our estimates, together they provided ca. 231,000 out of ca. 704,000 ZŁP of the total income of the nobility and the Church. The richest of these biggest individual estates belonging to the nobility and reported by H. Rutkowski generated 14,640 while the most 'modest' one generated 1,211 ZŁP of income.

Estimates of the Gini coefficient of the inequality of the distribution of incomes in the whole Voivodeship of Cracow can be made on the basis of Table 6. The Gini coefficient varies depending on the studied population. If we assume that the ecclesiastical estates provided income for a household of four, the Gini coefficient of incomes in the late 16th century in the Voivodeship of Cracow was 53. If we exclude the king the coefficient drops to 48. These estimates include the differentiation within the elite.

What happens if we look at the agricultural and the urban sector (the city of Cracow) separately? We exclude the smaller cities (i.e. the ones with populations between two and ten thousands, see Table 1), an in-between group, from either of the categories. If we look at the relations in the primary sector (groups 1,2,3,4,5,8,10 and 13 in Table 6 and the differentiation within the elite) the Gini coefficient of the inequality of the distribution of incomes was 57. This value might seem very high in international comparison (compare Milanovic et al. 2011). The high value of the coefficient is partially a result of treating the king as a single individual holding 10 per cent of the total income. However, even if we exclude the king, the Gini index still remains high - 51. This indicates that, the high inequality in the agricultural sector was not driven only by the inclusion of the king. The mean income per head in the sector (including the king) was 5.5 ZŁP. Conversely, according to income and population data presented in Table 5, the Gini coefficient of the inequality of the distribution of incomes in Cracow was 48.2; if we exclude agricultural workers and the noble families living in the city in order to clearly separate the two sectors, the Gini becomes slightly lower – 46.9). The mean income per head in the city was 10.7 ZŁP, almost double the average income of the countryside.

It should be highlighted that the observed income inequality in Cracow (Gini coefficient ca. 48) was lower than the inequality in the agricultural sector (Gini coefficient ca. 57). This corresponds to similar differences between wealth inequality within the elite of the agricultural sector of the Voivodeship and within the elite of Cracow. Wyczański (1977: 47) assembled historical records on wealth tax collected from 1,158 land estates located in the Voivodeship between 1563 and 1565. He divided the data into ten groups, reported the number of households in every group, and calculated the total tax paid by each of the groups. The Gini inequality index based on Wyczański's data is 71.5. This indicates that the landed elite of the Voivodeship was highly unequal. Conversely, Wagner (2013) collected similar information on a wealth tax paid by the 802 richest Cracow households in 1653. According to her findings, the Gini inequality index of the city's elite was 67.6. This indicates that the wealth of the elite in the city could have been more evenly distributed than that of the landed nobility in the Voivodeship. Our estimates contradict the notion proposed by Kuznets that inequality in the agricultural sector at the initial stages of economic growth is lower than in the urban sector (Kuznets 1995: 7-8, 17). They also differ from previous studies of income and wealth inequality in the towns and countryside of Holland (Van Zanden 1995) and Italy (Alfani and Ammannati 2014), which demonstrates that the inequality in the cities was higher than in the countryside. Income inequality in the primary sector in Poland was high, due to the income of the landed elite from the demesnes. If we exclude the elite from the estimates of inequality in

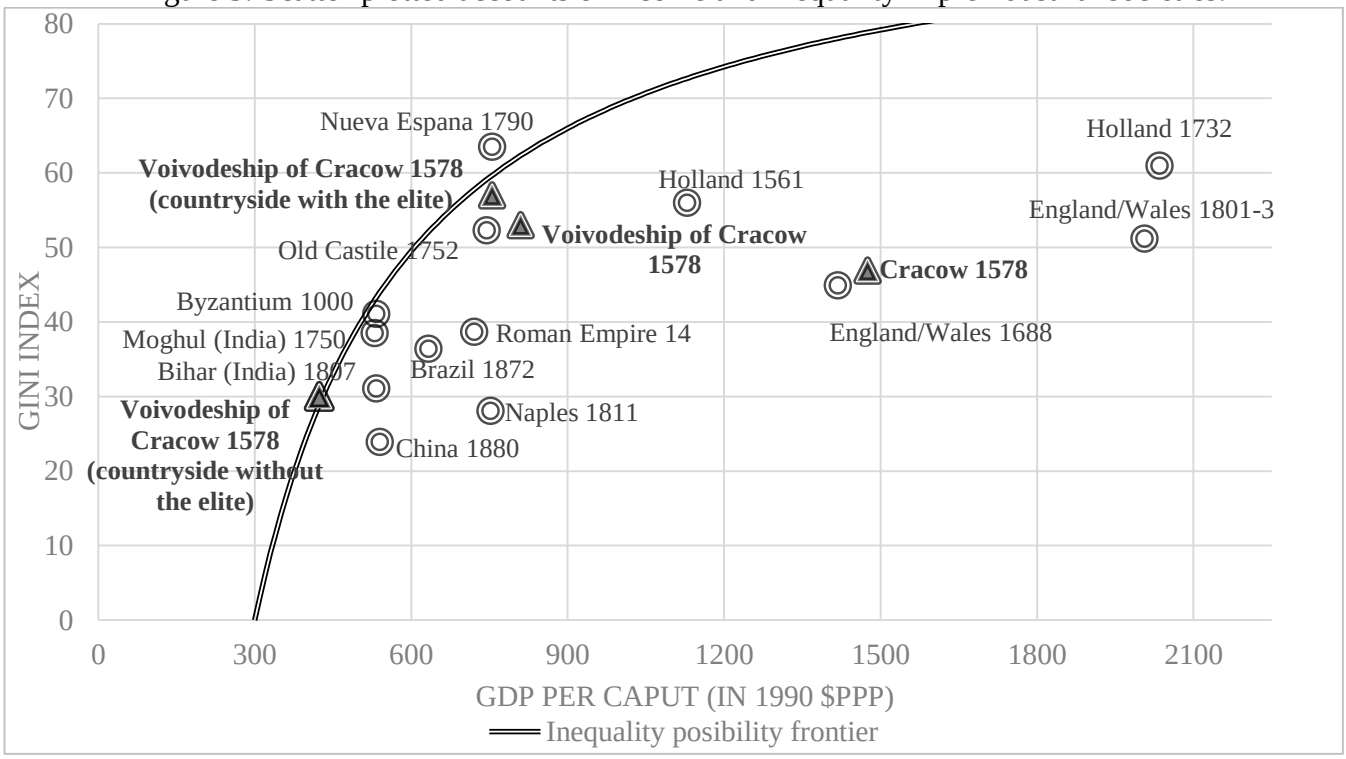
the agricultural sector (we base it on Table 6 and groups 3,4,5,8,10 and 13) the Gini coefficient decreases drastically from 57 to 30.1 (and a mean income of 3.1 ZŁP) – a level of income inequality (though not mean income) similar to that observed by Van Zanden (1995) for villages in Holland around the same time.

Conversely, income inequality in Cracow could have been relatively small due to the relative underdevelopment of the Polish urban sector, as is clear from the low level of urbanisation by European standards (Table 7). Income inequality in Cracow was lower than in the cities located in one of the most prosperous and urbanised regions, the Netherlands. According to Van Zanden (1995: Table 5), the Gini coefficients of the inequality of the distribution of incomes in Dutch cities around 1562 was 52 (56 when looking only at Amsterdam). According to Alfani (2010), in the case of Northern Italy immigration from rural areas to the cities in the preindustrial era resulted in an increase in income inequality in the urban sector. One could hypothesise that constraints on the labour mobility of the enserfed peasantry could have curbed a similar formation of income inequality in Cracow.

Figure 3 puts the estimates in an international context. It compares the Gini coefficients and income levels from a range of preindustrial economies within the context of the inequality possibility frontier. Despite the fact that the concept of the inequality possibility frontier was derived to analyse territorial units and whole economies, we also plot, for comparison, the estimates for Cracow and the countryside in it. The data for the other countries are taken from Milanovic et al. (2011) (we add the real GDP per capita levels specified in the next section where we establish a conversion rate between ZŁP and 1990$PPP). Our evidence indicates that, despite serfdom, income in Poland was distributed more equally than in contemporary Holland. However, the extraction rate in the Voivodeship was much higher than that identified for the North Sea area. In more detail, contrary to the theoretical underlying mechanism behind the well-known 'inverted U-curve' that was proposed by Kuznets, our findings suggest that due to high inequality in the agricultural sector under serfdom, in the case of preindustrial Poland, urbanisation (movement of labour to a sector with less institutional coercion) could have mitigated rather than increased the inequality of the distribution of incomes already at the initial stages of economic growth. Our findings indicate that a demesne economy based on serfdom might have been very 'successful' at extracting surplus from the peasants in general as well as creating inequality between the tenant farmers and the agricultural workers. The extraction rate (the ratio between the historical and the feasible Gini indices that measures how successful the elites were in appropriating surplus in an economy) in the Voivodeship was 86 per cent in comparison to 76 per cent in contemporary Holland or 57 in 17th century England

and Wales (see Milanovic et al. 2011). The inequality in the primary sector was at its maximum theoretical level (extraction rate around 100 per cent). As discussed, the inequality was primarily attributed to the wealth of the elite. Conversely, the city of Cracow, despite having much higher mean income, was characterised by lower income inequality. If we look at both the urban and agricultural sectors (i.e. the whole social table) the observed level of inequality is below that identified for the agricultural sector. It is also much further from the inequality possibility frontier (Figure 3).

Figure 3: Scatter-plotted accounts of income and inequality in preindustrial societies.



Note: Based on the 'original' not the updated GDP estimates (see Bolt and Van Zanden 2014).
Source: Milanovic et al. 2011, see the text

5. Gross Domestic Product

The estimates of the social table in 1578 also make it possible to explore the relative income level of (this part of) Poland in the early modern period, and to chart the development of GDP per capita in the long run. How did Poland perform during the period of The Little Divergence? Recent research reconstructing the growth pattern of England and Holland in this period highlighted signs of sustainable economic growth in the North Sea region before the Industrial Revolution (Van Zanden and Van Leeuwen 2012; Broadberry et al. 2015). By contrast, Mediterranean economies declined or at best stagnated during the early modern era (Malanima

2010; 2013; Álvares-Nogal and Prados de la Escosura 2013). These findings led to the belief that the North Sea region outperformed the rest of the continent prior to the Industrial Revolution. Furthermore, according to Maddison (2001) and the recent Maddison update (Bolt and Van Zanden 2014), income levels in late medieval Europe were already higher than in Asia.

There are, however, relatively few empirical studies that place Eastern Europe in this analytical framework, and those available provide a mixed picture. According to two independent Polish GDP estimates, the divergence might have occurred prior to the early modern period (Van Zanden 2001; Wójtowicz and Wójtowicz 2009). However, studies of the 'grain wages' – nominal wages expressed in litres of rye or wheat – suggest that incomes of the urban wage earners from Eastern European cities were superior to those of their Western counterparts (Mączak 1995 [1983]; Van Zanden 1999). Allen (2001) investigated differences in the income levels between countries by deflating urban nominal wages not by grains prices, but by a broad basket of goods known as the 'respectability basket'. Based on this evidence, Allen found that the economic advantage of the North Sea region vis-á-vis Eastern Europe dated back to the 16th century. Conversely, according to Malinowski (Forthcoming; Chapter 2), who weighted real wages by the occupational structure, the gap only opened up in the 17th century when urbanisation levels in Poland declined as a result of devastating warfare.

We contribute to this debate by estimating GDP per capita for Poland and by comparing these results with the international estimates. In the standard growth accounting framework, assuming no foreign transfers, GDP should be equal to gross domestic income, which implies that we can use the estimates from the social table to infer the level of GDP.

We know very little about historical GDP per capita in Poland. The accounts compiled by Maddison begin only in 1870 with 946 1990$PPP. There have been two previous attempts to reconstruct long-term series of GDP in early modern Poland. According to Van Zanden (2001), who was interested mainly in the relative not absolute levels of GDP, Polish living standards in the 16th century were below those of Italy and the Netherlands but on par with those of England. The author demonstrated that the Polish series began to also lag behind the English values in the 17th century due to growth in the latter series. According to a study of GDP made by Wójtowicz and Wójtowicz (2009), people living in Poland enjoyed only around 70 per cent of the goods and services available to the inhabitants of Western Europe in the 16th century. This value declined to around 40 per cent in the late 18th century. Wójtowicz also found evidence of growth in Poland in the 16th century as well as contraction in the 17th century,

contradicting the findings by Van Zanden. According to Wójtowicz and Wójtowicz's figures, the country underwent significant economic recovery in the 18th century.

We follow Federico and Malanima (2004), Malanima (2010), Álvarez-Nogal and Prados de la Escosura (2013), and Pfister (2011), who developed and popularised a method of projecting historical income levels backwards from the values known for the statistical era. The authors assume that certain crucial relations persisted from the Middle Ages to the 19th century and that we can build on these relations to extrapolate historical income levels.

We use this method, together with the information on historical cost of bare-bone basket, real wages, and population, to estimate the values of GDP per capita for the benchmark years 1500, 1578, 1662, and 1776. We choose these benchmarks because of the relative abundance of historical demographic information for these years. Via an international comparison of the purchasing power of the barebones basket, we link the 1578 estimates to the estimates of GDP per capita in 1990 international dollars in Holland and England. This makes it possible to compare Polish real incomes in the early modern period internationally. Next, we use series of real wages (in Cracow) between 1410 and 1910 and estimates of the development of the urbanisation ratio in the 15th and 19th century to create a tentative, very long-term series of Polish GDP per capita during these five centuries. Because these series are based on speculative intrapolations of the population data between benchmark years, these results are produced just to illustrate the long-term trends of the Polish economy.

The method of estimating historical GDP benchmarks consists of two steps. First, we estimate food production from its consumption. We assume that the production is equal to income (in the agricultural sector). Secondly, we rescale it to reconstruct total GDP. The procedure used to estimate agricultural output was developed by Wrigley (1985) and Allen (1999: 212–214; 2000: 13–14). According to the authors, the net agricultural output can be represented as follows:

$$Q_{At} = r\ c_t\ N_t \qquad (2)$$

Where Q_{At} is agricultural output, N_t is the total population, c_t is the real food consumption per capita, and r is the ratio of food consumption to food production. Allen (1999) proposed to estimate real per capita food consumption through a demand equation:

$$c_t = a\ P_t^e\ I_t^g\ M_t^b \qquad (3)$$

Where a is a scaling factor, P_t is the real price of agricultural goods (we proxy this with the cost of foodstuffs in the barebones basket), I_t is the real income per capita (we proxy it with real wages) and M_t is the real price of consumer goods apart from food (we proxy it with the cost of products other than food in the barebones basket). *e, g,* and *b* denote the food price, income, and cross-price elasticities of food demand respectively. In order to construct the scaling factor *a* we use the relations for the time period *s* – in this case 1578 – for which we reconstruct the share of income from the agricultural output.

$$a = Q_{As} \,/\, (r\, N_s P_s^e I_s^g M_s^b) \tag{4}$$

In order to rescale Q_{At} into a GDP estimate, Federico, Malanima, Álvarez-Nogal, and Prados de la Escosura assumed a stable ratio *p* between the share of agriculture in total production and the share of agricultural employment in the total labour force. *p* allows for estimating the overall productivity when having information only on the agricultural output and the share of agricultural labour in the total labour. *p* is defined as:

$$p = (Q_{As} \,/\, Q_s) \,/\, (L_{As} \,/\, L_s) \tag{5}$$

Where *Q* is the total output that we equal with the GDP, L_A is the labour in agriculture and *L* is the total workforce. Once Q_{At} for every benchmark year *t* is computed and the constant *p* is estimated, we account for the share of agricultural labour in total employment. According to the short-cut method, the national product in years other than the base one is:

$$Q_t = Q_{At} \,/\, (p\, L_{At} \,/\, L_t) \tag{6}$$

We modify the procedure slightly to meet the specific needs of this study. Due to data limitations we do not account for *P* and *M* in the point estimates (but do in the case of the continuous series) of agricultural consumption/production. In other words, for the point estimates only we set *e* and *b* to zero. By design, these factors take into account the short-time fluctuations in prices, which are not relevant for the point estimates which focus only on the long-term changes (a similar methodology was applied by Crafts 1985, and see Arroyo Abad and Van Zanden 2014 for a sensitivity analysis of this assumption). Table 7 presents the data used to extrapolate per capita GDP in the Voivodeship of Cracow in 1500, 1662, and 1776 by

building on relations in 1578. Malinowski (Forthcoming; Chapter 2) compiled information on occupational distribution and real wages in the region around 1500, 1578, 1662, and 1776. Despite the fact that a part of the Voivodeship was annexed by Austria in 1772, Malinowski estimated the population of the Voivodeship in 1776 in constant 'historical' borders. We assume that the whole population N was part of the labour force L. Furthermore, following Malanima (2010), we equate L_A with people living outside cities with populations above 5,000. Malinowski (Forthcoming; Chapter 2) also estimated real wages of unskilled workers in Cracow. Income (I) in 1500 is proxied by average real wages between 1480 and 1520. The value for 1578 is an average between 1558 and 1608. Income in 1662 is supposed to capture a new situation after the wars of the mid-17th century. It is the average wage between 1655 – the beginning of the Swedish Deluge – and 1675. The value for 1776 is the average real wage between 1756 and 1795 – the last partition of the country. Furthermore, following Allen (1999), we assume that e, g, and b should equal -0.6, 0.5, and 0.1 respectively (but only in the case of the continuous estimates, for the point estimates we set e and b to zero). Other articles have shown that changing this assumption has only small consequences for the estimate (see Álvarez-Nogal and Prados de la Escosura 2013). Lastly, for the sake of simplicity we assume that there were no substantial agricultural imports and exports to and from the Voivodeship and, therefore, r was one – food production equalled food consumption. The Voivodeship was located far from the Baltic and its economy did not rely on exports or imports of food (Carter 1994). The majority of grains exported from Poland came from the northern provinces of the country. According to Gierszewski (1982), in 1568 only 0.6 per cent of the total grain shipped on the Vistula down to Gdańsk came from the Voivodeship.

Table 7: Variables used to compute GDP per capita in 1500, 1662, and 1776 in the Voivodeship of Cracow with use of the short-cut method.

Year	N_t=L_t (total population)	L_{At} (population outside the cities)	Urbanisation ratio	I_t (real wages of unskilled urban workers in 'subsistence ratios')
1500	575,000	555,000	3%	2.38
1578	476,000	442,000	7%	3.20
1662	497,000	489,000	2%	1.88
1776	418,000	394,000	6%	1.86

Source: Malinowski Forthcoming; Chapter 2, see the text.

How can we integrate our estimates into the international framework to chart long-term economic growth as developed by Maddison? Due to the break in political entities after 1800 (see Figure 4) we cannot link the Polish estimates to the late 19th century data for Poland, so

we have to develop another way to do this. For two countries, England and Holland, there are continuous series of GDP per capita in current prices and in 1990$PPP (the standard unit of Maddison's work) which can be used for this purpose (Bolt and Van Zanden 2014). Via purchasing power parities (PPPs) we can link the Polish estimate (135 grams of silver for the benchmark 1578) with similar estimates for these two countries, and then use the implicit conversion ratios between (a) pounds of 1578 and 1990$PPP and (b) guilders of 1578 and 1990$PPP to get estimates for the relative income level of Poland in that year. The PPPs can be derived from Allen's work on the costs of a subsistence basket in the cities involved (Cracow, London, and Amsterdam). We use the basic barebones basket approach here, because the original series of Allen (2001) were strongly affected by the way in which grain prices were transformed into bread prices (see Allen et al. 2011 for the barebones basket and Malinowski Forthcoming; Chapter 2 for the real wages and prices estimates). It is no surprise that the average costs of a subsistence basket in Amsterdam and London were much higher than in Cracow, because the North Sea area imported a large part of its foodstuffs from Poland (Table 8). Taking this into account results in estimates of real GDP per capita that are far below the Western European level: the PPP transformation via Holland results in an estimate of 860 1990$PPP, via England this is 765 1990$PPP (see Table 8). We have no reason to assume that one is better than the other, and therefore take the Fisher average of these two estimates – 810 1990$PPP. This benchmark can then be used to link the other estimates to those of 1500, 1662, and 1776.

A rough check of these results is possible via the subsistence basket. The basket used in this conversion represents the minimum consumption requirements of an individual. According to Milanovic et al. (2011), the subsistence threshold is 300 1990$PPP. The authors admit that the threshold can be dependent on the level of economic development. According to Bolt and Van Zanden (2014), the threshold is between 250 and 300 1990$PPP. If we assume that: (a) the cost of the basket indeed represents the subsistence threshold, (b) this threshold is between 250 and 300 1990$PPP, and (c) Polish GDP per capita was equal to the cost of 2.93 baskets (Table 8), real income in the Voivodeship should have been between 732 and 879 1990$PPP. The 810 1990$PPP based on the implicit conversion ratios is nicely in the middle of this confidence interval, which reinforces the plausibility of the estimate.

Table 8: Estimates of the Polish GDP per capita in 1578.

Country	Nominal GDP per capita in grams Ag	Barebones subsistence basket in grams Ag	Ratio GDP pc/ subsistence	GDP pc in 1990 $PPP	Poland via England	Poland via Holland
Poland	135	46	2.93 = a	810 $= \sqrt{x * y}$	765 = ac/b = x	860 = ae/d = y
England	495	118	4.19 = b	1094 = c		
Holland	976	148	6.59 = d	1932 = e		

Note: All figures were based on 1570-1586 averages.
Source: Allen et al. (2011); Broadberry et al. (2015); Van Zanden and Van Leeuwen (2012); Poland: see the text.

How robust is this estimate to changes to some of the most controversial assumptions we made in order to construct the social table? In our view, the two most speculative points of the analysis are the reconstruction of the income of Cracow's merchants and the assumption regarding the 265 days of work. Given the small size of Cracow's economy, changes in the assumptions regarding the income of merchants do not affect the overall conclusions drastically. As discussed, since we derived the income of the richest merchants from the information on their relative wealth we most likely overestimated rather than underestimated their average income and thus produced an upper band estimate of the total income generated in the city. If we assume that all the merchants earned the same income as did the unskilled workers, i.e. there were no rich merchants, we should be able to construct a lower band estimate. Such an operation would most likely underestimate the total income of the city. If we modify the estimate of the income of the merchants accordingly, the GDP per capita decreases only slightly from 810 to 795 1990$PPP – i.e. by only two per cent. Furthermore, in our reconstructions we assume that all of the urban wage earners worked full time and that there were constant returns to their labour input. This probably overestimates the GDP per capita. If (on top of the assumption that all the merchants earned the same, low income) we arbitrarily assume that the wage earners worked 150 instead of 265 days a year, the GDP per capita decreases to 722 1990$PPP – i.e. 89 per cent of the base estimate. The difference is only 11 per cent because the majority of the income in Poland was generated in the agricultural sector, which is unaffected by these changes to the assumptions (as discussed, the information on the income of the agriculture workers already represents their annual remuneration and, therefore, does not require us to make any assumptions regarding the labour input in the sector).

According to the social table presented in Table 6, the share of the agricultural production of demesnes and farms was around 59 per cent of total income. This information together with the data in Table 1 and 7 allows estimation of the scaling factors *a* (46) and *p*

(0.62), using Equations 4 and 5. These data are sufficient to estimate GDP per capita in 1578 PPP grams of silver for other benchmark periods.

Table 9 shows the result of this procedure. It yields several important generalisations. First, it suggests that there was economic growth in the 16th century, known as the Golden Age of Poland. Second, the results confirm that there was a significant contraction of the economy between the end of the 16th and the middle of the 17th century. Third, there was little economic recovery in the 18th century. Economic growth between 1662 and 1776 was half (in absolute terms) of that between 1500 and 1578.

Table 9: GDP per capita in the Voivodeship of Cracow in the early modern period.

Year	GDP per capita	
	In 1578 PPP grams Ag	In 1990$PPP
1500	120	702
1578	133	810
1662	91	569
1776	106	634

Note: 135 1578 PPP grams Ag = 810 1990$PPP.
Source: See the text.

The contraction of the economy was the direct result of a sharp drop in real wages together with the destruction of Polish cities during the wars of the 17th century. Wars with Sweden, Russia, and Turkey – together with the Ukrainian uprising – all occurring around the same time have been long regarded as devastating for the Polish economy (for discussion see Przyboś 1957). Our findings confirm this.

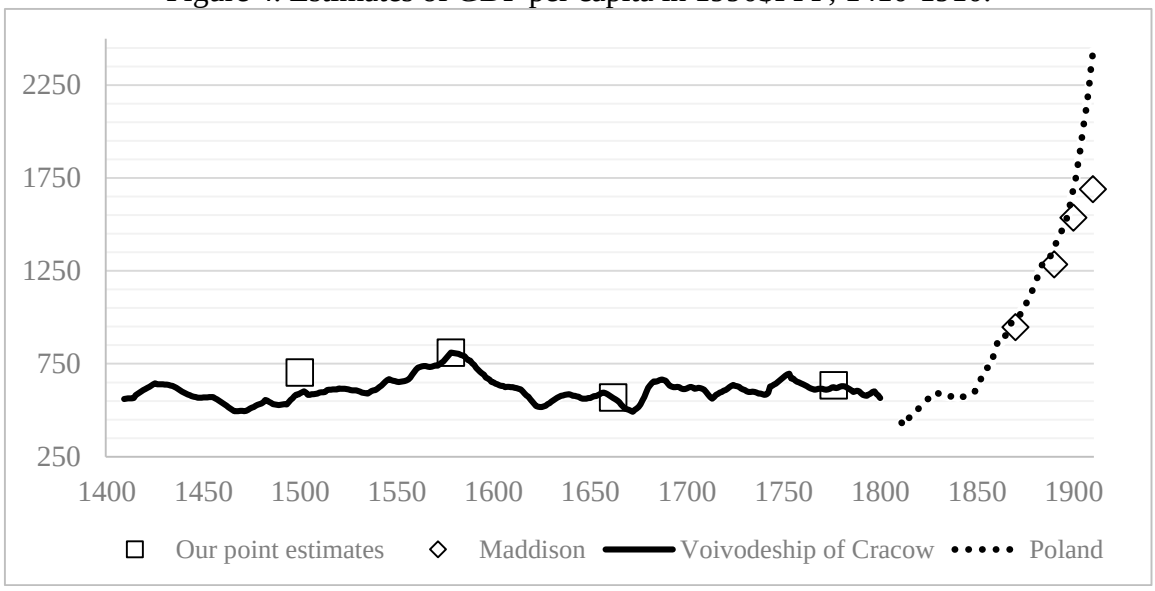
There is controversy in Polish historiography as to whether there was economic growth in the country in the 18th century. The discussion is motivated by the fact that the country was partitioned by Russia, Prussia, and Austria between 1772 and 1795. Some scholars have traditionally seen the reason behind the dissolution of the country in its inner weakness and advance evidence of political and economic underperformance in the 18th century to reinforce this supposition. Their opponents have argued that the partitions occurred despite ongoing political reforms and economic recovery (for a summary of the discussion see Sosnowska 2004). Our results indicate that there was only little recovery before 1776. This contradicts the findings of Rusiński (1954), who put forward evidence of economic change in the county in the second half of the 18th century. Furthermore, according to Wójtowicz and Wójtowicz's GDP estimates, there was a substantial recovery; his estimates indicate that the Polish economy grew from 540 in 1720 to 790 2007$PPP in 1790 and nearly re-established the level from 1470.

It is possible that the recovery accelerated after 1764 when numerous growth-enhancing institutional changes were undertaken (for discussion see Rusiński 1954). Our benchmark of 1776 may be too early to capture the probable post 1764 growth that can, however, be observed by the later benchmark of Wójtowicz. The issue of economic growth at the eve of the second and the third partitions of 1793 and 1795 requires further investigation.

One way to research this is to use the model for reconstructing benchmarks of GDP per capita for estimating much more tentative annual series of real income. We have intrapolated the benchmark estimates of population and urbanisation between 1500 and 1776 from Table 7, knowing that this may distort historical reality as declines in population and urbanisation were often the results of sudden shocks due to warfare. We added a tentative estimate for the urbanisation ratio at the start of the 15th century (2.2 per cent). To this purpose we used the urbanisation ratio for Poland from Bosker et al. (2013). We intrapolated urbanisation ratio between 1400 and 1500 assuming a constant linear trend. Given that by 1500 Poland (based on Bosker et al. 2013) and the Voivodeship (Table 3) had similar urbanisation levels (three per cent) we have reason to believe that the estimate for the whole country around 1400 can be used to proxy the situation in the Voivodeship. In order to estimate the income in the Voivodeship in the 15th century we make use of the real wage series for Cracow going back to 1410 (from Allen 2001). In order to construct a continuous wage series, we assumed a constant ratio between Malinowski's series (based on the barebones basket) that go back to the beginning of the 16th century and Allen's series (based on the respectability basket) that go back to 1410. In a similar way, we speculate about how the very low GDP levels of the 18th century can be linked to the first estimates produced by Maddison (1870: 946 1990$PPP, 1900: 1536 1990$PPP); is the model based on real wages and urbanisation ratio able to explain the growth that must have happened in the 19th century? To this purpose we also used urbanisation ratios for Poland as a whole (also based on Bosker et al. 2013) and the real wages reconstructed by Allen (2001). Because we use data for Poland as a whole for the 19th century, we linked the series of GDP estimates to the 1870 estimate from Maddison. Estimating and interpreting any long-term series of Polish GDP is complicated because of the partitions of the country that persisted between 1795 and ca. 1918. At the time, Poland was divided between Prussia, Russia, and Austria (Cracow and its immediate surroundings, before it was incorporated to Austria in 1846, formed a semi-autonomous republic). Therefore, it can be interpreted that our estimates of per capita GDP in the 19th century represent the situation in the 'Polish lands' i.e. territories that are currently in Poland.

Figure 4 presents the estimates derived in this rough way. The model does a good job of explaining 19th century growth: real wages go up by a factor 2.5-3 between 1820 and 1910, and the urbanisation ratio increases from 7 to 28 per cent in the same years, more than explaining the increase in GDP from about 500 1990$PPP in 1820 to almost 2500 1990$PPP in 1910. Our figures link well with the point estimates proposed by Maddison for 1890 and 1900. However, whereas our model predicts sharp economic growth between 1900 and 1910, Maddison's figures suggest a much lower value for 1910 (1689 instead of 2430 1990$PPP). More to the point, both series, anchored on 1578 for the period 1410-1800 and on 1870 for 1811-1910, nicely 'meet' at about the same level in the early 1800s. The estimated decline of GDP per capita in the years 1800-1811 (from 543 in 1799 to 445 1990$PPP in 1811) is entirely due to the decline of the real wage by more than 40 per cent in these years (as wage data are missing for the intervening years, we cannot reconstruct the decline of GDP). Between 1410 and 1800 the annual series also picks up the swings suggested by the benchmarks (which is of course not unexpected as they are based on the same data). The 'growth spurt' in the 16th century is quite clear from this evidence, as is the decline after 1570, and the long stagnation during the rest of the early modern period. We do not identify any economic growth in the late 18th century. Lastly, as elsewhere in Europe, real wages were relatively high in the 15th century, but this did not translated itself into high incomes due to the very low rate of urbanisation.

Figure 4. Estimates of GDP per capita in 1990$PPP, 1410-1910.



Source: See the text.

Table 10 puts the Polish figures in a global perspective. It presents GDP per capita estimates for England, the Netherlands, Northern Italy, Spain, Germany, the Ottoman Empire, Japan,

India, and Poland. The comparison yields several important generalisations about the place of Poland in the narratives of the so-called 'Great' and 'Little Divergence' in income levels around the world and within Europe. If we take the accounts at their face value, it appears that at the beginning of the 15th century Poland was already lagging behind the Western European countries represented in the sample. Its level of economic development was closer to that of Asian rather than Western European countries. However, by 1600, due to economic expansion during its Golden Age (i.e. the 16th century), Poland was richer than most Asian countries. However, its relatively high growth rate at the time was insufficient to reach the level of the Western European countries.

As a result of the crisis of the 17th century, the Polish economy contracted even below the low levels characteristic of Asia. After the crisis of the 17th century, Poland was the poorest country in the sample. This reinforces previous findings of Polish historiography about the severity of the crisis (Przyboś 1957, Sosnowska 2004). At the same time, the North Sea region accelerated and the Mediterranean economies defended their relatively – in a global perspective – high equilibrium. As already discussed, the crisis was followed by a slow recovery. By the end of the 18th century, Polish GDP per capita was barely above that of Japan and India and below that of the Ottoman Empire. During the 18th and the 19th century, however, the country managed to surpass the Asian figures. Nonetheless, its absolute growth rate in the first century after the onset of the Industrial Revolution on the continent was much lower than that of Western Europe. By around 1870, the average GDP per capita of the European countries in the sample other than Poland was 2077 1990$PPP. The Polish economy in per capita terms was less than half that level.

Table 10: GDP per capita around the globe 1400-1910 in 1990$PPP.

Year	UK	NL	Northern Italy	Spain	Germany	Poland	Ottoman Empire	Japan	India
1400	1,053	920	1,596	892		562[hd]	610	527[g]	
1500	1.041	1.119	1,398	919	1.146	702[d]	660		
1600	1.037	2.049	1,243	1,005	807	810[ad]		574	793
1700	1.513	1.620	1,346	905	939	569[bd]	700	629	729
1820	2.074	1.886	1,378	1.062	986	634[cd]	740	600	588
1870	3.190	2.755	1,541	1.207	1.692[e]	946[f]	825	737	533
1910	4,611	3,783	2,176	1,895	3,348	1,689		1,304	697

Note: a) value for 1578; b) value for 1662; c) value for 1776; d) Voivodeship of Cracow; e)1850; f) Poland in the present borders as calculated by Maddison; g) value for 1450; h) value for 1410.
Source: Maddison 2001; Álvarez-Nogal and Prados De La Escosura 2013; Malanima 2010; Pfister 2011; Bolt and Van Zanden 2014; Broadberry et al. 2015; Van Zanden and Van Leeuwen 2012; Pamuk and Shatzmiller 2011, Table 8.

6. Conclusion

Our inquiry into the long-term growth curve of the Polish economy confirms the conventional knowledge that Poland/Eastern Europe was a European periphery. Our figures reinforce the notion suggested by all of the previous studies of Polish per capita GDP that the county already lagged behind Western Europe in economic development at the end of the Middle Ages. The disproportion between the country and the front-runners located in the North Sea region as well as the other Western European countries widened through the period. The growth in the gap was not only a result of growth of the Western – particularly north-western – European economies, but also by the contraction of the Polish economy.

Furthermore, our investigation of income inequality in 16th century Poland contributes to a broader discussion about the link between economic growth and inequality. We demonstrated that, contrary to the claims made by Kuznets (and in opposition to the growing empirical evidence on the historical experience of preindustrial Western Europe), income inequality in the Polish agricultural sector was most probably higher than in the urban sector. This was a result of vast income differences brought about by a demesne economy based on serfdom with a class of landed nobility at the top and disenfranchised peasants at the bottom of the social ladder. This points to the crucial role of institutions (not only economic growth) when trying to understand the formation of income inequality. It is not to say that economic growth and income levels are unimportant. According to our findings, the inequality was curbed by the level of per capita income. In line with the theoretical claims made by Milanovic and collaborators, the level of inequality in the Polish agricultural sector, although relatively high, was limited by the inequality possibly frontier.

References

ADAMCZYK, W. (1935). *Ceny w Lublinie*. Lviv: Instytut Popierania Polskiej Twórczości Naukowej.

ALLEN, R.C. (1999). Tracking the Agricultural Revolution. *Economic History Review, 2nd ser*. **52**, 209–235.

ALLEN, R.C. (2000). Economic structure and agricultural productivity in Europe, 1300–1800. *European Review of Economic History* **4**, 1–26.

ALLEN, R.C. (2001). The Great Divergence in European wages and prices from the Middle Ages to the First World War. *Explorations in Economic History* **38**, 411–447.

ALLEN, R.C., BASSINO, J.P., MA, D., MOLL-MURATA, C. and VAN ZANDEN, J.L. (2011). Wages, prices, and living standards in China, 1738–1925: in comparison with Europe, Japan, and India. *Economic History Review* **64**, 8–38.

ÁLVAREZ-NOGAL, C. and PRADOS DE LA ESCOSURA, L. (2013). The rise and fall of Spain (1270–1850). *The Economic History Review*, **66** (1), 1–37.

ALFANI, G. (2010). Wealth inequalities and population dynamics in Northern Italy during the early modern period. *Journal of Interdisciplinary History* **XL** (4), 513-549.

ALFANI, G. and AMMANNATI, F. (2014). Economic inequality and poverty in the very long run: The case of the Florentine State. Dondena Working Papers no. 70.

ARROYO ABAD, L. and VAN ZANDEN, J. L. (2014). Growth under extractive institutions? Latin American per capita GDP in colonial times. CGEH Working Paper Series no. 61

BATEN, J. and SZOŁTYSEK, M. (2014). A golden age before serfdom? The human capital of Central-Eastern and Eastern Europe in the 17th-19th centuries, MPIDR working PAPER WP2014-008.

BOGUCKA, M. and SAMSONOWICZ, H. (1986). *Dzieje miast i mieszczaństwa w Polsce przedrozbiorowej*. Wrocław: Zakład Narodowy Im. Ossolińskich.

BOLT, J. and VAN ZANDEN, J.L. (2014). 'The Maddison Project': collaborative research on historical national accounts. *Economic History Review* **67(3)**, 627–651.

BOROWSKI, S. (1975). Próba odtworzenia struktór społecznych i procesów demograficznych na Warmii. *Przeszłość Demograficzna Polski* **VIII**, 125-198.

BOSKER, M., BURINGH, E. and VAN ZANDEN, J.L. (2013). From Baghdad to London: Unravelling Urban Development in Europe, the Middle East, and North Africa, 800–1800. *Review of Economics and Statistics* **95(4)**, 1418-1437.

BROADBERRY, S., CAMPBELL, B., KLEIN, A., OVERTON, M. and VAN LEEUWEN, B. (2015). *British economic growth, 1270-1870.* Cambridge University Press.

CACKOWSKI, S. (1961). *Gospodarstwo wiejskie w dobrach biskupstwa i kapituły chełmińskiej*. Toruń: PWN.

CARTER, F.W. (1994). *Trade and urban development in Poland. An economic geography of Cracow, from its origins to 1795*. Cambridge University Press.

CHAYANOV, A.V. (1966). *The theory of peasant economy*. D. THORNER, B. KERBAY, and R.E.F. SMITH (eds.). Homewood.

CRAFTS, N. (1985). *British economic growth during the industrial revolution*. New York: The Clarendon Press.

DOMAR, D. (1970). The causes of slavery or serfdom: a hypothesis. *The Journal of Economic History* **30**, 18-32.
DWYER, P. (2013). *The rise of Prussia 1700-1830*. New York: Routledge.
EPSTEIN, S. (2001). Introduction. In: S. EPSTAIN (ed.), *Town and country in Europe, 1300-1800*. Cambridge University Press.
FEDERICO, G. and MALANIMA, P. (2004). Progress, decline, growth: product and productivity in Italian agriculture, 1000–2000. *Economic History Review, 2nd ser.* **57**, 437–464
GIERSZEWSKI, S. (1982). *Wisła w dziejach Polski*. Gdański: Wydawnictwo Morskie.
GUZOWSKI, P. (2008). *Chłopi i Pieniądze na przełomie średniowiecza i czasów nowożytnych*. Cracow: Avalon.
HOSZOWSKI, S. (1928). *Ceny we Lwowie w XVI i XVII wieku.* Lviv: Instytut Popierania Polskiej Twórczości Naukowej.
IZODORCZYK-KAMLER, A. (1990). Wynagrodzenie pracowników najemnych w folwarkach małopolskich w XVI i pierwszej połowie XVII wieku. *Przegląd Historyczny* **81**, 655-667.
JANKOWIAK-KONIK, B. (2011). *Atlas Histoii Polski*. Warsaw: Demart S.A.
KARPIŃSKI, A. (1983). *Pauperes, o mieszkańcach Warszawy XVI i XVII wieku*. Warsaw: PWN.
KOPCZYŃSKI, M. (1998). *Studia nad rodziną chłopską w koronie*. Warsaw: Krupski i S-ka.
KUKLO, C. (2009). *Demografia Rzeczypospolitej przedrozbiorowej*. Warsaw: DiG.
KULA, W. (1951). Stan i potrzeby badań nad demografią historyczną dawnej Polski. *Roczniki Dziejów Społecznych i Gospodarczych* **XIII**, 71.
KULA, W. (1983). *Teoria ekonomiczna ustroju feudalnego.* Warszawa: Książka i Wiedza.
KUZNETS, S. (1955). Economic growth and income inequality. *American Economic Review* **45**, 1-28.
LASZUK, A. (1999). *Ludność województwa podlaskiego w drugiej połowie XVII wieku*. Warsaw: Białostockie Towarszystwo Naukowe.
LESLETT, P. (1983). Family and household as work group and kin group. In: R. WALL, J. ROBIN and P. LASLETT (eds.), *Family forms in historic Europe*. Cambridge University Press.
MADDISON, A. (2001). *The World Economy. A millennial perspective*. Paris: OECD.
MALANIMA, P. (2009). *Pre-modern European economy*. Leiden-Boston: Brill.
MALANIMA, P. (2010). The long decline of a leading economy: GDP in Central and Northern Italy, 1300-1913. *European Review of Economic History* **15**, 169-219.
MALANIMA, P. (2013). When did England overtake Italy? Medieval and early modern divergence in prices and wages. *European Review of Economic History* **17**, 45-70.
MALINOWSKI, M. (Forthcoming). Little Divergence revisited: Polish weighted real wages in a European perspective, 1500-1800. *European Review of Economic History*.
MAŁECKI, J. (1963). *Studia nad rynkiem regionalnym Krakowa w XVI wieku*. Warsaw: PWN.
MĄCZAK, A. (1982). The structure of power in the Commonwealth of the sixteenth and seventeenth centuries. In: J. K. FEDOROWICZ (ed.), *A republic of nobles. Studies in Polish history to 1864*. Cambridge University Press, 109-134.

MĄCZAK, A. (1995 [1983]). Development levels in early-modern Europe. In: Idem (ed.), *Money, Prices and Power in Poland*. Norfolk: Variorum.

MELTON, E. (1988). Gutsherrschaft in East Elbian Germany and Livonia 1500–1800: a critique of the Model. *Central European History* **21**, 315–349.

MILANOVIC, B, LINDERT, P. and WILLIAMSON, J. (2011). Pre-industrial inequality. *Economic Journal* **121**, 255-272.

MOLENDA, D. (1978a). *Kopalnie rud ołowiu na terenie złóż śląsko-krakowskich*. Wrocław: Zakad narodowy Im. Ossolińskich.

MOLENDA, D. (1978b). Ludzie pracy. In: W. Hensel and J. Pazdura (eds.), *Historia kultury materialnej Polski*, Vol. III. Wrocław: Zakład Narodowy Im. Ossolińskich, 206-214.

PAMUK, Ş. and SHATZMILLER, M. (2011). Real Wages and GDP per capita in the Medieval Islamic Middle East in Comparative Perspective, 700-1500, paper presented at the 9th Conference of the European Historical Economics Society, Dublin.

PELC, K. (1935). *Ceny w Krakowie w Latach 1369-1600*. Lviv: Instytut Popierania Polskiej Twórczości Naukowej.

PETERS, J. (1970), Ostelbische Landarmut: Statistisches uber landlose und landarme Agrarproduzenten im Spatfeudalismus (Schwedisch-Pommern und Sachsen). *Jahrbuch fur Wirtschaftsgeschichte* **1**, 115-16.

PFISTER, U. (2011). Economic growth in Germany, 1500–1850, Paper presented at the Conference on Quantifying Long Run Economic Development, Venice.

PRZYBOŚ, A. (ed.) (1957). *Polska w okresie drugiej wojny północnej 1655–1660*. Warsaw: PWN.

RUTKOWSKI, H. (ed.) (2008). *Atlas historyczny Polski, Województwo Krakowskie*. Warsaw: Neriton.

RUTKOWSKI, J. (1938). *Badania nad podziałem dochodów w Polsce w czasach nowożytnych*. Cracow: Polska Akademia Umiejętności.

RUSIŃSKI, W. (1954). O rynku wewnetrzynym w Polsce w drugiej połowie XVIII wieku. *Roczniki Dziejów Społecznych i Gospodarczych* **16**, 113-149.

SOSNOWSKA, A. (2004). *Zrozumieć zacofanie*. Warsaw: TRIO.

TACUTU, R., CRAIG, T., BUDOVSKY, A., WUTTKE, D., LEHMANN, G., TARANUKHA, D., COSTA, J., FRAIFELD, V. E. and DE MAGALHAES, J. P. (2013). Human Ageing Genomic Resources: Integrated databases and tools for the biology and genetics of ageing. *Nucleic Acids Research* **41**.

TOPOLSKI, J. (1965). Narodziny kapitalizmu w Europe. Warsaw: Państwowe Wydawnictwo Naukowe.

TRZYNA, E. (1963). *Położene ludności wiejskiej w królewszczyznach Województwa Krakowskiego w XVII wieku*. Wrocław: Zakład Narodowy Im. Ossolińskich.

VIELROSE, E. (1957). Ludność Polski od X do XVIII wieku. *Kwartalnik Historii Kultury Materialnej* **1**, 3-49.

WAGNER, K. (2013). Inequality in Polish cities in the 17th and 18th century. Paper presented at FRESH Meeting, Warsaw.

WRIGLEY, E. A. (1985). Urban growth and agricultural change: England and the Continent in the early modern period. *Journal of Interdisciplinary History* **15**, 683–728.

WÓJTOWICZ, G. and WÓJTOWICZ, A. (2009). *Dlaczego nie jesteśmy bogaci*. Warsaw: Cedewu.

WYCZAŃSKI, A. (1977). *Uwarstwienie społeczne w Polsce XVI wieku*. Wrocław-Warsaw-Cracow-Gdańsk: Wydawnictwo Polskiej Akademii Nauk.

VAN ZANDEN, J.L. (1995). Tracing the beginning of the Kuznets' Curve. *The Economic History Review* **48(4)**, 643-664.

VAN ZANDEN, J.L. (1999). Wages and the standard of living in Europe, 1500-1800. *European Review of Economic History* **2**, 175-197.

VAN ZANDEN, J.L. (2001). Early-modern economic growth: a survey of the European economy, 1500-1800. In: M. Prak, (ed.), *Early-modern Capitalism, economic and social change in Europe 1400-1800*. London: Routledge, 69-87.

VAN ZANDEN, J.L. (2009). The skill-premium and the 'Great Divergence'. *European Review of Economic History* **13**, 121-153.

VAN ZANDEN, J.L, and VAN LEEUWEN, B. (2012). Persistent but not consistent: The growth of national income in Holland 1347–1807. *Explorations in Economic History* **49**, 119-130.

ZURIMENDI, I. (2014). Abolition of serfdom and the growth of cities in Eastern Europe. Paper presented at the ESSHC, Vienna.

ŻYTKOWICZ, L. (1962). *Studia nad gospodarstwem wiejskim w dobrach kościelnych w XVI wieku*. Warsaw: PWN.

Chapter 4: Market conditions in preindustrial Poland, 1500-1772[7]

Abstract: I investigate commodity market integration, market efficiency and market performance in preindustrial Eastern Europe. In particular, I look at the Polish rye market between 1500 and 1772. I analyse annual rye price data from seven cities. The results suggest that market conditions in Poland in the sixteenth century were relatively favourable. The market disintegrated in the seventeenth century. Afterwards, Polish markets remained relatively segmented, in contrast to many Western European countries whose markets thrived in the eighteenth century. This supports the hypothesis that even before the Industrial Revolution there was The Little Divergence in economic development between Western and Eastern Europe. The disintegration crisis in Poland was linked to the separation of landlocked cities from the common market. After the seventeenth century, cities located on the Vistula river enjoyed better market conditions and remained better integrated than the landlocked ones. The long-term market crisis may have resulted from the devastating warfare in the mid-seventeenth century.

Keywords: Market integration, market efficiency, market performance, Poland

JEL codes: N13, N73

Publication process: Accepted for publication by *Economic History of Developing Regions*

[7]The author wishes to acknowledge the contributions of: Piotr Guzowski, Michał Kopczyński, Bas van Leeuwen, Oliver Volckart, Nikolaus Wolf, Jan Luiten van Zanden, and the referees of *Economic History of Developing Regions*. All remaining mistakes are the sole responsibility of the author.

1. Introduction

Long-term changes in market conditions have become a popular research topic in economic history. Improvement in market conditions is a multifaceted process of changes in, among other things, market integration, market efficiency and market performance.[8] Favourable market conditions stem from an environment conducive to trade and economic specialisation within and between geographically separated markets (Persson 1999; Özmucur and Pamuk 2007; Unger 2007; Bateman 2012). Improvement in market conditions is both a part and a cause of overall economic development. Discussions about market conditions in preindustrial Europe relate to The Little Divergence debate, which centres on when and why Western Europe's economy pulled ahead of that of the rest of the continent. In a recent study of annual wheat prices across markets, Bateman (2011: Tables 3–5) identified an improvement in domestic market conditions in numerous Western European countries in the sixteenth century, followed by disintegration around the seventeenth century and recovery in the eighteenth century.[9] Investigating wheat prices in western cities, Studer (2008: 404) found that regional and intraregional markets in Western Europe in the first half of the eighteenth century were already closely connected and became even more integrated through the century.[10] Özmucur and Pamuk, who studied prices of numerous commodities, say 'there is some evidence that parts of [Western] Europe were becoming more integrated … during the early modern era'.[11] In particular, they identified a progressive convergence of the prices of most, but not all, of the studied commodities (Özmucur & Pamuk 2007: Table 3.1, 80).

There has been no systematic study of long-term changes in domestic market conditions in preindustrial Eastern Europe. This chapter helps to fill this gap in the literature by providing an account of the market integration, efficiency and performance of the Polish rye market between 1500 and 1772 – the date of the First Partition of Poland. The study demonstrates that the Polish rye market was fairly well developed in the sixteenth century, fragmented in the seventeenth century, and failed to recover in the eighteenth century. It contributes to The Little

[8]See Federico (2012) on differences between integration and efficiency and Van der Spek et al. (2015), who recently advocated adding the dimension of market performance to the research agenda.

[9]The countries that followed the pattern were Austria, Spain, France, England and Italy. However, in the case of the last two Bateman did not identify a significant market crisis in the seventeenth century.

[10]Studer's sample focused mainly on Western Europe, but it also included prices from Cracow and Vienna.

[11]Özmucur and Pamuk's sample focused mainly on Western Europe, but also included prices from Sopron and Istanbul.

Divergence debate by demonstrating that, while market conditions in Western Europe continued to develop in the eighteenth century, Eastern Europe's markets declined.

The problem of market conditions in preindustrial Poland has already been addressed by several scholars (for example Rusiński 1954; Wyrobisz 1966, 1981; Kula 1976; Bateman 2012). Mielczarski (1962) identified a progressive convergence of weights and measures across the country in the sixteenth century. Using modern statistical methods, Baten and Wallusch (2005) analysed prices on the Polish grain market in the eighteenth century and found the market conditions poor. To bridge the gap between the two studies and construct a long-term account of market conditions in preindustrial Poland, I investigate annual rye prices from seven Polish cities between 1500 and 1772. I look at Cracow, Gdańsk, Warsaw, Koenigsberg, Wrocław, Lublin and Lviv, the first three situated on the Vistula river. I measure market integration by examining year-by-year changes in the coefficient of variation of rye prices from across the country. I also look at market efficiency by estimating the correlation of prices across markets. I analyse market performance by studying conditional volatility in discrete markets. I look at various subsets of the cities, situated on or away from the Vistula, to gauge the effects of geography. I base the analysis on two datasets: a basic dataset of historical annual rye prices from the seven cities and – perhaps more controversially – an enhanced dataset that includes rye prices extrapolated from prices of wheat and oats in the same market. The results indicate that market conditions in Poland in the sixteenth century were relatively favourable. But the market disintegrated in the seventeenth century and, in contrast to many Western European countries, remained segmented in the eighteenth. The disintegration crisis in Poland resulted from the separation of landlocked cities from the common market. After the seventeenth century, cities located on the Vistula enjoyed better market conditions and remained better integrated than landlocked ones.

2. Methodology

In this chapter I investigate three different qualities of the Polish rye market – its integration, efficiency, and performance. Market integration relates to decline in transaction and transportation costs and a gradual transformation of a range of discrete independent markets into one economic unit. I assume that markets become more integrated if in the long-term the costs decrease and prices converge. I link the process to the so-called law-of-one-price (see Jacks 2004; Federico 2012).

$$|Price_{a,t} - Price_{b,t}| \leq Transaction\_and\_tranposrtation\_costs_{ab,t} \quad (1)$$

The law-of-one-price is demonstrated by Equation 1. The law states that any rise in the price gap between two cities above the transaction and transportation costs is expected to have been utilised by an instant arbitrage performed by the grain merchants.

Federico (2011) advocated the use of the coefficient of variation (hereafter the CV) of all the prices across the common market at any given year to measure price convergence. The measure captures the convergence of all the prices in a market to the mean value. It focuses on unification of the whole system rather than integration of individual pairs of cities. According to Federico (2011), the CV has been the standard measure of integration since the 1960s mostly because it is: simple to compute, intuitive, and easy to compare across time and space. The method allows me to estimate the situation on the whole market in any given year and thus track short-term changes.

$$CV_t = SD_t / \mu_t = (1/n\ [\Sigma(p_{i,t} - \mu_t)^2])^{0.5} / \mu_t \quad (2)$$

Equation 2 proposes how to measure the CV; $p_{i,t}$ denotes the rye price in the i-th market and μ_t represents the mean price. Federico (2012) and Van Bochove (2008) pointed at a crucial problem with the use of decreases in the price gap as indicators of market integration. The authors noted that markets that do not interact could still have – incidentally – similar levels of prices. For example, segmentation could potentially result in an increase in prices in the cheaper market and a consequent narrowing of the price gap. Such a development can create a false impression of integration.

Furthermore, the law-of-one-price rests on the assumption that traders know the current prices on the markets. Fama (1970) defines such situation as weak efficiency, as opposed to strong efficiency that relates also to other types of information. Furthermore, the author defines a market as fully efficient if '*prices always "fully reflect" the available information'* (see: Federico 2012: 476). Building on this literature, here I define market efficiency as having access to information and being to reflect the information in prices. In this chapter I analyse only price data and therefore focus solely on weak efficiency. Federico (2012) argues that the assumption that prices always reflect all the information on the market may be too optimistic. Looking solely at price convergence may therefore give a misleading picture of market conditions. To create a more coherent picture of market conditions, I also account for market efficiency. Given that transport costs tend to be stable in the short term, a logical conclusion of

the law-of-one-price is that in an efficient market an external shock to one price will also affect the other price. The price series from across an efficient market must therefore be highly positively correlated. In this case, Van Bochove (2008) also cautions that co-movement in prices can be 'spurious' as it can be a result of a common shock such as war. We should be able to avoid this 'danger' as long as we keep in mind the historical context.

Federico (2012: 480) says that to measure market efficiency we can test the transfer of information between markets by – among other methods – seeing whether arbitrage forces prices to converge (co-movement tests). Weir (1989) proposes a method of measuring sympathetic movements of prices in a broad market composed of numerous local markets with a known price series. Weir claims that the variance of the mean of all the regional price series will increase with the progressive correlation across the individual series. In other words, '*the year-to-year variance of the [regional] market will increase … with greater correlation across* [individual] *markets'* (Weir 1989: 206; Jacks 2004: 293). Weir uses the following equation to formalise this assertion:

$$R = \frac{\dfrac{Var(regional)}{\sum_i Var(i)/n\text{^}2} - 1}{(n-1)} \tag{3}$$

where *Var(regional)* is the variance of a new time series composed of the year-by-year average prices of all the discrete prices series. Moreover, *Var(i)* is the variance of each i-th price series. *R* with some loss of statistical precision can be interpreted as the average correlation coefficient across regions. For this reason, for the sake of simplicity, *R* can be called 'Weir's correlation coefficient'.

Weir's method makes it possible to discover how well markets transfer information about regional shocks between cities and represent the information in the prices. I am also interested in the ability of each discrete market to adapt to these shocks. Van der Spek et al. (2015), after Földvari and Van Leeuwen (2011), define market performance as the ability of markets to cope with shocks – i.e. the effects of unexpected events. To avoid confusion, I must caution that, due to the unfortunate looseness of the definitions prevalent in the literature on market conditions, many studies not only treat 'market integration' and 'efficiency' as interchangeable but also use these terms when discussing what Van der Spek et al. call 'market

performance' (Van der Spek et al. 2015: 3; and see Federico 2012 on the looseness of definitions). Van der Spek et al. (2015: 4) explain the concept with an example:

> *'In a perfectly working market an external shock due to, for example, a failed harvest will lead to rising prices, which will trigger trade, the sale of grains from storage houses, etc. Hence, even though prices will increase to some extent, the increase in the price of food will be mitigated by economic adaptations, and the degree to which this will occur will be related to the quality of the institutional (and geographical) framework.'*

In short, perfectly working markets respond well to shocks and, as a result, are less volatile. Földvari and Van Leeuwen (2011) argue that market performance can be directly affected by improvements in trade, storage, consumption diversification and technological development.

Földvari and Van Leeuwen (2011) also argue that the most popular method of studying price volatility, i.e. looking at the CV of prices over time (as opposed to across space in the convergence test), often produces overestimated results due to the persistence of the shocks to the price series. Furthermore, the measure can also be biased by inflationary and deflationary tendencies. Instead, they suggest we observe market performance by studying the residual variance of commodity prices, using an autoregressive conditional heteroscedasticity (ARCH) model.

In more detail, they explain that differences in prices between two consecutive years are partly driven by a trend and partly random. They assume that the size of shocks is, on average, zero and homoscedastic.[12] To gauge the degree of unexpected volatility the authors suggest we analyse the residual variance (or conditional variance) instead of the variance of the price series themselves. They say a trend-like behaviour in the residual variance can be interpreted as a sign of the market's ability to cope with the effect of shocks. The residual variance will reflect the share of shocks in the total variance that is the effect of unexpected events on price volatility. This means that, in order to measure market performance, we should first model the prices and further analyse only that part of the variation that was random and unexpected (see more in Van der Spek et al. 2015).

---

[12] However, they admit that although '*the assumption about the homoscedasticity of* [the size of shocks] *within the same country or region sounds feasible, it is less likely that the shocks have the same variance across all regions as well, making this method not ideal for cross-country comparisons'* (Földvari and Van Leeuwen 2011: 174)

In practice, due to the gaps in the time series, the ARCH model cannot be estimated directly. Thus, as instructed by Földvari and Van Leeuwen, we calculate the conditional variation of the price series using a two-step procedure. First we estimate the main equation as follows:

$$Price_t = Constant + APrice_{t-1} + BPrice_{t-2} + \Gamma Price_{t-n} + u_t \quad (4)$$

The greater the volatility and therefore the (under)performance, the less of the variance is explained by the previous prices and therefore the greater the error term u.

We then use the variance equation to gauge the changes in volatility over time in the whole domestic market. The equation builds on the theory that the variation in the price, and therefore also the error, is likely to be related to its past variations. For this reason, the model controls for the lags of the dependent variable. To quantify the markets' reaction to shocks in the long run, the estimates from different discrete price series (Equation 4) can be pooled and regressed on a set of time dummies (Equation 5).

$$\hat{u}^2_{i,t} = Constant + \alpha\hat{u}^2_{i,t-1} + \beta\hat{u}^2_{i,t-2} + \gamma\hat{u}^2_{i,t-n} + \sum_x^n \delta_x p_x + e_{i,t} \quad (5)$$

where $\hat{u}$ denotes fitted values obtained from Equation 4, p denotes n different time period dummies, and i denotes different discrete markets. The larger the coefficient δ_x , the greater the conditional volatility in the corresponding period.

In the case of both the main and the variance equation, the appropriate number of lags of the dependent variable is determined by the results of an analysis of their statistical significance.

3. Two datasets

To investigate market conditions, I use two datasets. The first one consists of annual grain price data between 1500 and 1772 for seven cities – Cracow, Gdańsk, Warsaw, Koenigsberg, Wrocław, Lublin and Lviv. I call this the basic dataset. Because there are numerous gaps in that dataset I also construct an enhanced dataset. I use the information on the prices of wheat and oats from the same market to extrapolate missing observations. I base the analysis of market performance on the basic dataset. For the continuous series of the CV and Weir's correlation coefficient, I use the enhanced dataset.

The basic unit of observation is a series of annual retail rye prices for each of the seven cities. I chose rye for this study as it was the most commonly traded grain on the domestic market. It was also the most basic source of calories for the population (Wyczański 1969). Not all of these seven cities were part of the country. Koenigsberg was located in Ducal Prussia, which was a fief of the Polish king after 1525. Wrocław was located in the historical region of Silesia, which had been a part of the domain of the Polish King back in the eleventh century. At that time, it was considered one of the main capitals of the kingdom. In 1335 it became part of the Czech domain and in 1526 it was claimed by the Habsburgs. Subsequently, in 1742, the city was assimilated by the Kingdom of Prussia. According to Wolański (1961), in spite of the border Wrocław retained close economic ties with Poland. Warsaw was incorporated into the Polish Kingdom in 1526. The other four cities were part of Poland between 1500 and 1772.

Annual grain price data for Gdańsk, Cracow, Lviv, Warsaw, Lublin and Wrocław – the last only until 1618 – were collected from primary archival material (Hoszowski 1928, 1934; Furtak 1935; Adamczyk 1935, 1938; Siegel 1936; Pelc 1935, 1937, Wolański 1993) and standardised to a uniform measure of a price in grams of silver for one litre by the Global Price and Income History Group.[13] Standardised prices for Koenigsberg were taken from the Allen-Unger Global Commodity Prices Database.[14] Prices for Wrocław for the eighteenth century were taken from David Jacks' webpage[15] and required standardisation.[16] See Table 1.

Table1: Descriptive statistics of the annual rye price data in the basic dataset.

	Years	Coverage (%)	Mean	SD
Gdańsk	1501-1772	83	0.27	0.11
Cracow	1504-1772	55	0.07	0.04
Koenigsberg	1700-1772	93	0.23	0.09
Lublin	1570-1772	20	0.33	0.18
Lviv	1519-1759	28	0.27	0.16
Warsaw	1526-1772	27	0.17	0.1
Wrocław	1509-1618 & 1696-1772	87	0.3	0.19

Note: Prices in grams of silver for one litre of rye.

[13]http://gpih.ucdavis.edu/

[14]http://www.gcpdb.info/data.html

[15]http://www.sfu.ca/~djacks/data/prices/Poland/index.html

[16]Rye prices in Jacks's dataset are presented in silbergroschen per Berliner Scheffel. One Spesieztaler was worth 30 silbergroschen. In the late seventeenth century the taler contained 25.9839 g of fine silver. From 1740 onward this was reduced to 19.4879 g. In 1750 Prussia debased the taler further to 16.7039 g and kept it at this level until the end of the studied period. The silver content in the period 1756–1763 is unclear and the prices from that time were left out of the dataset. One Berliner Scheffel was 62.3 litre. (Information from Praun 1784; Ebeling and Brodhagen 1789: 490; Engel 1855.)

There are numerous gaps in the basic dataset. Calculation of the CV of all the prices and Weir's correlation coefficient requires numerous simultaneous observations and is sensitive to gaps in the series. I thus had to fill the gaps in the basic dataset by creating the enhanced one. Jacks (2004), computing market integration between ports located at the North and Baltic seas, struggled with a similar shortage of data for Poland. He used information on the simultaneous prices of the same grain from different markets and used panel data analysis to predict the missing observations. I fill some of the gaps in the basic dataset in a similar fashion by using correlations within the same market.

I extrapolate missing prices of rye in each discrete market in three steps. First, I extrapolate the unknown prices of rye from known prices of wheat. I use a simple linear OLS regression (Equation 6) of the annual rye price on the corresponding wheat price and predict rye prices for the years with a known wheat price but an unknown rye price. I use this procedure for each of the seven cities separately. Second, I predict the remaining missing prices of rye from the prices of oats, using the same procedure. I do not use the rye prices previously predicted from wheat in this second operation. As the third and final step, I fill the remaining gaps in the time series by using a linear interpolation, provided a gap is not wider than five years.

$$\text{rye\_price}_t = \text{Constant} + \alpha\text{price\_of\_other\_grain}_t + e_t \qquad (6)$$

How do I know that I can use wheat and oats prices to extrapolate data on rye prices? Both grains were consumed by people and – to some extent – can be regarded as substitutes for rye (Wyczański 1969). Furthermore, production and pricing of all the grains produced in one region were dependent on the same weather conditions and, in general, were subjected to similar shocks. For this reason, two series consisting of paired commodities, one for rye and wheat and the other for rye and oats, can both be expected to have been highly positively correlated. Table 2 presents the results of the regressions of rye prices on prices of wheat and prices of oats separately. Because these correlations can be spurious due to a possible common time trend, I look both at levels[17] and changes[18] in prices. The results of the regression analysis indicate that the prices of rye have been correlated with the prices of wheat and the prices of oats. Specifications I and II indicate that both the constant and the coefficients next to wheat

[17] $\text{rye\_price}_{t,i} = \text{Constant} + \alpha\text{price\_of\_other\_grain}_{t,i} + \sum_x^n \beta_x \text{city\_dummy}_x + e_{t,i}$

[18] $\text{rye\_price}_{t,i} - \text{rye\_price}_{t-1,i} = \text{Constant} + \alpha(\text{price\_other\_grain}_{t,i} - \text{price\_other\_grain}_{t-1,i}) + e_{t,i}$

or oats are statistically different from zero. Furthermore, for all the cities except Lublin, the average ratio between the studied prices was statistically different from the constant as well as from the relation in the city of reference – Gdańsk. And according to Mielczarski (1962) and Guzowski (2011), in early modern Poland, the ratio of the price of rye to the price of oats was relatively stable and particular to each individual market. All of this suggests that Equation 6 can be used to predict missing rye prices for each city separately.

Table 2: Results of regression of rye prices on prices of wheat or oats.

Rye_price_t	I	II	III	IV
Method	Levels	Levels	First-differences	First-differences
Constant	-0.028** (0.05)	0.029*** (0.01)	-0.003 (0.70)	0.000 (0.82)
Wheat	0.663*** (0.00)		0.543*** (0.00)	
Oats		1.727*** (0.00)		1.26*** (0.00)
Warsaw	0.032*** (0.00)	-0.03*** (0.01)		
Cracow	0.03*** (0.00)	-0.012 (0.31)		
Lviv	0.03*** (0.01)	-0.056*** (0.00)		
Lublin	0.007 (0.64)	0.005 (0.81)		
No.	245	429	150	307
R^2	0.86	0.76	0.45	0.31

Note: P-values based on heteroscedasticity robust standard errors in brackets. *, **, *** denote significance at the 10, 5, and 1 per cent level respectively. Gdansk used as the city of reference. Based on the basic dataset.

Table 3 provides descriptive statistics of the enhanced dataset. It shows that the additional data points were created mostly for Cracow, Lviv, Warsaw and Lublin. The R^2 values of the regressions of rye prices on wheat prices are, in general, relatively high (apart for the R^2 value for Lviv). This suggests that the rye prices extrapolated from wheat prices are a close approximation of the historical prices (see also the high R^2 value in specification I in Table 2). The R^2 values from the regressions of different rye series on corresponding oats series are high for Lviv and Lublin and low for Cracow and Warsaw.[19]

[19]This might indicate that in Lviv and Lublin – the poorer cities – oats, which were cheaper, were more often used as a substitute for the more expensive rye.

Table 3: Descriptive statistics of the annual rye price data in the enhanced dataset.

	Gdańsk	Cracow	Lviv	Warsaw	Lublin	Wrocław	Koenigsberg
Period	1501-1772	1504-1772	1519-1759	1526-1772	1570-1772	1509-1618 & 1696-1772	1700-1772
No. observations	256	263	241	211	155	163	68
Coverage (%)	94	98	95	86	76	87	93
Mean	0.25	0.08	0.26	0.20	0.35	0.3	0.23
SD	0.12	0.03	0.17	0.07	0.16	0.19	0.09
No. from the basic dataset	228	148	73	67	42	163	68
No. extrapolated from wheat		12	10	19	7		
No. extrapolated from oats	9	81	133	63	49		
No. from a linear interpolation	19	22	25	62	56		
No. of years with known rye-oats pairs	145	138	62	60	29		
R^2 of regression on wheat		0.80	0.49	0.83	0.61		
R^2 of regression on oats	0.70	0.28	0.72	0.16	0.66		

Note: Prices in grams of silver for one litre of rye.
Source: See the text.

Table 4 presents the share of historical, extrapolated and intrapolated rye price data by city and sub-period. Koenigsberg and Wroclaw are not included because their rye price series are, in general, continuous and therefore do not require extrapolation from wheat or oats. As expected, rye price series for the sixteenth and seventeenth centuries (especially for Lviv, Warsaw and Lublin) had numerous gaps. In the period between 1625 and 1649 all rye prices for Cracow, Warsaw, and Lublin had to be extrapolated. The data for the eighteenth century required much less extrapolation (in the case of Gdańsk and Cracow almost none). In contrast, for the sixteenth and the seventeenth centuries around 60 per cent of data in the enhanced dataset were synthesised on average. For the eighteenth century, only 33 per cent of the data had to be extra- or intrapolated.

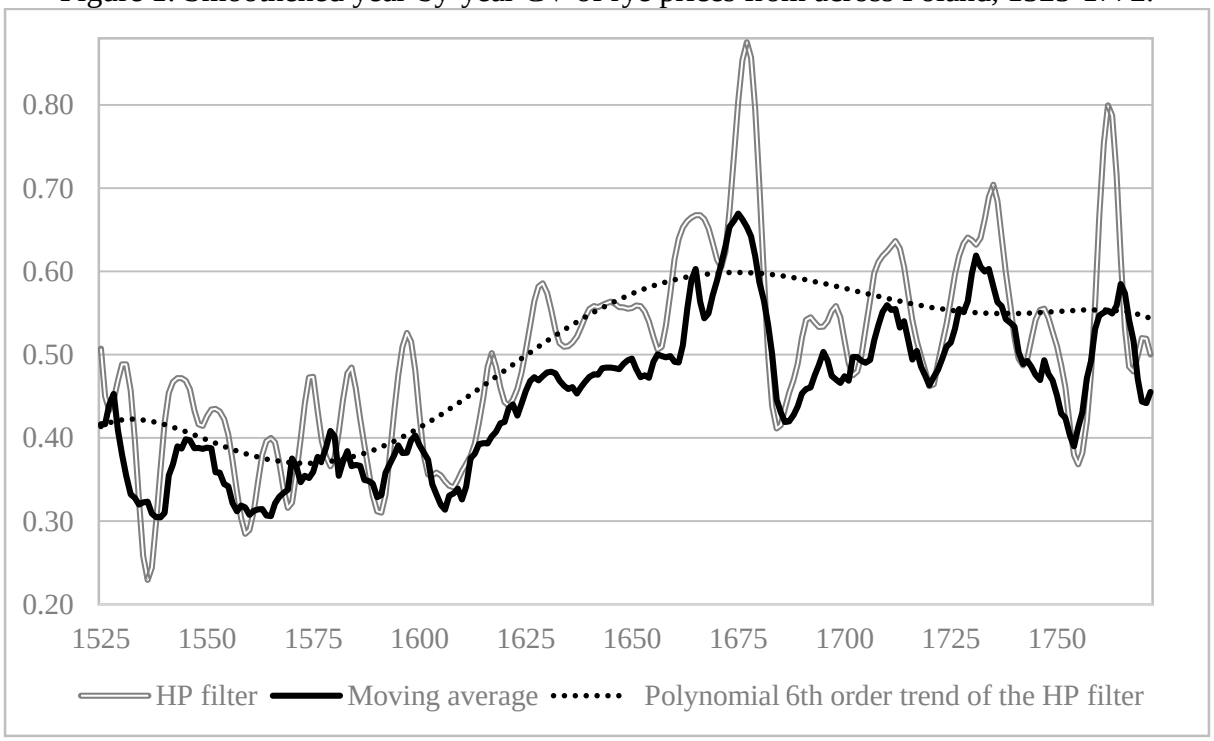
Table 4: Composition of the enhanced dataset on annual rye prices by source of data by city and period.

	Cracow	Gdańsk	Lviv	Warsaw	Lublin
Coverage / share original / share from wheat / share from oats / share intrapolated (in %)					
1525-1549	100/60/12/24/4	100/44/0/16/40	100/8/4/88/0	56/50/7/14/29	
1550-1574	100/56/0/44/0	100/80/0/4/16	100/24/0/76/0	100/16/28/20/36	
1575-1599	100/68/4/28/0	100/96/0/4/0	100/16/0/80/4	100/20/4/32/44	28/14/0/86/0
1600-1624	100/32/0/68/0	100/88/0/8/4	100/44/4/32/20	100/20/4/44/32	92/13/0/35/52
1625-1649	100/0/0/100/0	100/100/0/0/0	100/28/4/68/0	28/0/0/86/14	76/0/0/53/47
1650-1674	76/47/0/21/32	100/100/0/0/0	100/0/0/84/16	68/12/0/47/41	100/32/4/36/28
1675-1699	100/44/8/24/24	100/100/0/0/0	100/32/12/36/20	100/24/0/32/44	100/36/4/32/28
1700-1724	100/52/24/8/16	100/100/0/0/0	100/64/4/20/12	100/56/8/16/20	56/29/0/36/36
1725-1749	100/100/0/0/0	100/100/0/0/0	100/36/8/28/28	100/44/20/28/8	76/32/16/0/53
1750-1772	100/100/0/0/0	100/100/0/0/0	40/80/0/20/0	100/56/8/20/16	68/47/12/12/29

4. Trends in market conditions in the Polish rye market

Figure 1 plots the estimates of the CV of the prices from the enhanced dataset. The data has been smoothed by using the five-year-centred moving average and the Hodrick-Prescott filter. The two methods of smoothing produce similar results. The positions of the local minimums and maximums can be linked to Polish sociopolitical history (I discuss the long-term trends later in this section).

Figure 1: Smoothened year-by-year CV of rye prices from across Poland, 1525-1772.



Source: Based on the enhanced dataset. See the text.

The story begins with the elevated values in 1525 and 1526. At that time, Gdańsk rebelled against the magistrate. Trade was for a short time redirected to a nearby port, which increased the transaction costs. Military intervention by the king restored trade to Gdańsk. Subsequently, the Gdańsk market was progressively integrated with Warsaw's market, after the Mazowia region, which includes Warsaw, was incorporated into the Crown in 1526. The general downward trend in the CV lasted until 1564, which coincided with a reform of political and fiscal institutions instigated by the middle nobility and the beginning of the war for possession of the Duchy of Livonia (1563–1570). In 1569 the regions of present-day Ukraine were taken from the Grand Duchy of Lithuania and incorporated into the Polish Kingdom. Later that year, Poland and Lithuania united into one political entity known thenceforth as the Commonwealth of the Two Nations. Political disturbances intensified around 1572 when the last king from the hereditary Jagiellonian dynasty died and the kingdom became an elective monarchy. Between 1576 and 1577 Gdańsk, which had supported the election of a candidate from the Hapsburg family, was at war with the elected King Stefan Batory. Military intervention by Batory and foreign mediation ended the conflict and restored trade. The wars, together with various political shocks, destabilised the Polish economic system. Nonetheless, until the low CV point around 1606, the markets were fairly well integrated. These findings correspond to what is known about the Polish economy at the time. Many authors have noted the progressive

specialisation between the cities and sectors in the second half of the sixteenth century (Baranowski 1919; Wyrobisz 1966, 1981).

The pan-European General Crisis of the seventeenth century hit Poland hard. At the beginning of the seventeenth century, the country not only had to fight Sweden, Russia and Turkey but also had to resolve domestic military conflicts. This caused a continuous increase in the CV after around 1606. Between 1626 and 1629, Swedish armies occupied much of the Polish coastline. Subsequently in 1632, Russia invaded the country and besieged the important stronghold of Smoleńsk. This turbulent period concluded with ceasefires with Sweden and Russia signed in 1634 and 1635. The CV plateaued in the 1630s and 40s.

The peace did not last long. The disintegration was especially bad after the 1650s when the Ukrainian uprising (1648–1655), Swedish Deluge (1655–1660), and the war with Russia (1654–1667) hit the country around the same time. According to numerous studies, the wars of the mid-seventeenth century were devastating to the Polish economy. Not only did Poland lose more territories to Russia, but – more importantly – its population was decimated (Przyboś 1957). The war crisis brought the CV values to the highest levels in the studied period. The trend changed around 1686, the date of the signing of a peace treaty with Russia and the beginning of two decades of relative stability.

Disintegration began again towards the end of the seventeenth century and lasted until the 1730s. The year 1704 marks the beginning of another grim period in Polish history – the outbreak of a massive bubonic plague that lasted until 1713. Compounding this, Poland joined the Great Northern War (1700–1721), which was nearly as devastating as the wars of the mid-seventeenth century. The war was followed by a period of political chaos and civil wars that concluded with the War for the Polish Succession (1733–1738). At that time, foreign military powers and magnates were fighting for political influence in the country. The war ended with the victory by Russia and Saxony that forced out the Polish candidate for the Crown. The end of war resulted in an improvement in market conditions. However, the progressive foreign influence gradually led to the first partition of the country in 1772 by Austria, Russia and Prussia.

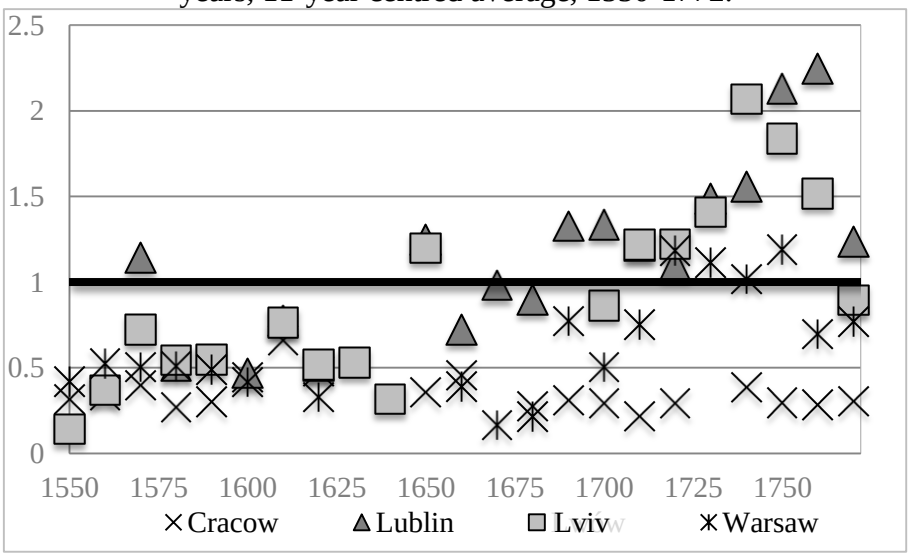
It has been commonly argued in the historiography (for example by Rusiński 1954) that 1764 was a turning point in the economic history of the country. At that date, Russia agreed to a wide range of reforms in order to secure the election of its candidate to the Polish throne. The reforms included the standardisation of measures and moneys. According to Rusiński, the second half of the eighteenth century was a period of progressive specialisation across the

Polish cities. The CV series indicate a slight convergence in prices between 1764 and 1772, but not down to the levels typical for the sixteenth century.

Thus far I have analysed only the short-term changes in market integration. I also wish to identify and possibly explain the long-term changes. First, I identify major break points. I propose some possible explanations for these long-term changes in the next section of the text. Regarding the long-term changes, the straightforward and most important conclusion of Figure 1 is that the values in the sixteenth century were lower than those in the eighteenth century. The Chow Break Point Test confirms this difference between CV estimates from before and after 1650 at a 10 per cent significance level. The difference is statistically significant both for the values based on the basic dataset and for those based on the enhanced dataset.

I investigate the identified disintegration in more detail. Figure 2 presents the ratios of various cities' rye prices to Gdańsk's rye price. The figure is based on the basic dataset. It is a well-established fact that Gdańsk was the centre of Polish grain markets and the outlet for most of the grain exports from the country (Małecki 1968). In an integrated market, the price of rye in Gdańsk should be the highest in the country. The figure suggests that this was the case until around the 1650s, when the prices in Lviv and Lublin rose high above the threshold set by Gdańsk. These cities were located off the Vistula and were connected with the other cities via the network of small towns that was destroyed in the middle of the seventeenth century. I return to this point in the next section.

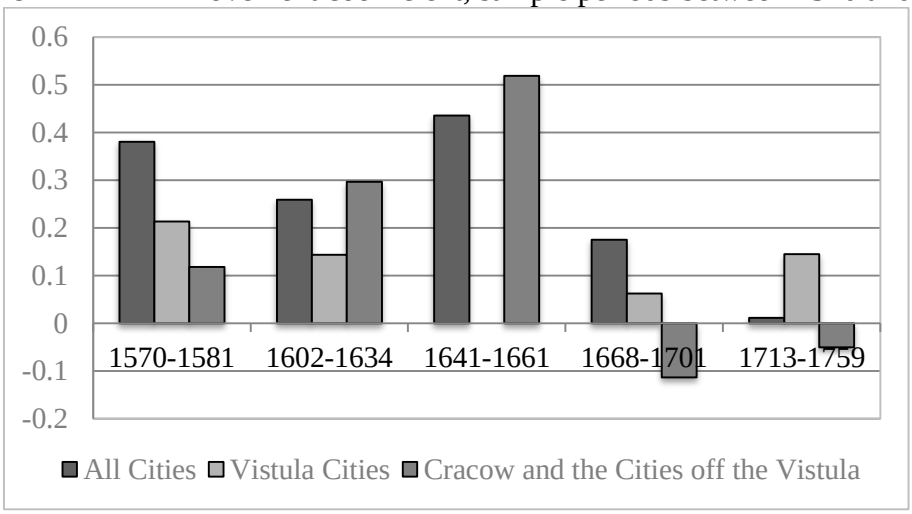
Figure 2: Ratios of rye prices from various Polish cities with the Gdańsk's price in selected years, 11-year centred average, 1550-1772.



Source: Based on the basic dataset. See the text.

To double-check the argued trends in market conditions established by investigating the CV of prices, I test for co-movement of prices in a broad market with the method proposed by Weir (1989). I investigate three sets of cities: (1) only the ones located on the Vistula (Gdańsk, Warsaw and Cracow), (2) only the ones located off the Vistula plus Cracow, and (3) all the cities. With the second specification, I hope to observe the extent to which the higher prices in the landlocked cities were the result of not having access to river transport. The results of Weir's correlation coefficient are based on the enhanced dataset.

Figure 3: Weir's co-movement coefficient, sample periods between 1570 and 1759.



Note: Vistula cities are Warsaw, Gdańsk, and Cracow. Cities off the Vistula are Lviv and Lublin.
Source: Based on the enhanced dataset. See the text.

The results indicate a progressive decline in market efficiency in early modern Poland. Figure 3 shows that exchange of information between the cities may have been more efficient in the sixteenth than the eighteenth century when I look at the domestic market – I find there was little or no correlation of prices in the second half of the eighteenth century. The closer correlation of prices before the 1650s can be also observed by studying the Pearson product-moment correlation coefficient of all the individual pairs of cities.[20] When I compare the landlocked cities with those on the Vistula, I find different trends. The results show that the exchange of information between cities located on the Vistula was more efficient both in the sixteenth and in the eighteenth centuries. The cities located off the river showed signs of a sympathetic co-movement in prices in the sixteenth century, but they disintegrated in the eighteenth century. The inflated estimates of co-movement observed for the seventeenth

[20]This analysis, based on the basic dataset, is not included in this chapter.

century were – most probably – a result of common shock to the system; both of the sample periods were characterised by devastating military operations inside the Polish territory that increased prices all over the country. The landlocked cities were particularly subjected to this shock.

I also study long-term changes in unexpected price volatility across the markets by looking at residual variance. Table 5 shows the results of the main regression. It presents estimates obtained from the analysis of the basic dataset, so, unlike the measures of the CV and Weir's coefficient, it does not suffer from the shortcomings of the enhanced dataset. Specification I indicates that the third lag of the dependent variable is only weakly significant. The third lag becomes insignificant if I account for city-specific fixed effects (specification II). It also becomes insignificant if I account for the trend in the data (not included). As a result, I estimate error terms for every city individually by regressing the dependent variable on only two lags (see Equation 4).

Table 5: Results of the main equation.

$Price_t$	I	II	III
Constant	0.045*** (0.00)	0.287*** (0.00)	0.057*** (0.00)
AR (1)	0.984*** (0.00)	0.949*** (0.00)	0.938*** (0.00)
AR (2)	-0.356*** (0.00)	-0.372*** (0.00)	-0.148*** (0.00)
AR (3)	0.124* (0.08)	0.107 (0.12)	
AR (4)	0.104** (0.04)	0.066* (0.07)	
City-specific fixed effects	NO	YES	NO
No.	401	401	465
R^2	0.69	0.71	0.67

Note: P-values based on heteroscedasticity robust standard errors in brackets. *, **, *** denote significance at the 10, 5, and 1 per cent level respectively. Based on the basic dataset. See the text.

Table 6 presents the results of the variance equation (Equation 5). Specification I shows that the third lag of the dependent variable is not statistically significant. Therefore, specifications II to V use two lags of the dependent variable.[21] The results of specification V of the panel data analysis indicate that the cross-market volatility in the period 1700–1750 was significantly higher than that of the reference period 1500–1550. Specification II indicates that – where the whole studied period is concerned – the volatility was significantly lower in the cities located

[21]If I incorporate a third lag into the analysis the general conclusions do not change, however.

on the Vistula. The results of specification III indicate that the volatility across all of the cities was significantly higher in the period of crisis, 1650–1772. Different specifications of the beginning of the crisis do not change this result. Lastly, specification IV includes an interaction term between the 'being located on the Vistula' dummy and the 'operating during the disintegration crisis' – i.e. after 1650 – dummy. This inclusion yields some explanatory power as it nearly doubles the overall R^2. The interaction terms entirely negate the adverse effect of the crisis. This indicates that market performance in the cities located on the Vistula was not significantly affected by the disintegration crisis, whereas prices in the cities located off the river were significantly more volatile in the period of their disintegration.

Table 6: Results of the variance regression.

$\hat{u}^2$	I	II	III	IV	V
Constant	0.0048*** (0.00)	0.0085*** (0.00)	0.0022*** (0.00)	0.0024*** (0.00)	0.0022 (0.34)
ARCH (1)	0.246*** (0.01)	0.1714** (0.03)	0.1815** (0.02)	0.0981 (0.29)	0.1775** (0.02)
ARCH (2)	0.162** (0.04)	0.1332* (0.09)	0.1434* (0.06)	0.0601 (0.55)	0.14* (0.07)
ARCH (3)	-0.08 (0.11)				
1551-1600[a]					0 (0.99)
1601-1650[a]					0.0001 (0.97)
1651-1700[a]					0.0014 (0.63)
1701-1750[a]					0.0065* (0.07)
1751-1772[a]					0.0024 (0.5)
On Vistula[a]		-0.0059** (0.02)		0.0006 (0.53)	
During the crisis[a] (1650-1772)			0.0042*** (0.01)	0.0183*** (0.01)	
On Vistula during the crisis[a]				-0.0183*** (0.01)	
No.	381	401	401	401	401
Within R^2	0.08	0.07	0.08	0.13	0.08
Between R^2	0.99	0.57	0.77	0.23	0.38
Overall R^2	0.11	0.11	0.1	0.17	0.11

Note: P-values based on heteroscedasticity robust standard errors in brackets. *, **, *** denote significance at the 10, 5, and 1 per cent level respectively. Based on Equation 5 plus additional specifications. a) denote dummy variables. Based on the basic dataset.

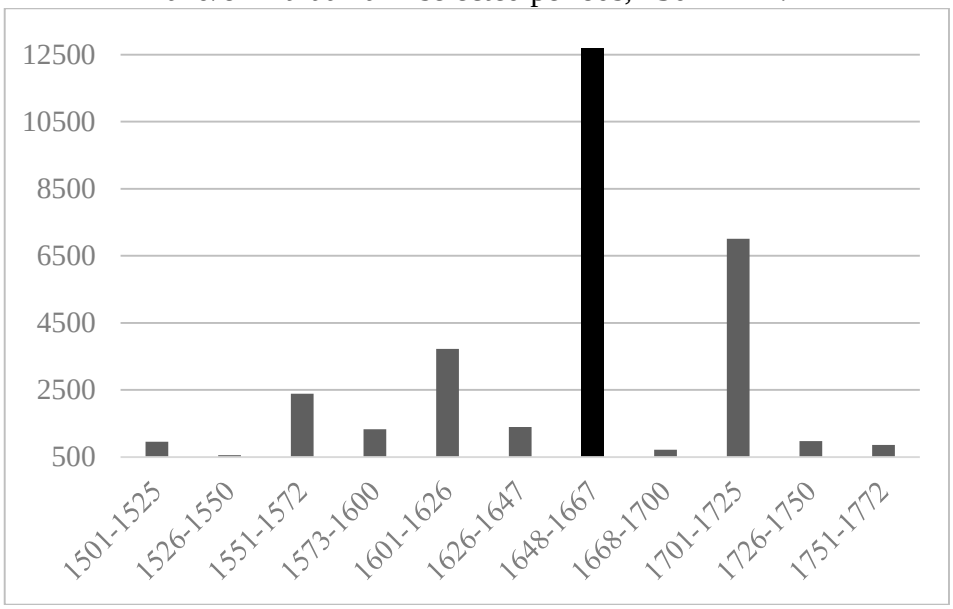
In summary, this inquiry into the long-term changes in conditions on the Polish rye market indicates that the market was better integrated, more efficient, and performed better in the

sixteenth than in the eighteenth century. Measures of market integration and market performance both indicate that the observed protracted market crisis could have originated around the middle of the seventeenth century. Furthermore, market disintegration was caused by a relative increase in prices in the landlocked cities. The results of the analyses of market efficiency and performance indicate that market conditions in the landlocked cities in the eighteenth century were worse than in the cities located on the Vistula.

5. Hypotheses regarding the possible causes of the protracted market crisis

What are the probable causes of the observed long-term changes in market conditions? I suggest two possible complementary explanations that require further empirical verification, which is beyond the scope of this chapter. I suggest that the disintegration accelerated because of the already-mentioned devastating military conflicts around the middle of the seventeenth century that decimated the population and crippled the trade network. Furthermore, I suggest that the disintegration persisted because of ongoing political fragmentation of the country in the late seventeenth and early eighteenth centuries.

Figure 4: Rough estimates of the average annual war casualties in wars fought by Poland and/or Lithuania in selected periods, 1501-1772.



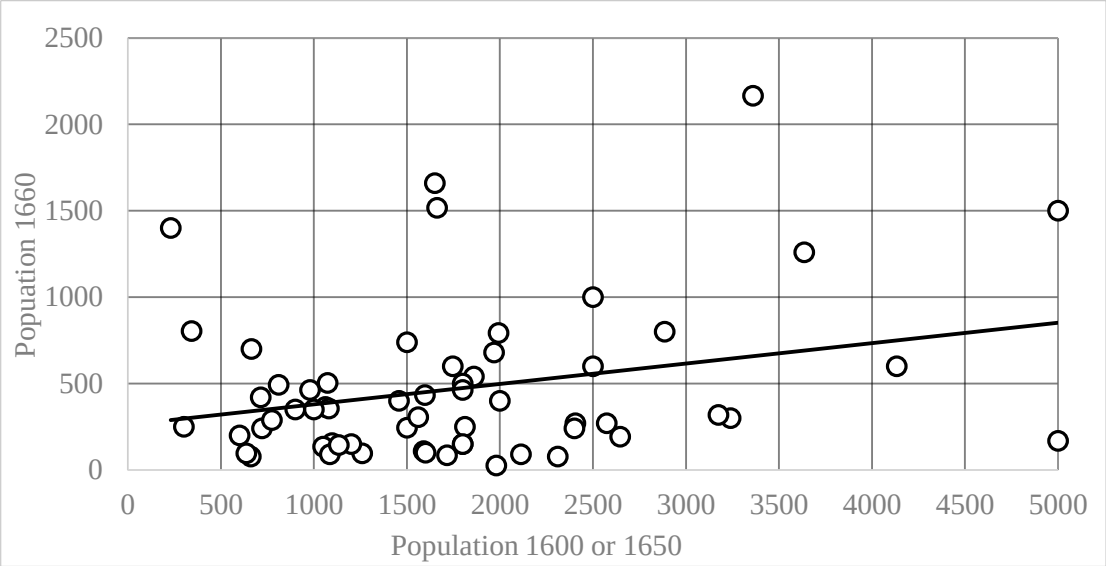
Source: Malinowski 2015.

Regarding the impact of the devastating wars of the mid-seventeenth century, Figure 4 shows available estimates of the average annual war casualties in wars fought by Poland and/or Lithuania. It demonstrates that between 1648 and 1667 the country experienced an unprecedented loss in population. According to Reed (1973), there are economics of scale in

the transactions sector and, as a result, the costs of exchange are negatively correlated with the size of the population. For example, low population means that fixed costs of infrastructure have to be spread among many people. Moreover, the more actors there are on the market, the more likely potential buyers are to meet potential sellers and the more easily information spreads by word-of-mouth. According to Bateman (2012: 130), population shocks affect market conditions because '*if population falls, people tend to retreat from the market, which then lowers the benefits to others of remaining in the market'*. The population of Poland (current borders), after a period of continuous growth dropped from 7.6 to 6.1 million between 1655 and 1660 and, due to the devastating warfare in the first quarter of the eighteenth century, remained relatively low and recovered only by the late eighteenth century (Wójtowicz 2006: 44). This could have contributed to the spike in market disintegration that occurred after the 1650s (see Figure 1) and the relatively low levels of market integration thereafter.

Devastating warfare could also have affected market conditions by crippling the land trade network. According to Unger (2012), markets in the late medieval and early modern period could have become integrated via the dense network of small towns that were mushrooming at the time. It has been shown on several occasions that such a dense network of urban dwellings was present in Polish lands as early as the late Middle Ages (Wyrozumski 1980; Wiesiołowski 1980; Mączak and Smout 1991). This network most likely contributed to the relatively good integration of the sixteenth century. It was destroyed as a result of the mid-seventeenth century warfare. According to Bogucka and Samsonowicz (1986), most urban settlements were levelled and most of the urban population slain. Figure 5 scatterplots the population in 65 urban dwellings located around the country from before and after the most wars. It is based on urban population data assembled by Malinowski (2016). It shows an average decline in the size of urban dwellings of around 70 per cent.

Figure 5: Scatter-plotted population in 1600 or 1650 against the population in 1660 in 65 sampled Polish cities with populations below 5,000 inhabitants.



Source: Malinowski 2016 dataset; Chapter 5.

The destruction of the network could have affected the landlocked cities differently, as the cities on the Vistula were still connected by the river. The destruction of towns could have hampered trade on land as well as increasing transaction and transport costs. This could explain the disintegration of the landlocked cities presented in Figure 2 and the identified decrease in market performance. Moreover, the destruction of the trade network could also have impeded the transfer of information between the landlocked cities and the Vistula region. This could explain the decline in market efficiency in the landlocked cities presented in Figure 3. This issue, however, requires further empirical investigation, which is beyond the scope of this paper.

Given that the population and urbanisation levels gradually recovered from the low post-1650s levels (Wójtowicz 2006) and that the second half of the eighteenth century was relatively peaceful (see Figure 4), warfare and obstruction of the trade network could explain a temporary decline but not the persistent change in market conditions. In a companion paper I propose a hypothesis that the poor market conditions persisted through the eighteenth century because of the adverse political setup of the country at the time (Malinowski 2015). Mączak (1982, 1987) hypothesised that the wars of the seventeenth century induced a sharp increase in wealth inequality within the political elite as they provided a few wealthy families with opportunities to buy up estates devastated during military actions. This led to the rise of the so-called 'Magnate Oligarchy' that shifted the balance of power from the central level – the parliament – to the local level – mini-states controlled by the wealthy families. Whereas the sixteenth century was dominated by relatively strong central institutions (a hereditary dynasty

and active parliament) that kept the magnates in check, in the eighteenth century the parliament was, for the most of the time, ineffective and the king was dependent on the magnates' support to be elected. This political change could have affected market conditions. According to Epstein (2000), centralisation of sovereignty can help enforce convergence of institutions. Political centralisation deprives local elites of jurisdictional power and displaces rent-seeking from the local to the national arena. This makes rent-seeking more transparent and therefore harder to implement. Furthermore, political centralisation reduces the costs of coordination, allowing for concerted decisions and policies. This should result in a convergence of legal, monetary and measurement systems that lowers transaction costs. Moreover, according to Bateman (2012: 156) political fragmentation deters market development because it prevents the use of economies of scale in the provision of public services, thus keeping transaction costs high.

Next to warfare and political economy, I can suggest one more complementary or alternative explanation of the trends I have observed in market conditions. As discussed, a price gap between a pair of cities can be small and prices on discrete markets can move in tandem, even if the cities do not interact with each other. It is possible that the identified trends in market integration and market efficiency were caused not by changes in the dynamic of the Polish domestic market but by changes in the international one. According to Jacks (2004: Figure 7), prices on the Polish grain market in the sixteenth century were highly co-dependent with prices in Amsterdam (and those in London, but to a much smaller degree). Every week, the Amsterdam Commodity Exchange issued and distributed a financial newspaper reporting current prices in the city (*Price Currant*), which was distributed throughout Europe (McCusker and Gravestein 1991). Given the availability of information on prices in Amsterdam and the large scale of the grain export (Biernat 1962), it is possible that changes in prices in Polish cities were strongly influenced by changes in prices in Amsterdam. This links to an observation made by Baten and Wallusch (2005), that prices in cities across Poland were more dependent on changes in the price in Gdańsk (the export port and thus the point of contact with Amsterdam) than on changes in other cities. Various students of the Dutch-Polish grain trade also suggest that prices in Gdańsk could have been dependent much more on changes in Amsterdam (Lemmink and Koningsbrugge 1990; Van Bochove 2008). If it is the case that the Polish cites were, through the information from Gdańsk, in effect following prices from Amsterdam, then the resulting similarity in their prices might be misinterpreted as evidence of integration in Polish markets. Moreover, the prices on such a market would also move in tandem, which would wrongly imply high efficiency.

This possible dependence on the foreign markets could partly explain the observed decline in market conditions after the seventeenth century. According to Jacks, the connection between Amsterdam and Poland weakened throughout the seventeenth and the eighteenth centuries – prices in the two areas became less co-dependent. This coincided with a decline in export of rye from Poland (Biernat 1962), which could mean that information on rye prices in Amsterdam became less important to grain merchants trading in the commodity. Without a 'leader', Polish cities would have to start setting their prices independently. One could hypothesise that without the outside coordination, market conditions were left to the forces on the domestic market, which resulted in the decline in market conditions. The question of whether market conditions in Poland were driven by domestic or international connections (and to what degree) requires further investigation, which is beyond the scope of this chapter.

6. Conclusion

This study provided new estimates of market conditions in preindustrial Poland. It showed that the Polish rye market disintegrated in the mid-seventeenth century after a period of a relative integration. It advanced empirical evidence that the disintegration came about because the landlocked cities became separated from the markets in other cities. The study also showed that the cities on the Vistula remained relatively integrated. The domestic market in Poland remained disintegrated in the eighteenth century, at the time of a relative improvement in market conditions in a range of Western European counties. The difference in the general trends in market development between Eastern and Western Europe supports the notion of The Little Divergence in economic development within Europe before the Industrial Revolution.

This paper also suggested that the market crisis could have been a result of the wars of the mid-seventeenth century, which decimated the population and crippled the trade network. The wars could have had a lasting and negative effect on market development by encouraging wealth inequality within the political elite. As I explain in a companion paper, the rise of the magnates who bought the devastated estates of the rank-and-file nobility led to a shift of political power from the central to the local level, which hampered the convergence of legal, monetary and measurement systems on the common market (see Malinowski 2015). According to the conventional knowledge, military conflicts accelerated state development in the West that, in turn, promoted an environment conducive to trade. The notion that wars could have had different political and economic consequences in the East invites more comparative research into the character and intensity of military conflicts in the two regions.

References

ADAMCZYK, W. (1935). *Ceny w Lublinie*. Lviv: Instytut Popierania Polskiej Twórczości Naukowej.

ADAMCZYK, W. (1938). *Ceny w Warszawie w XVI i XVII wieku*. Lviv: Instytut Popierania Polskiej Twórczości Naukowej.

BARANOWSKI, I. (1919). *Przemysł Polski w XVI wieku*, Warsaw: M. Orota.

BATEMAN, V. (2011). The evolution of markets in early modern Europe, 1350–1800: a study of wheat prices. *Economic History Review* **64**, 447–471.

BATEMAN, V. (2012). *Markets and growth in early modern Europe*. London: Pickering & Chatto.

BATEN, J. and WALLUSCH, J. (2005). Market integration and disintegration of Poland and Germany in the 18th century. *Economies et Societes* **33**, 1233-1264.

BIERNAT, C. (1962). *Statystyka obrotu towarowego Gdańska w latach 1651-1815*. Warszawa: PWN.

VAN BOCHOVE, C. (2008). *The economic consequences of the Dutch; Economic integration around the North Sea, 1500-1800*. Amsterdam: IISG.

EBELING, C.D. and BRODHAGEN, P.H.C. (1789). *Gottfried Christian Bohns wohlerfahrener Kaufmann*. Hamburg: Carl Ernst Bohn.

ENGEL, E. (1855). Die Geldprägungen nach dem Leipziger Münzfuße, dem Conventionsfuße und dem 14-Thalerfuße in dem Churfürstenthume und dem Königreiche Sachsen. *Zeitschrift des Statistischen Büreaus des Königl. Sächs. Ministeriums des Innern* **4**, 49-64.

EPSTEIN, S. (2000). *Freedom and growth. The rise of states and markets in Europe, 1300-1750.* London: Routledge.

FAMA, E. (1970). Efficient capital markets: A review of theory and empirical work. *Journal of Finance* **25**, 383-471.

FEDERICO, G. (2011). When did European markets integrate? *European Review of Economic History* **15**, 93-126.

FEDERICO, G. (2012). How much do we know about market integration in Europe? *The Economic History Review* **65**, 470-497.

FÖLDVÁRI, P. and VAN LEEUWEN, B. (2011). What can price volatility tell us about market efficiency. *Cliometrica* **5**, 165-86.

FURTAK, F. (1935). *Ceny w Gdańsku w latach 1701-1815*. Lviv: Instytut Popierania Polskiej Twórczości Naukowej.

GUZOWSKI, P. (2011). The influence of exports of grain production on Polish royal demesne farms in the second half of the sixteenth century. *Agricultural History Review* **59**, 312-327.

LEMMINK, J. and KONINGSBRUGGE, J. (eds.) (1990). *Baltic affairs: Relations between the Netherlands and North-Eastern Europe 1500-1800.* Nijmegen: Instituut voor Noord- en Oosteuropese Studies.

HOSZOWSKI, S. (1928). *Ceny we Lwowie w XVI i XVII wieku*. Lviv: Instytut Popierania Polskiej Twórczości Naukowej

HOSZOWSKI, S. (1934). *Ceny we Lwowie w latach 1700-1914*. Lviv: Instytut Popierania Polskiej Twórczości Naukowej.

JACKS, D. (2004). Market integration in the North and Baltic Seas, 1500-1800. *Journal of European Economic History* **33(3)**, 285-329.

KULA, W. (1983). *Teoria ekonomiczna ustroju feudalnego.* Warsaw: Książka i Wiedza.

MALINOWSKI, M. (2015). Freedom and decline: Polish state formation and rye market disintegration. Mimeo. Conference Paper presented at WEHC Kyoto 2015. Available at: https://www.academia.edu/9107881/Freedom_and_decline_Polish_state_formation_and_rye_market_disintegration_1500-1772.

MALINOWSKI, M. (2016). Serfs and the city: Market conditions, surplus extraction institutions and urban growth in Poland, 1500–1772. *European Review of Economic History*. (published online)

MAŁECKI, J. (1968). *Związki handlowe miast polskich z Gdańskiem*. Wrocław: Zakład Narodowy Im. Ossolińskich.

MĄCZAK, A. (1982). The structure of power in the Commonwealth of the sixteenth and seventeenth centuries. In: J.K. FEDOROWICZ (ed), *A republic of nobles. Studies in Polish history to 1864*. Cambridge University Press, 109-134.

MĄCZAK, A. (1987). The conclusive years: the end of the sixteenth century as the turning point of Polish history. In: E.I. KOURI and T. SCOTT (eds.), *Politics and society in reformation Europe*. London: Macmillan, 516-532.

MĄCZAK, A. and SMOUT, CH. (1991). *Gründung* und *Bedeutung kleinerer Städte* im *nördlichen*. *Europa* der *frühen Neuzeit. Wiesbaden:* Harrassowitz.

MCCUSKER, J.J. and GRAVESTEIN, C. (1991). *The Beginnings of commercial and financial journalism: the commodity price currents, exchange rate currents, and money currents of early modern Europe*. Amsterdam: NEHA.

MIELCZARSKI, S. (1962). *Rynek zbożowy na ziemiach polskich w drugiej połowie XVI i pierwszej połowie XVII wieku*. Gdańsk: Gdańskie Towarzystwo Naukowe.

ÖZMUCUR, S. and PAMUK, Ş (2007). Did European commodity prices converge during 1500-1800? In: T.J. HATTON, K. 0'ROURKE and A.M. TAYLOR (eds.), *The new comparative economic history.* Cambridge University Press.

PELC, K. (1935). *Ceny w Krakowie w Latach 1369-1600*. Lviv: Instytut Popierania Polskiej Twórczości Naukowej.

PELC, K. (1937). *Ceny w Gdańsku w XVI i XVII Wieku*. Lviv: Instytut Popierania Polskiej Twórczości Naukowej.

PERSSON, K. (1999). *Grain markets in Europe, 1500-1900*. Cambridge University Press.

PRZYBOŚ, A. (ed.) (1957). *Polska w okresie drugiej wojny północnej* 1655–1660. Warsaw: PWN.

PRAUN, G.A.S.V. (1784). *Grundliche Nachricht von dem Münzwesen insgemein, insbesondere aber von dem Deutschen Münzwesen älterer und neuerer Zeiten: und dann auch von dem Französischen, Spanischen, Niederländschen, Englischen und Dänischen Münzwesen.* Leipzig: Weygandsche Buchhandlung.

REED, C. (1973).Transaction costs and differential growth in seventeenth century Western Europe. *The Journal of Economic History* **33(1)**, 177-190.

RUSIŃSKI, W. (1954). O rynku wewnętrznym w Polsce w drugiej połowie XVIII wieku. *Roczniki Dziejów Społecznych i Gospodarczych* **16**.

SIEGEL, S. (1936). *Ceny w Warszawie w latach 1701-1815*. Lviv: Instytut Popierania Polskiej Twórczości Naukowej.

STUDER, R. (2008). India and the great divergence: Assessing the efficiency of grain markets in eighteenth- and nineteenth-century India. *Journal of Economic History* **68(2)**, 393-437.

TILLY, C. (1990). *Coercion, Capital, and European States, AD 990-1990*. Malden-Oxford: Blackwell Publishers Inc.

VAN DER SPEK, B., VAN LEEUWEN, B. and VAN ZANDEN, J. L., (eds.) (2015). *A history of market performance from Ancient Babylonia to the Modern World.* Routledge.

UNGER, R. (2007). Thresholds of market integration. In: L. ARMSTRONG, I. ELBL, and M. ELBL (eds.), *Money, markets and trade in late medieval Europe*, Leiden: Brill.

UNGER, R. (2012). Maritime transport. In: P. VAN CRUYNINGEN and E. THOEN (eds.), *Food supply, demand and trade,* Turnhout: Brepols.

WEIR, D.R. (1989). Markets and mortality in France 1600-1789. In: J. WALTER and R. SCHOFIELD (eds.), *Famine, disease and the social order in early modern society.* Cambridge University Press.

WIESIOŁOWSKI, J. (1980). Sieć miejska w Wielkopolsce w XIII-XVI Wieku. *Kwartalnik Historii Kultury Materialnej* **28**.

WOLAŃSKI, M. (1961). *Związki handlowe Śląska z Rzeczypospolita w XVII wieku*. Wrocław: Zakład Narodowy Im. Ossolińskich.

WOLAŃSKI, M. (1993). *The prices of corn, cereal products, fruits and vegetables in Wrocław from 1506 to 1618.* Wrocław: Wydawnictwo Uniwersytetu Wrocławskiego.

WÓJTOWICZ, G. (2006). *Trendy i ewolucja*. Warszawa: Twigger.

WYCZAŃSKI, A. (1969). *Studia nad konsumpcji żywności w Polsce w XVI i pierwszej połowie XVII wieku*. Warsaw: PWN.

WYROBISZ, A. (1966). Handel na Solcu nad Wisłą do końca XVIII w. Przyczynki do historii rynku wewnętrznego w Polsce przedrozbiorowej. *Kwartalnik Historii Kultury Materialnej* **14**, 15-18.

WYROBISZ, A. (1981). Typy funkcjonalne miast polskich w XVI-XVIII w. *Przegląd Historyczny* **72**, 25-49.

WYROZUMSKI, J. (1980). Rozwój sieci miejskiej w Małopolsce w Średniowieczu i u progu czasów nowożytnych. *Kwartalnik Historii Kultury Materialnej* **28**, 363-372.

Chapter 5: Serfs and the city: market conditions, surplus extraction institutions, and urban growth in early modern Poland[22]

Abstract: I investigate relations between institutions, markets, and preindustrial economic growth. In particular, I investigate the impact of coercive agricultural class structures on urban population growth in Poland. I argue that the impact of the demesne economy based on serfdom on urban growth was not inherently negative or positive. I propose that the effect was dependent on market conditions. I propose a hypothetical mechanism that explains how higher monetary and labour duties charged by landlords to their enserfed tenant farmers might have made urban settlements more resilient to a market crisis. I find empirical support for this idea with use of a new dataset on urban settlements.

Keywords: Serfdom, market conditions, urban growth, early modern Poland

JEL codes: N43, N53, N73

Publication process: Accepted for publication by the *European Review of Economic History*

---

[22]Earlier versions of this text were presented at: EHS Annual Conference 2013, ESSHC Conference 2014, FRESH Warsaw Meeting 2013, and seminars at: Utrecht University, Groningen University, LSE, Humboldt University in Berlin, and Oxford University. The author wishes to acknowledge a contribution of: Robert Allen, Marcus Cerman, Tracy Dennison, Piotr Guzowski, Benjamin Guilbert, Wolf-Fabian Hungerland, Alex Klein, Jacek Kochanowicz, Michał Kopczyński, Maarten Prak, Eric Schneider, Max-Stephan Schulze, Oliver Volckart, Tamas Vonyo, Nikolaus Wolf, Jan Luiten van Zanden, Igor Zurimendi, and the anonymous referees of the *European Review of Economic History*. All remaining mistakes are the sole responsibility of the author.

1. Introduction

The complex relationship between markets, institutions, and economic growth is one of the main topics in economic history. Part of the debate focuses on the role the legal status of peasants vis-à-vis their landlords played in economic development. According to the dominant position, serfdom was an inhibitor of economic growth (for a summary see Sosnowska 2004, Ogilvie and Carus 2014). Recently, Acemoglu and Wolitzky (2011: 557) demonstrated that coercion is: '*always 'socially inefficient,' because it involves a (endogenously) costly way to transfer resources (utility) from workers to employers'*. However, it has been also argued that serfdom could have addressed various problems caused by adverse economic and political conditions that could have been themselves the root cause of underdevelopment (see North and Thomas 1970, 1971, 1973; Fenoaltea 1975a). In particular, Bush (1996: 5) argued that, in preindustrial societies struggling with poorly-developed markets, demesne economy based on surplus extraction allowed for development of large-scale commercial farming. This, in turn, could have stimulated, otherwise hindered, urban population growth. These discussions invite a hypothesis that feudal coercive institutions could have made urban settlements more resilient to a market crisis, i.e. decline in market conditions. Conversely, in well-developed markets freer labour contracts in agriculture allowed for relatively better redistribution of resources between urban and rural sectors. I reinforce this intuition empirically. I study Poland - a classic example of an enserfed society. According to Sosnowska (2004), serfdom is regarded as one of the main causes of the economic collapse of the country in the 17th and the 18th centuries. I challenge this conventional knowledge. I outline a hypothetical mechanism that explains in detail how higher monetary and labour duties charged by landlords to their tenant farmers could have made urban settlements more resilient to a market crisis that occurred in the country at the time (see appendix 1). I analyse a new database on Polish urban populations. I identify that the negative impact of a market crisis (in particular market disintegration) on urban population growth was mitigated in areas without legal protection of the peasantry.

The impact of institutions on preindustrial urban growth has been already subjected to empirical analysis (for example Bosker et al. 2013; De Long and Shleifer 1993). However, the importance of labour relations in agriculture for urban growth has never been analysed empirically, nor has it been interacted with changing market conditions. Furthermore, thus far, all the studies of preindustrial urban growth analysed only cities – defined as urban settlements with populations above 5,000 inhabitants – leaving out smaller settlements that accounted for the bulk of the urban sector. I address these issues and analyse a new dataset of both towns and

cities located in Poland between 1500 and 1772 – the first partition of the country by Austria, Prussia, and Russia.

According to Blum (1971: 8), serfdom relates to any situation when '*the lord had complete legal jurisdiction over his peasants to the complete, or nearly complete, exclusion of the state'*. Therefore, serfdom can be classified as a legal phenomenon. This study operationalises serfdom with the ownership of a settlement and the domain where the settlement was located. After 1518, the Polish state had no legal jurisdiction over the peasants located in the private domains (Bardach 1957). This institutional change, according to Blum's definition, can be equated with a full installation of serfdom in these estates. At the same time, the king kept jurisdiction over the peasants located in the state's domain. This resulted in an institutional differentiation between the two types of landholdings. According to Mironov (1996), lack of legal protection typically results in surplus extraction. I show that in the areas with private and unrestricted legal jurisdiction, monetary rents and corvée duties were higher. I merge the approaches of Blum and Mironov. I define serfdom as a lack of legal protection of the peasantry, resulting in surplus extraction.

In my previous work, I showed that Poland experienced a period of relatively favourable market conditions in the 16th century and a market crisis in the 17th and the 18th centuries (Malinowski Forthcoming; Chapter 4). An investigation of two cross-sections from both 'good' and 'bad' times can indicate whether serfdom had different impacts on urban growth under different market conditions. I operationalise an abstract concept of market conditions with a more traceable one of market integration – price convergence – of the Polish rye market.

The results of empirical analysis identify a positive effect of the interaction between market disintegration and private legal jurisdiction on urban population growth. These findings are robust to alternative specifications of both serfdom and market conditions, as well as an inclusion of a range of control variables that had been previously identified by Bosker et al. (2013) as fundamental to urban population growth. I propose a hypothesis that the identified effect of private legal jurisdiction is channelled via higher levels of surplus extraction from the peasantry. Since I do not observe the size of surplus extraction directly this hypothesis requires further empirical investigation based on primary materials, which is beyond the scope of this text. In sum, the results suggest that market crisis rather than serfdom could have been the root cause of the economic decline of the country in the 17th and 18th centuries.

2. Debate on serfdom

In the course of history, serfdom manifested itself in numerous region-specific forms. For this reason, the definition of the phenomenon varies between individual studies (for discussion see Cerman 2012). All the definitions boil down to supra-economic coercion of peasants by their landlords. According to Blum (1971: 8), serfdom essentially relates to any situation when '*the lord had complete legal jurisdiction over his peasants to the complete, or nearly complete, exclusion of the state'*. According to Mironov (1996), this type of dependence typically results in: (1) coerced exchange based on non-economic factors, (2) constraints on spatial mobility, (3) weak property rights (of the peasantry), and (4) enforcement of occupation. These features allow for one-sided changes in contractual obligations by the landlords and subsequent surplus extraction from their tenant farmers, understood as an increase in the size of monetary rents and/or labour duties. As a result, serfs are likely to pay higher rents for the right to use land than their counterparts in a market with legal protection. I define serfdom as lack of legal protection of the peasantry resulting in surplus extraction.

There is an ongoing debate about the exact impact of serfdom on economic growth. According to the conventional knowledge, serfdom is a rent-seeking institution tailored only for the benefit of the landlords. It is argued that serfdom is inherently unfavourable to the Smithian growth processes. It is accused of: (1) constraining mobility between agricultural and urban sectors, (2) discouraging agricultural productivity by undermining incentive structures, (3) hampering accumulation of human capital, and (4) decreasing the purchasing power of the villagers (for summaries of these discussions see Sosnowska 2004; Dennison 2011; Baten and Szołtysek 2014; Ogilvie and Carus 2014).

This conventional wisdom that serfdom is, especially in the long run, a growth-discouraging institution begs questions about its origins and persistency. Ogilvie and Carus (2014) group different ideas about the origins, persistency, and the economic impact of serfdom, understood mostly as corvée duties and weak property rights of the peasantry, into three broad categories.

According to the first point of view, serfdom is a superstructure resulting directly from exogenous geographical resource endowments. According to Domar (1970: 20), high land-labour ratios in Eastern Europe forced landlords to compete over scarce agricultural labour. This motivated the landed elite in the region to limit peasants' mobility and introduce forced labour on their demesnes. However, according to Domar (1970), high land-labour ratios resulted in the introduction of serfdom (or slavery) only if the elites had enough political power

to organise property rights in a society in their favour. For example, according to North and Thomas (1971), the same high land-labour ratios in Western Europe, empowered the peasantry, forced landlords to abolish serfdom, and stimulated more favourable (from the point of view of the peasantry) property rights in agriculture.

This links to the second point of view that interprets serfdom as a frontline in the ongoing class-conflict over redistribution of resources. Most notably, Brenner (1976) challenged the hypothesis that the coercive agricultural class structures result from resource endowments and argued that they originate primarily from the ability of the landlords to band together collectively and ally with the coercive power of the state. According to Brenner, serfdom was always an extractive institution imposed by the landlords to exploit the peasants. Moreover, according to the author, the effect of serfdom on Eastern Europe was that '*the possibility of (...) economic growth was destroyed and* [the region was] *consigned to backwardness for centuries'* (Brenner 1976: 60).

According to the third point of view, serfdom was neither a result of certain exogenous resource endowments nor simply a rent-seeking practice, but it was an 'efficient' solution to various adverse economic and political conditions. It is not to say that serfdom was beneficial to the whole society; Acemoglu and Wolitzky (2011: 557) show that coercion is: '*always 'socially inefficient,' because it involves a (endogenously) costly way to transfer resources (utility) from workers to employers'*. However, serfdom might have addressed a particular problem of agricultural societies. For example, according to North and Thomas (1971: 778), '*serfdom in Western Europe was essentially not an exploitative arrangement (...)* [it] *was a contractual arrangement where labour services were exchanged for the public good of protection and justice*.' According to the authors, mandatory corvée duties were introduced to counterbalance the incentive of individual peasants to 'free-ride' on, for example, the military protection of the manor. Furthermore, according to Fenoaltea (1975a: 695), the demesne economy (again only in Western Europe) '*might be considered a means to increase output by imposing the use of a superior technique* [on a demesne]'. Regarding Eastern Europe, however, Fenoaltea argued that the demesnes in the region did not promote any superior techniques and that the authority over peasantry was preferred by the landlords at the costs of reduction of the total agricultural output to ensure stabilisation of social rules and hierarchy.

More importantly for this text, and also regarding Eastern Europe, serfdom has been also seen as an institutional response to imperfect market conditions/market underdevelopment. Given the unpredictability of the markets and the grim perspective of harvest failures prevalent in the preindustrial era, peasants were argued to have been risk- and

market-averse (for example Chayanov 1966, see appendix 1 for a discussion how these ideas fit the Polish case). According to Epstein (2001: 12), *'the high transaction costs typical of pre-modern societies meant that many markets were too 'thin' for prices to signal supply and demand unambiguously. Asymmetric information and poor co-ordination between producers* [farmers] *and consumers* [townsmen] *created mismatches and reduced the scope of markets and trade. The resulting low-level economic equilibria could only be broken by external agents who were in a position to enforce new, more efficient 'rules of the game'*. This links up with an observation made by Bush (1996: 8), who argued that surplus extraction by the demesne allowed for large-scale commercial farming in societies with scarce supplies of labour and underdeveloped markets (see also Mironov 1996; Kula 1976). In sum, demesne economy based on serfdom might have provided urban-rural trade relations with stability in absence of a well-developed market. Furthermore, according to North and Thomas (1973: 39-40), the general long-term improvement in market conditions in Europe was one of the causes of the abolishment of serfdom around the 19th century. According to these authors, favourable market conditions allowed for more efficient pricing of labour and thus encouraged both peasants and landlords to change labour-rent into money-rent (compare: Brenner 1976: 43 and Fenoaltea 1975b for critique of North and Thomas).

On the other hand, especially in the Polish case, improvement in market conditions has also been argued to have encouraged landlords to increase corvée duties (Małowist 2006). According to Guzowski (2011), structure of production on a demesne – and therefore its demand for coerced labour – was related to its market access. In more detail, according to Topolski (1994), demesnes could be broadly divided into 'expansionist' (producing a narrow range of effort-intense cash crops for export) and 'autonomous' (producing a diversified range of products for the local market). According to the author, export opportunities encouraged landlords to increase productivity on the expansionist demesnes. This could have motivated the landlords to make use of coerced labour for two reasons. First, according to Acemoglu and Wolitzky (2011: 557), effort and coercion are 'complements' and, as a result, more 'productive' employers tend to use more coercion. The authors argue that: '*when the employer wishes to induce effort, he finds it optimal to pay wages following high output, so he must pay wages frequently when he induces high effort. Greater ex ante coercion enables him to avoid making these payments, which is more valuable when he must pay frequently, hence the complementarity between effort and coercion*'. Second, according to Fenoaltea (1984: 636, 662), supervised coerced labour is more productive and therefore 'cost-effective' than self-supervised free waged labour on estates specialised in a single effort-intense cash-crop (like

rye or wheat) than on estates producing diversified and care-intense goods (like vegetables), especially on markets with scarce labour. In particular, the author argues that: '*Where the worker's productivity depends overwhelmingly on his brute effort and negligibly on his carefulness (...) a shift to a system that eliminates the supervisor (...) would not yield a reduction in total labor costs, precisely because the attendant shift (...) causes a reduction in the worker's effort and productivity. (...) In care-intensive activities, in contrast, the substitution of care for effort does not reduce the worker's productivity; a shift from supervised* [coerced] *gang work (...) to self-supervised work with ordinary rewards* [wage] *will therefore be profitable*.'

Is it possible that I put the cart before the horse and that changes in market conditions were a result rather than a cause of serfdom? The expected impact of surplus extraction on market conditions is also ambiguous. Corvée duties and limitation on migration could have constrained market participation of the peasantry and made the market 'thinner' (Bogucka and Samsonowicz 1986). On the other hand, as it has been discussed, high monetary rents could have forcefully connected risk-averse peasants to the markets and therefore improved commercialisation and the 'thickness' of the market. I develop these arguments later in this article and in appendix 1. The issue of the impact of surplus extraction on market conditions requires, however, further theoretical and empirical investigation. Scant evidence based on comparison of proxies of intensity of serfdom (Map 2 below) and market integration (Map 3 below) used in this study suggests that the two might have been only weakly correlated.

3. Serfdom in early modern Poland

Manorial estates dominated the feudal environment of rural Poland. The manors were divided between a demesne (*folwark*) and the land devoted to a rural peasant commune (*gromada*). Furthermore, in general, the land leased to the commune was divided into the landholdings of individual tenant farmers (*kmiecie*) and the common land. Arguably, landlords used the political organisation of the *gromadas* to expand their influence over the inhabitants of their manors (Trzyna 1963). The manors belonged either to the state/king or were privately owned by a noble family or the Church. The two latter groups received the rights to the land in the Middle Ages, i.e. before re-imposition of serfdom in the late 15th and the early 16th century.

Most Polish villages were established or reorganised in the 14th and 15th centuries as part of the colonisation movement. In order to attract new settlers from Western Europe, Polish landlords offered rental contracts similar to those used in German lands. Similar agricultural

structures were gradually implemented, with minor local variations, in most of the country in order to prevent migration within the country and maximise monetary income. According to the Polish version of the German law: (1) the tenants had the right to hereditary lease of land, (2) they were allowed to transfer the lease on condition of the landlord's consent, (3) the contract stipulated the exact size of the rent in money and/or kind, (4) it also specified the exact extent of the labour obligations for the landlord that were usually not greater than a few days a year, (5) tenants had the right to leave a village after fulfilling clearly specified conditions, and (6) the village had a right to its own political organisation. In sum, the rights of the villagers were well defined in the late Middle Ages (Bardach 1957).

These original contracts between landlords and their tenant farmers were gradually altered. This change consisted of (a) an alteration of all the labour relations on the country level and (b) changes in the legal position of the peasantry on the local level. On the national level, in 1496 the mobility of all the peasants in Poland was constrained by the Parliament. It was decided that only one son from a *kmiecie* family was allowed to leave the village for training in a town. In 1520, a subsequent law was passed that officially set the minimal duties of all tenant farmers, regardless of the domain they lived in, to one day of unpaid work per week per one *łan* (ca. 16–26 ha.) of land they were entitled to. In practice, peasants often substituted their corvée obligations with monetary payments, quitrent (Wyczański 1960: 102). As a result, there were numerous villages without any corvée duties but with high monetary payments (see Guzowski 2014). The size of quitrent, as well as monetary rents, was not regulated.

Regarding the local level, in 1518 the inhabitants of the lands belonging to the nobility lost the protection of the royal court. From that year onwards, the king refused to listen to pleas made by peasants from the noble estates (Bardach 1957). This effectively meant that there was no longer any legal constraint on the nobles that would prevent them from disregarding their contractual obligations vis-à-vis the peasants. The Church enjoyed a similar legal privilege. Conversely, peasantry in the royal lands kept the right to defend themselves in court against the actions of the king's regional representatives, known as *starostas.* It must be stressed that, in 1518, the king recognised the de facto judiciary independence of the private estates that developed gradually throughout the 15th century (Bardach 1957). The development and strengthening of serfdom was gradual and did not originate in 1518. As it has been mentioned, nearly all the peasants in the country faced limitations on their mobility already in the 15th century. However, it can be generalised that the peasants living in the private estates were 'more enserfed' than their counterparts in the royal domain. The legal change of 1518 can be

seen as the culmination of the process of the introduction of serfdom in the country, as it deprived the majority of the peasants of any legal protection.

This lack of legal protection opened avenues for further surplus extraction in the private domain, above the levels typical for the state's domain. According to Bardach (1957), there were important differences in labour relations between the two domains due to the legal difference. The dissimilarities existed mainly in: (a) the extent of corvée duties, and (b) the size of monetary rents. Bardach did not provide any empirical evidence to support these claims. Here I discuss available secondary data on the relative size of the relevant duties. This compilation reinforces the argued differences in the levels of surplus extraction between the private and the state's domains.

Regarding the differences in corvée duties, Wyczański (1960: 105) compared the extent of the labour obligations in noble and royal estates in the 16th century. The author compiled primary and secondary data on labour duties in a range of noble and royal villages. Table 1 yields the results of Wyczański's investigation. According to his findings, in the first half of the 16th century, corvée duties in the studied noble estates were much higher than in the royal ones (ca. 43 per cent on average). However, through the 16th century, the average duties increased in both the domains by nearly the same absolute value (ca. 1.4 days per week). Although the absolute difference in the average size of corvée duties changed only slightly (i.e. decreased only by 0.18 days per week), the relative difference dropped from 43 to 12 per cent. Therefore, Wyczański identified a narrowing of the gap between the domains in the 16th century. It must be stressed that, according to Wyczański's data, there was, however, no perfect equalisation of corvée duties between the domains.

Table 1: Differences in the average size of corvée duties in noble and royal villages denoted in days per week per one *łan* in Poland in the 16th century.

Period	Noble I	Royal II	Ratio I/II	Difference I - II
1500-1550	1.71	1.2	1.43	0.51
1551-1580	3.03	2.7	1.12	0.33

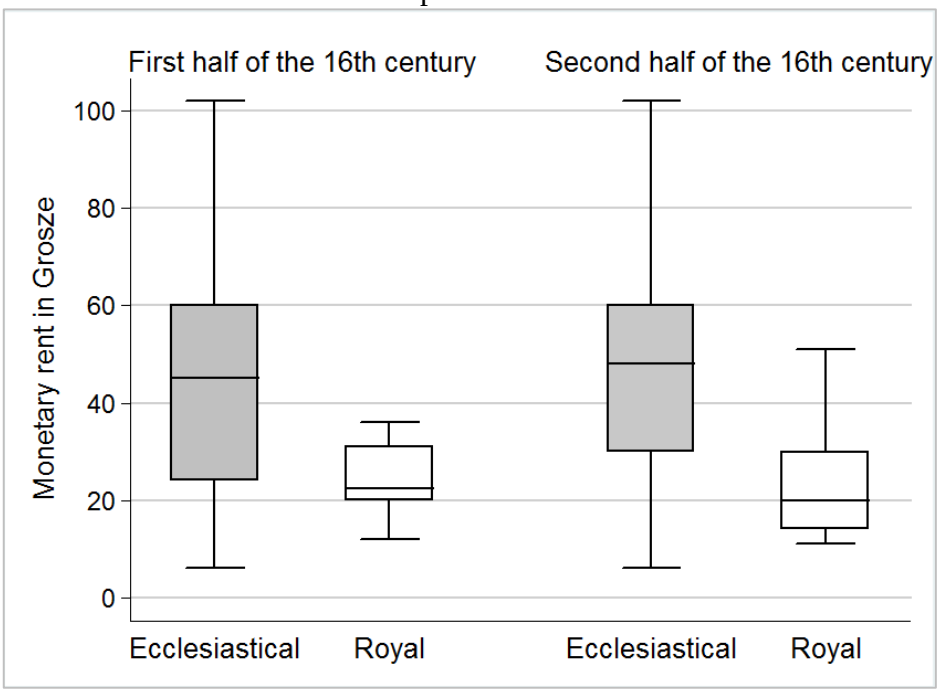
Note: Wyczański based his estimates for noble villages on a sample of 40 estates. The author did not indicate the exact number of studied royal villages however.
Source: Wyczański 1960: 105.

According to Wyczański (1960: 102), the decline in the relative difference was a result of a political pressure imposed by the nobility, understood here as a 'coalition of power', on the king and his local representatives to equate corvée duties between the domains. The law of 1520 that introduced the minimal labour duties in the country was, in practice, aimed at

increasing corvée duties in royal estates. According to the author, the nobility insisted on narrowing the gap in labour duties between the domains in order to discourage peasants from leaving their private manors.

Looking only at corvée duties can provide an impression that there could have been a progressing convergence in the total levels of surplus extraction (i.e. combined value of both monetary and labour duties) in the country. However, corvée duties and monetary rents could have followed different trends. Although the shared interest of the whole nobility was to equate the duties between the domains, individual landlords had an incentive to 'free-ride' on this tendency by maintaining the relatively higher size of surplus extraction in their respective manors. This resulted in a 'prisoner's dilemma' problem. Since the nobility and the king left the matter of the monetary rents unregulated there was no political mechanism that could have mitigated the problem. Moreover, in contrast to the corvée duties, there was no law that obliged the king or his local representatives to increase the size of monetary rents in the royal domain. This political and legal framework combined with the incentive structure could have resulted in a persistent gap in the size of monetary rents between the private (owned by the Church/Bishops/Monasteries or the nobility) and the royal estates. This intuition is supported by empirical evidence. Guzowski (2014) gathered information on contractual obligations of 94 communes located in six different regions of Poland in the first and the second half of the 16th century. Guzowski's data provides insights into villages located both in the state-owned (two regions, 28 villages) and the Church-owned domains (four regions, 66 villages). Figure 1 based on Guzowski's research shows that monetary rents were higher (ca. twice the size on average) in the villages located in the estates privately owned by the Church than they were in the state's domain. The results also suggest that there was no progressing convergence in sizes of monetary rents between the domains.

Figure 1: Distribution of size of monetary rents paid by tenant farmers in the royal and ecclesiastical domains in Poland in the first and the second half of the 16th century in *Grosze* per *łan*.



Note: The upper and lower lines denote the maximum and minimum value respectively. The box captures 50 per cent of the observations. The line inside the box is the median of the whole population.
Source: Based on Guzowski 2014 dataset, courtesy of the author.

The dissimilarity in the sizes of monetary and labour duties, thus far exemplified only for the 16th century, could have persisted throughout the remainder of the early modern era. Until the Constitution of 1791 (never implemented) that intended to (a) undo the legal change of 1518 by offering legal protection by the state for all the peasants and (b) reinstate their freedom of movement, there was no new law, which could have fostered equalisation of the duties. Moreover, Kochanowicz (1981: 91-94) demonstrated that the dissimilarity in the levels of surplus extraction between the two types of domains existed also in the 19th century (with the use of a smaller dataset and some anecdotal evidence). Unfortunately, to the best of my knowledge, there is no continuous dataset that can be used to definitely prove the persistency of the identified dissimilarity in the size of surplus extraction between the different types of domains. It is also not certain whether ecclesiastical and noble landholdings followed the same trends.

Our analysis of the levels of surplus extraction focused only on national averages. The exact arrangements in the country were, however, not homogenous. The degree of surplus extraction in the east and the south-east of the country was arguably greater – especially in Volhynia (Baten and Szołtysek 2014). Conversely, the position of the peasantry in Royal

Prussia was much stronger than anywhere else in Poland. Inhabitants of the king's domain in the north of the country were often exempted from unpaid labour altogether (Bardach 1957).

In sum, despite these regional differences and in light of the available empirical evidence, I propose that, in general, peasantry living in the royal domain could have enjoyed freer labour relations than their counterparts in the landholdings belonging to the Church or the nobility. However, evolution of rents in labour and money in Poland requires further empirical investigation based on primary sources, which is beyond the scope of this article.

4. Hypothesis

Here I put forward a testable hypothesis and propose a mechanism that explains how higher monetary and labour duties charged by landlords to their tenant farmers could have made urban settlements more resilient to a market crisis. Here I focus only on key mechanisms and the core idea. A much more detailed discussion can be found in appendix 1.

According to Chayanov (1966), who studied relations in Russia, poor market conditions defined relations in preindustrial Eastern European agriculture. The author argued that, due to poor market conditions prevalent in the region, peasants had little information on the market price of their produce. High transaction costs hampered the exchange and transfer of information. Furthermore, frequent harvest failures increased price volatility, risk, and unpredictability of the future. For this reason, in Chayanov's view, neoclassical rationality assumptions were not valid for peasants living under such harsh conditions. In contrast to people living in the urban sector, peasants evaluated the net benefits in qualitative not quantitative/monetary terms. They compared the proceeds of their crops with the disutility of physical labour. Furthermore, according to Chayanov, because peasants were disintegrated from markets, they did not aim to maximise their profits but sought security. In short, their aversion towards risk dominated the desire to increase their monetary income. In Chayanov's view, market disintegration, risk, and information imperfections were the key features of market conditions that affected peasants' behaviour. According to the author, subsistence farmers were particularly risk-averse because they had little disposable surplus. Should an exchange go wrong, they risked losing precious resources. Because they were food producers, they could have limited their market participation to the minimum. Since they lived close to the subsistence level, they were willing to consume the surplus food rather than risk an unprofitable trade on the market. They could have also simply refrained from additional work

had they valued leisure above additional consumption (see appendix 1 for a discussion how Chayanov's ideas fit the Polish case).

I build on Chayanov's ideas and propose a hypothesis that the harsher the market conditions, the lesser market exposure of the peasantry, and/or the smaller its voluntary labour input. Conversely, the better the market conditions, i.e. the more integrated peasants are with the market, the lower the risks related to exchange, and the more available the information, the higher the willingness of the peasants to maximise their profits by commercialising their production and/or increasing their labour input (see appendix 1 for a detailed discussion).

I also propose that under unfavourable market conditions surplus extraction enforces production and/or commercialisation of the production that would otherwise be kept in the agricultural sector. Landlords could extract the surplus either by increasing corvée duties or by charging higher monetary rents. Had they decided to increase the labour duties, labour input would have been re-allocated from the farms to landlords' demesnes. According to Fenoaltea (1975a: 696), peasants are more productive when they farm they own land than when they work on a demesne. Therefore, high corvée duties tended to lower the overall output of the agricultural sector. However, due to the vast size of the available surplus, landlords, as opposed to peasants, always produced for the market regardless of the market conditions. Therefore, under unfavourable market conditions and given the risk averseness of the peasantry, an increase in corvée duties could have resulted in a decline in the total agricultural output, but also in an increase in the volume of the commercialised surplus. Conversely, had landlords chosen to increase monetary duties, they would have forced their tenant farmers to commercialise their production by selling it to a town in order to raise money for rent. In this scenario, tenant farmers would have continued to work on their own plots, where they were more productive. Therefore, during a market crisis, an increase in monetary duties might have not affected the total agricultural output but could have increased the volume of the commercialised surplus. Commercialisation of agricultural production is of paramount importance to the urban sector. In general, one could expect that the more food finds its way to a town, the more it can grow.

In sum, surplus extraction in the forms of monetary rents and high corvée duties could have mitigated the adverse effects of unfavourable market conditions on urban population growth. Furthermore, surplus extraction by monetary rents could have been more beneficial for the town than that based on coerced labour. This might explain why cities located west of the river Elbe were, in the long run, more prosperous than those positioned in the region of Europe where corvée duties were more common. However, under uncertain market conditions both

peasants and landlords might have preferred the rent to be paid in labour duties. This is because it might have been cheaper for the landlord to charge flat rent in labour duties rather than constantly evaluate performance of the hired labour and change wages according to the market conditions. Corvée duties might have been also preferred by the peasants, as they did not force them to expose themselves to volatile and expensive markets. The question about the origin of serfdom and labour duties is, however, not in the scope of this article. Here I examine consequences of these arrangements when they were already in place.

5. Empirical model

I test whether serfdom mitigated adverse effects of unfavourable market conditions on urban growth by pooling entire cross-sections of population growth during different time periods (the pooled OLS estimation method). The baseline estimation equation is:

$$PopGrowth_i = \beta_0 + \beta_1 S_i + \beta_2 MC_i + \beta_3 MC_i S_i + \sum_{k=4}^{m} \beta_k X_{k,i} + \sum_{l=1}^{n} \partial_l + \varepsilon_i \qquad (1)$$

Where $PopGrowth_i$ denotes population growth i of an urban settlement during a time period. S_i is unconstrained legal jurisdiction over peasantry in settlement's vicinity during the growth period. S_i is a dummy equal one if a town and the domain where it was located belonged to a noble family. As discussed, after 1518 peasants living in private estates were deprived of legal protection of the state and, as a result, could have paid higher rents than their counterparts in the state's domain on average. MC_i denotes the degree of adversity of market conditions around the settlement during the growth period (operationalized either as degree of market disintegration or underperformance). ∂ is a dummy variable representing changes in the intercept between cross-sections. $\sum_{k=4}^{m} X_k$ is a set of control variables. ε is the error term. The hypothesis is that β_3 is positive and statistically significant. I define population growth as:

$$PopGrowth_t = \frac{population_{t-1} - population_t}{population_{t-1}} \qquad (2)$$

Regarding the control variables, Bosker et al. (2013) proposed an empirical framework to study drivers of early modern urban growth. I incorporate variables similar to those proposed by the authors to control for other phenomena that could have influenced urban growth in Poland. I also add additional controls that might have been important in the Polish case. I control for: (1) latitude and longitude that captures the distance to the sea and the western markets, (2)

dummies indicating access to (a) major land trade routes and (b) navigable rivers (Vistula, Bug, Pilica, Wieprz, and Narew), (3) foreign market potential that captures the proximity to potential trade partners at the beginning of a growth period, (4) dummies capturing so-called consumer cities, i.e. urban dwellings hosting political institutions that might have redirected resources from the country to the settlement for political rather than economic reasons: (a) bishoprics, (b) major political institutions (tribunals, national parliament, and local dietines), and (c) minor political institutions (headquarters of a starosty) (for discussion see Bosker et al. 2013), (5) dummies indicating the existence of a university or a branch of a university, (6) dummies capturing the ownership of a settlement by the Church, (7) a set of regional dummies that should capture legal differences within the country, (8) and the initial conditions, i.e. the level of population at the beginning of a growth period that account for the fact that the potential for growth may change with the size of a settlement. The sources and summary statistics of all the variables are available in appendix 3.

The baseline model suffers from the endogeneity problem resulting from a probable positive impact of urban population growth on market conditions. According to North (1981), the denser the population, the more frequent the transactions, and the lower their costs. Therefore, it is likely, that urban growth (clustering of people) had a beneficial effect on market conditions. However, thus far, there has been no study of a preindustrial economy that has verified this intuitive statement empirically. Typically, quantitative economic historians address the issue of endogeneity by implementing a two-stage regression with use of instrumental variables. To the best of my knowledge, however, there is no suitable instrument for regional market conditions available that could remedy the problem in Polish historiography.

Regarding the relation between urban growth and serfdom, according to my hypothesis, the impact of the unconstrained legal jurisdiction over peasantry on urban growth is channelled via higher levels of surplus extraction. Legal jurisdiction over towns and villages is exogenous. However, the unobserved, levels of surplus extraction were most probably influenced by the size of the urban settlements. Since I do not observe the levels of surplus extraction directly and the ownership was not determined by the levels of surplus extraction, it is impossible to implement a two-stage regression with use of instrumental variables to address the issue of endogeneity. For these reasons the results of regression analysis should be interpreted as ‘correlations’ between private ownership and urban population growth rather than a definite proof of the causal relationship between surplus extraction and urban population growth.

Regarding the used data, in order to estimate the model, I construct a new database on urban settlements with city rights for the benchmark years 1500, 1600, and 1772. The study analyses towns and cities that were located in historical Poland around 1569 and are currently located in the country (for details see appendix 3). The database contains information on 264 individual towns and cities. It is sufficient to construct two cross-sections of urban growth for the periods 1500-1600 and 1600-1772, consisting of samples of 93 and 108 settlements respectively. 75 settlements appear in both the cross-sections.

Table 2: Descriptive statistics of the urban population and ownership data.

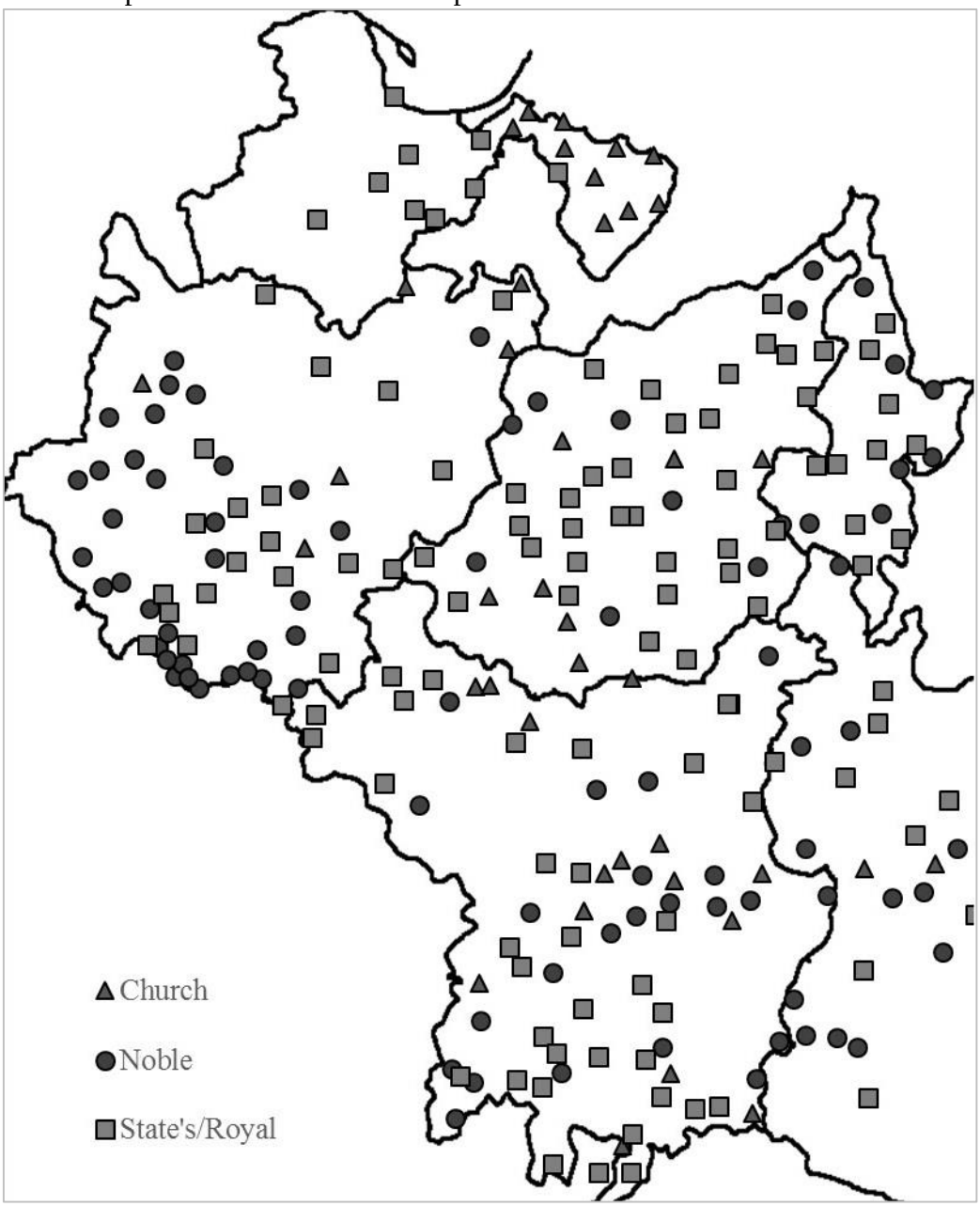
	Whole cross-section	Balanced panel	Initial conditions (when analysing growth)	Whole cross-section	Balanced panel
	Growth		Population level		
	1500-1600		1500		
No.	93	75	93	177	75
Min.	-0.85	-0.85	504	504	504
Max.	3.06	1.97	30,000	30,000	30,000
Mean	0.17	0.18	2,548	2,023	3,002
Std. dev,	0.71	0.63	4,160	3,093	5,000
% Noble	17	15	17	27	15
% Royal	68	70	68	50	70
% Church	15	15	15	23	15
	1600-1772		1600		
No.	108	75	108	135	75
Min.	-0.84	-0.84	55	55	210
Max.	14.67	6.53	53,000	53,000	53,000
Mean	0.18	0.04	3,006	2,908	4,327
Std. dev.	1.74	1.04	6,398	6,605	9,071
% Noble	19	15	19	22	15
% Royal	65	70	65	60	70
% Church	16	15	16	18	15
			1772		
No.				204	75
Min.				162	162
Max.				44000	44,000
Mean				2,811	3,481
Std. dev.				8,806	7,325
% Noble				32	15
% Royal				45	70
% Church				23	15

Source: See appendix 3.

Table 2 presents descriptive statistics of the ownership and population data. It shows that the sample is biased towards the royal dwellings by 45 to 70 per cent. Historically, royal settlements accounted for a more modest share of the settlements – around 40 per cent in 1500 and 27 per cent in the 18th century (Kuklo 2009). The bias is caused by the fact that the state domain was subjected to audits (*lustracje*) that controlled the condition of public finance and

left behind a rich source material. Regarding the population, the trends in the data follow the trends in Polish urbanisation; Table 2 shows growth in the mean size of urban population between 1500 and 1600 and a contraction thereafter (compare Kuklo 2009). The cross-sections are dominated by towns with populations between around 1,000 and 3,000 inhabitants (see appendix 3 for exact distributions). Table 2 presents that all the samples are characterised by wide gaps between the minimum (declining agricultural towns) and maximum (booming urban centres) population levels. I account for these differences in size by incorporating the 'initial conditions' control variable into the baseline estimation equation.

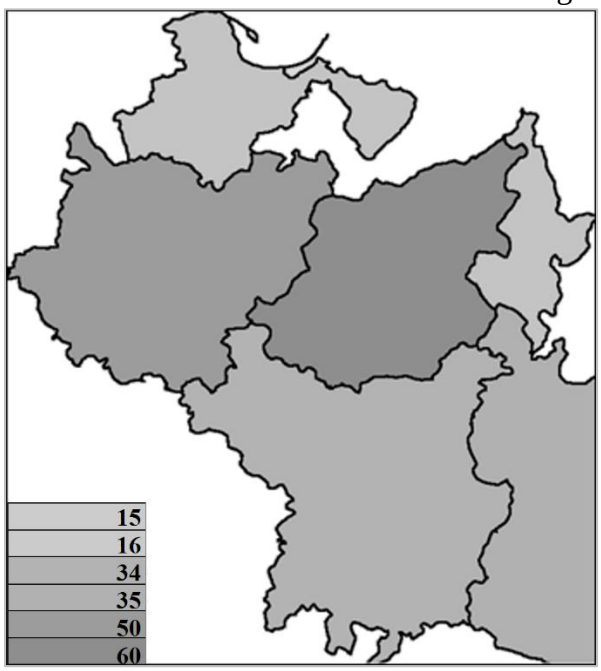
Map 1: Location and ownership of urban settlements in the dataset.



Source: See appendix 3.

It is possible that the private ownership dummy does not capture the impact of serfdom in the surrounding agriculture, but rather the different legal situation inside noble urban settlements. Private towns and cities in Poland were governed by absolutistic rule of the owner. Landowners were supreme judges not only in their villages but also in their private urban settlements. According to De Long and Shleifer (1993), legal protection and political representation are beneficial for urban growth. To account for this possibility, I also use an alternative measure of serfdom. I look at the share of the private domain – in this case no matter if owned by the Church or by noble families – in the total arable landmass of the region where a settlement is located. Estimations of the share in the 18th century were taken from Zielińska (1977). Such estimates for earlier periods are not available. This disallows use of this measure of serfdom to study earlier cross-sections.

Map 2: Share of the private domain in the total arable land of a region in the 18th century.

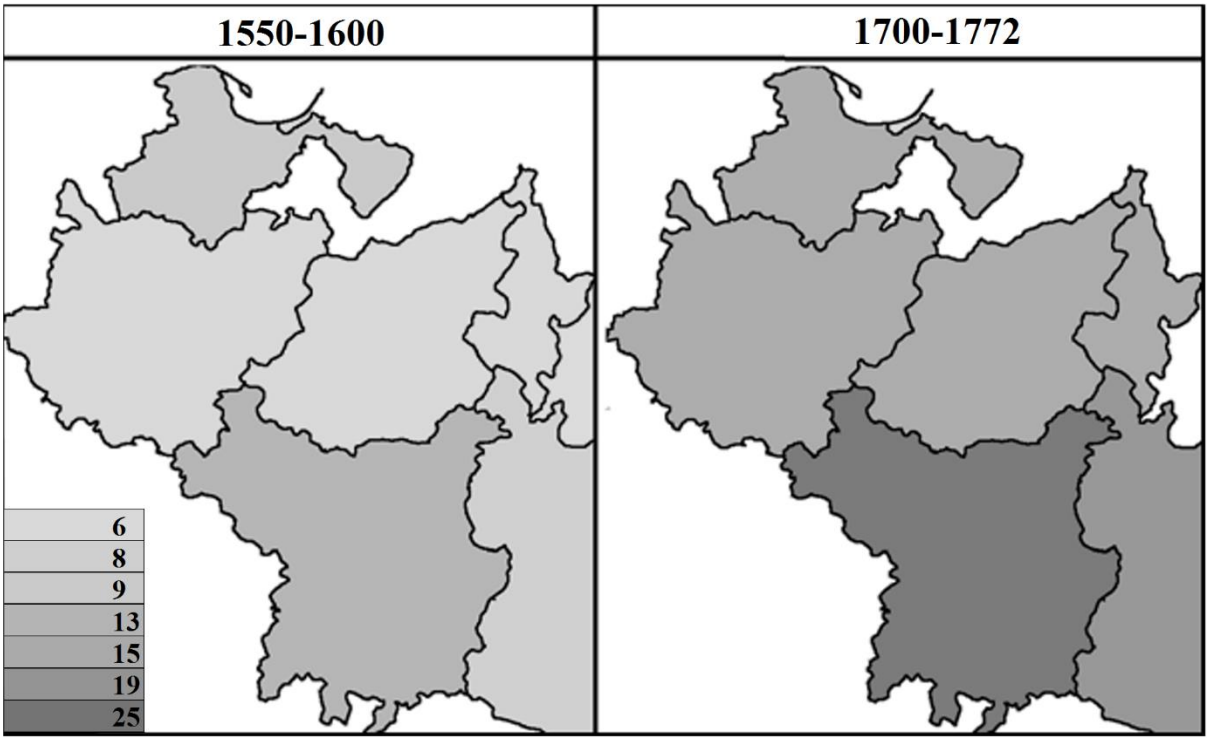


Source: Zielińska (1977)

Exact measurement of the abstract concept of market adversity *MC* poses a serious empirical challenge. Instead I focus on two relatively traceable aspects of market development, market integration and market performance. Market integration relates to decline in transaction and transportation costs and a gradual transformation of a range of discrete independent markets into one economic unit. According to Persson (1999), the process was fundamental to economic development of agricultural societies. According to the author, disintegrated grain markets are vulnerable to recurrent harvest failures. Spatial market integration spreads this risk between the

regions of the common market. In an integrated market where transaction costs are small, a harvest failure can be offset by a booming harvest elsewhere, and vice versa. Such a situation should promote formation of an environment conducive to trade. According to the literature, if I assume ongoing efficient arbitrage, low price gaps between cities/regions should indicate low transaction costs (for discussion see Federico 2012). Therefore, an increase in the average price gap between a city within a region and cities in other regions should proxy disintegration of the region from the other regions. I measure market integration in Poland for the two cross-sections with estimates of aggregated regional rye price gap between the region a settlement was located and all other regions. For the period 1500-1600 I use the average price gap between 1550 and 1600, and for the period 1600-1772 I look at the average between 1700 and 1772 (for details see appendix 2).

Map 3: Degree of market disintegration of various regions within Poland with the rest of the country in the 16th and the 18th century represented as an average difference in price of 100 litres of rye denoted in grams of silver.



Source: See appendix 2.

Map 3 and Table 4 present basic information on the aggregated regional price gap data used to proxy the degree of market disintegration. They show the disintegration of all the regions around the country between the 16th and 18th century.

Table 3: Descriptive statistics of the price gap estimates.

Period on which a sample is based	Average difference in price of 100 litres of rye denoted in grams of silver between a city representing a region and all the other cities			
	Min.	Max.	Mean	SD
1550-1600	6	13	8.22	2.95
1700-1772	15	25	17.87	4.3

Source: See appendix 2.

I also look at market (under)performance. Van der Spek et al. (2015) define market performance as the ability of markets to cope with shocks, i.e. effects of unexpected events. The authors explain the concept with an example. On page 4 they write: '*In a perfectly working market an external shock due to, for example, a failed harvest will lead to rising prices, which will trigger trade, the sale of grains from storage houses, etc. Hence, even though prices will increase to some extent, the increase in the price of food will be mitigated by economic adaptations, and the degree to which this will occur will be related to the quality of the institutional (and geographical) framework'*. In short, perfectly working markets respond well to shocks and, as a result, are less volatile. Földvari and Van Leeuwen (2011) argue that market performance can be directly affected by improvements in trade, storage, consumption diversification, and technological development. The authors also suggest observing market performance with a study of the residual variance of commodity prices through the use of an autoregressive conditional heteroscedasticity (ARCH) model. In my previous work (Malinowski Forthcoming; Chapter 4), I followed methodology advocated by Földvari and Van Leeuwen (2011) and estimated conditional volatility in Poland. This allowed me to track the performance of the whole market over time. I make use of this research. The limitation of this measure is that it does not diversify between regions. It only provides one estimate of price volatility per time period (1551-1600 and 1750-1772) for the whole country (see Table 6 in Malinowski Forthcoming; Chapter 4, I add the constant plus the coefficient next to corresponding time dummy, I obtain values 22 and 46 respectively).

The fact that 75 settlements feature in both the samples of urban growth indicates that the samples are not fully independent and, therefore, are not ideal for the pooled OLS estimation method (the overlap may result in a serial correlation in the error term). In order to address this limitation of the data I perform a robustness check of the baseline results (based on the analysis of the whole samples) with a study of a balanced panel of only the 75 settlements using the random effects GLS estimation method. With this method I account for the effect of the time invariant legal jurisdiction dummy (this would be impossible with use of the, for

example, first differences or fixed effects estimation methods) as well as for the serial correlation in the error term. I base the sensitivity analysis on estimation equation:

$$PopGrowth_{I,t} = \beta_0 + \beta_1 S_I + \beta_2 MC_{I,t} + \beta_3 MC_{I,t} S_I + \sum_{k=4}^{m} \beta_k X_{k,I} + \mathrm{FMP}_{I,t} + InitialConditions_{I,t} + \sum_{l=1}^{n} \partial_l + \propto_I + \varepsilon_{I,t} \quad (3)$$

Where *I* denotes an urban settlement and *t* a time period. $\sum_{k=4}^{m} X_k$ is the set of the time invariant control variables. *FMP* represents foreign market potential. $InitialConditions$ is the size of the population of the settlement at the start of the growth period. $\propto_I$ is the unobserved time invariant and settlement-specific effect. I arbitrarily assume that the effect is independent of all explanatory variables in all time periods. This is probable as I account for a wide range of control variables. I use the model also to investigate the alternative measure of market conditions, market underperformance proxied by national price volatility. When I account for market conditions with use of the national price volatility rather than the regional price gap, $MC_{I,t}$ becomes MC_t and $\sum_{l=1}^{n} \partial_l$ becomes redundant due to the lack of variability of the variable through (but not between) the cross-sections.

Furthermore, in order to increase the robustness of the findings based on investigations of population growth, I also test for the studied effect by pooling together whole cross-sections of population levels at different benchmark years (1500, 1600, and 1772) with use of estimation equation:

$$LogPop_i = \beta_0 + \beta_1 S_i + \beta_2 MC_i + \beta_3 MC_i S_i + \sum_{k=4}^{m} \beta_k X_{k,i} + \sum_{l=1}^{n} \partial_l + \varepsilon_i \quad (4)$$

Where $LogPop$ denotes the logarithm of the size of the population *i* of a settlement. In contrary to the previous estimation equations that analyse urban growth: MC_i indicates market conditions directly before the benchmark year, I account for the foreign market potential at the benchmark year, and I do not account for any initial conditions.

The cross-section 1500 represents a year shortly before 1518 when the king refused to listen to pleas of peasants from private domains. However, as it has been discussed, private legal jurisdiction was, de facto, uncontested already at the turn of the 16th century. Therefore, when analysing the 1500 cross-section, the noble jurisdiction dummy, most probably, also catches the impact of serfdom despite the fact that peasants in the private domains were still, de jure, able to petition to the king at the time. To increase robustness, however, I estimate the estimation equation with and without the 1500 cross-section.

6. Empirical analysis

Analysis of the new database of Polish towns and cities indicates different growth patterns between private and royal domains after full installation of serfdom in the first group in 1518. According to the sample, the settlements located in the state's domain grew by around 210 people between 1500 and 1600. During the same period, the private settlements declined by about 300 people on average. Conversely, in the period of crisis, i.e. between 1600 and 1772, it was the private settlements that grew by around 370 while the royal ones declined by about 200 people on average. Moreover, according to data on cities assembled by Kuklo (2009) for the whole Polish-Lithuanian Commonwealth, five out of six new cities that crossed the threshold of 5,000 inhabitants in the 16th century were located in the state's domain. Conversely, 12 out of 15 new cities that crossed the same threshold in the following two centuries belonged to a noble family. The described differences reinforce the hypothesis that serfdom could have had a different effect on urban growth under different market conditions. Under the more favourable market conditions of the 16th century, locations where there officially was legal protection of the peasantry by the king performed better. Conversely, in the 17th and 18th centuries settlements located in domains without such protection were relatively more successful (see appendix 3).

Table 4 shows results of regression analysis of the baseline model (Equation 1). Specification I pools two cross-sections 1500-1600 and 1600-1772. It does not account for the 1600-1772 cross-section dummy. The results based on specification I show that, when accounting for the degree of market disintegration, proxied by the regional price gap, noble jurisdiction resulting in lack of legal protection of the peasantry had a statistically significant and negative effect on urban population growth. Moreover, specification I indicates that increase in the degree of market disintegration had a statistically significant and negative effect on population growth. Specification I also supports the main hypothesis that serfdom could have mitigated the adverse effects of market crisis on urban growth; The coefficient next to the interaction term between noble jurisdiction and price gap is positive and statistically significant. Specification II includes the intercept for the 1600-1772 cross-section. Inclusion of the intercept lowers the statistical significance of the price gap. However, inclusion of the cross-section dummy does not affect the sign, the size, or the statistical significance of both serfdom and the interaction between market disintegration and serfdom. Specification III pools the two cross-sections 1500-1600 and 1600-1772 without accounting for market disintegration. Contrary to the two previous specifications, specification III suggests that serfdom did not have

any inherent negative or positive impact on population growth. The effect of serfdom is statistically significant only when interacted with the degree of market disintegration. Specification IV analyses only the cross-section 1600-1772, i.e. urban growth during the period of market crisis. It shows that in a more disintegrated market, settlements surrounded by an agricultural sector without legal protection of the peasantry grew relatively better than the settlements located in the royal domain with better legal protection. Specification V addresses the concern that the ownership dummy possibly captures the impact of institutions inside a settlement rather than the legal situation of peasantry in its vicinity. It uses the alternative measure of serfdom: the share of the private domain in a region where the settlement was located. It only analyses settlements owned by the nobility in order to exclude the differences in the legal standing of the townsmen. It analyses population growth in the period of market crisis for which the information on the alternative measure of serfdom is available. It shows that under adverse market conditions noble towns in regions where serfdom was more prevalent grew better. In short, the analysis of the baseline model provides some empirical support to the idea that private legal jurisdiction could have made urban settlements more resilient to a market crisis.

Table 4: Results of regression Equation 1 obtained with use of the pooled OLS estimation method.

PopGrowth	I	II	III	IV	V
Cross-sections	1500-1600 & 1600-1772	1500-1600 & 1600-1772	1500-1600 & 1600-1772	1600-1772	1600-1772
Noble jurisdiction	-2.95* (0.08)	-2.73* (0.08)	0.65 (0.16)	1.04** (0.02)	
Share of the private domain in a region (%)					0.14** (0.04)
Log price gap	-0.65* (0.06)	0.22 (0.62)			
Noble jurisdiction * log price gap	1.45* (0.07)	1.38* (0.08)			
Minor institutions	0.16 (0.34)	0.16 (0.33)	0.17 (0.31)	0.09 (0.83)	omitted
Major institutions	0.01 (0.94)	-0.01 (0.95)	-0.02 (0.92)	0.30 (0.63)	omitted
University	0.35 (0.24)	0.39 (0.21)	0.59* (0.06)	0.66 (0.49)	-0.70 (0.82)
Bishopric	0.35 (0.13)	0.42 (0.11)	0.40 (0.13)	0.28 (0.77)	omitted
Land trade route	0.03 (0.85)	-0.02 (0.92)	-0.04 (0.86)	-0.22 (0.61)	4.23* (0.09)
Navigable river	-0.13 (0.54)	-0.1 (0.6)	-0.08 (0.67)	-0.16 (0.7)	-3.05 (0.55)
Longitude	0.29 (0.13)	0.38 (0.11)	0.41 (0.11)	0.5** (0.04)	1.86* (0.08)
Latitude	-0.25 (0.24)	-0.12 (0.47)	-0.16 (0.38)	-0.66** (0.01)	0.59 (0.79)
Log foreign market potential	1.1 (0.18)	1.45 (0.14)	1.56 (0.13)	1.34 (0.13)	8.27 (0.18)
1600-1772 cross-section		-0.96 (0.21)	-0.63* (0.08)		
Constant	8.15 (0.4)	-2.66 (0.77)	-0.97 (0.9)	24.18 (0.17)	-85.79 (0.52)
Sample	Whole cross-sections	Whole cross-sections	Whole cross-sections	A cross-section	Only noble in a cross-section
R^2	0.16	0.17	0.11	0.29	0.71
No.	201	201	201	108	21

Note: P-values based on heteroscedasticity robust standard errors (based on the Huber-White estimation method) in brackets. *, **, *** denote significance at the 10, 5, and 1 per cent level respectively. Additionally, I include controls: a dummy for ecclesiastical ownership, a set of regional dummies, and the initial population in 1500 or 1600 depending on a cross-section. Variables in specification V were omitted due to the small size of the sample resulting in collinearity.

Table 5 provides various robustness checks of the main findings. It addresses the problem that the cross-sections investigated with use of the pooled OLS estimation method, which ideally should be independent, shared some of the same settlements. It analyses the balanced panel of 75 settlements with use of the random effects GLS estimation method (Equation 3). This part of the analysis also looks at the degree of market underperformance, proxied by the national price volatility, as an additional aspect of market development. Specification I and II study regional price gap and identify that the impact of the interaction between degree of market disintegration and noble jurisdiction had a statistically significant and positive effect regardless of whether I account for the cross-section dummy. Moreover, the two specifications both identify the negative and statistically significant impact of serfdom on urban population growth. As in the case of specification I of the baseline model (Table 4), specification I of this alternative model also identifies the statistically significant and negative impact of an increase in price gap on urban growth. Similarly to the baseline model, inclusion of the 1600-1772 dummy renders the effect insignificant however. Specification III uses the national price volatility, a measure which is identical for all the settlements in a cross-section but changes between cross-sections, as a measure of the degree of market underperformance in the country during a time period. It identifies the negative and statistically significant effect of serfdom. It also finds the positive and statistically significant impact of the interaction between noble jurisdiction and the degree of market underperformance. It also shows the statistically significant and negative impact of an increase in price volatility on urban growth. This specification cannot include the dummy capturing differences between cross-sections due to the lack of variability of the measure of national price volatility within a cross-section.

Table 5: Results of regression Equation 3 obtained with use of the random effects GLS estimation method.

PopGrowth	I	II	III
Cross-sections	1500-1600 & 1600-1772	1500-1600 & 1600-1772	1500-1600 & 1600-1772
Noble jurisdiction	-3.25* (0.08)	-3.2* (0.08)	-10.66* (0.07)
Log price gap (regional)	-.04** (0.04)	0.3 (0.5)	
Log price volatility (national)			-0.83* (0.08)
Noble jurisdiction * log price gap	1.54* (0.06)	1.53* (0.06)	
Noble jurisdiction * log price volatility			2.86* (0.06)
Minor institutions	0.6 (0.55)	0.08 (0.47)	0.04 (0.76)
Major institutions	0.13 (0.93)	0.12 (0.8)	0.07 (0.76)
University	0.09 (0.73)	-0.13 (0.65)	0.34 (0.43)
Bishopric	0.16 (0.15)	0.23 (0.33)	0.2 (0.56)
Land trade route	0.08 (0.51)	0.03 (0.84)	0.07 (0.72)
Navigable river	0.08 (0.45)	0.12 (0.24)	0.12 (0.5)
Longitude	0.15 (0.2)	0.22* (0.08)	0.19 (0.31)
Latitude	-0.07 (0.48)	0.03 (0.75)	-0.05 (0.7)
Log foreign market potential	0.12 (0.67)	0.46 (0.16)	0.35 (0.61)
1600-1772 cross-section		-0.72* (0.1)	Omitted (collinearity)
Constant	1.31 (0.85)	-7.01 (0.41)	-2.37 (0.75)
Sample	Balanced panel	Balanced panel	Balanced panel
Overall R^2	0.20	0.21	0.22
Within R^2	0.20	0.18	0.19
Between R^2	0.24	0.29	0.30
Prob. > chi2	0	0	0.15
No.	150	150	150

Note: P-values based on heteroscedasticity robust and clustered standard errors in brackets. Specification III includes bootstrapped standard errors (1,000 replications, re-estimation does not change the main results). *, **, *** denote significance at the 10, 5, and 1 per cent level respectively. Additionally, I include controls: a dummy for ecclesiastical ownership, a set of regional dummies, and the initial population in 1500 or 1600 depending on a cross-section.

I check the robustness of the findings by pooling various cross-sections of population levels. Table 6 shows results of estimation of Equation 4. Specification I pools all the cross-sections

(1500, 1600, and 1772) but does not account for market conditions. The coefficient next to the private jurisdiction dummy is not statistically different from zero because serfdom could have had a different impact under the different market conditions that characterised the periods. Specification II analyses cross-sections 1500 and 1600, i.e. before the market crisis. The impact of private jurisdiction is negative and statistically significant. This suggests that serfdom could have been negatively associated with city size under favourable market conditions. Conversely, analysis of the cross-section 1772, i.e. after the market crisis, located in the noble domain were on average 24 per cent bigger than the ones owned by the Crown. This difference suggests that serfdom could have had different effect under different market conditions. Specifications IV to VI pool various cross-sections and account for the impact of the degree of market disintegration. Inclusion or exclusion of the 1500 cross-section does not change the general results. Specifications IV to VI identify that after accounting for the degree of market disintegration serfdom had a negative and statistically significant effect. They find a positive and statistically significant effect of the interaction between serfdom and market disintegration on urban population growth. The observed impact of the increase in the degree of market disintegration is negative. As in the case of the previous estimates, the effect is significant only in specifications that do not include any cross-section dummies.

In sum, both the estimation of the baseline model and the sensitivity analysis identify the positive and statistically significant impact of the interaction between unrestricted private legal jurisdiction over peasantry and market disintegration (or underperformance) on urban population growth. The analysis also suggests that, after accounting for market conditions, serfdom had a negative and statistically significant effect on urban growth. Due to the endogeneity problem, however, the baseline results should be interpreted as correlations rather than a definitive prove of causality. Moreover, given that I do not observe levels of surplus extraction directly, the hypothesis that the identified impact of private legal jurisdiction in agriculture on urban population growth was channelled via higher levels of surplus extraction from the peasantry requires further empirical investigation.

Table 6: Results of regression Equation 4 obtained with use of the pooled OLS estimation method.

Log population	I	II	III	IV	V	VI	VII
Cross-sections	1500 & 1600 & 1772	1500 & 1600	1772	1600 & 1772	1600 & 1772	1500 & 1600 & 1772	1500 & 1600 & 1772
Noble jurisdiction	0.01 (0.83)	-0.17* (0.06)	0.24** (0.04)	-0.93* (0.09)	-0.94* (0.09)	-0.55*** (0.01)	-0.55*** (0.00)
Log price gap				-0.22* (0.1)	-0.05 (0.87)	-0.15* (0.1)	-0.15 (0.5)
Noble jurisdiction * log price gap				0.41** (0.05)	0.41** (0.05)	0.26*** (0.00)	0.26*** (0.00)
Minor institutions	-0.01 (0.87)	-0.0 (0.98)	-0.09 (0.56)	-0.05 (0.64)	-0.06 (0.61)	-0.02 (0.84)	-0.02 (0.84)
Major institutions	0.14 (0.4)	0.16 (0.54)	0.23 (0.33)	0.18 (0.34)	0.2 (0.34)	0.18 (0.27)	0.18 (0.3)
University	1.01*** (0.00)	1.08*** (0.00)	0.99** (0.04)	0.93*** (0.00)	0.95*** (0.00)	1.02*** (0.00)	1.01*** (0.00)
Bishopric	0.58*** (0.00)	0.5** (0.04)	0.66 (0.13)	0.72*** (0.00)	0.71*** (0.00)	0.56*** (0.01)	0.57*** (0.01)
Land trade route	0.48*** (0.00)	0.52*** (0.00)	0.45*** (0.00)	0.51*** (0.00)	0.5*** (0.00)	0.49*** (0.00)	0.49*** (0.00)
Navigable river	0.22** (0.02)	0.23** (0.04)	0.14 (0.37)	0.17 (0.16)	-0.18 (0.15)	0.2** (0.03)	0.2** (0.03)
Longitude	-0.03 (0.04)	-0.04 (0.33)	0.02 (0.78)	-0.02 (0.46)	0.09 (0.81)	-0.03 (0.4)	-0.02 (0.41)
Latitude	0.07* (0.06)	0.11** (0.04)	0.01 (0.81)	0.09* (0.08)	0.12** (0.05)	0.07* (0.08)	0.07* (0.08)
Log foreign market potential	0.01 (0.89)	-0.07 (0.58)	0.12 (0.44)	0.0 (0.4)	0.12 (0.46)	-0.0 (0.95)	0.0 (0.98)
1600 cross-section	-0.02 (0.81)	-0.02 (0.77)					0.02 (0.95)
1772 cross-section	-0.11 (0.43)				-0.27 (0.42)		-0.01 (0.89)
Constant	4.12* (0.06)	2.6 (0.37)	6.15* (0.08)	3.48 (0.26)	1.54 (0.66)	4.68** (0.03)	4.6** (0.04)
Sample	Whole cross-sections	Whole cross-sections	A cross-section	Whole cross-sections	Whole cross-sections	Whole cross-sections	Whole cross-sections
R^2	0.31	0.37	0.35	0.33	0.33	0.32	0.32
No.	516	312	204	312	312	516	516

Note: Note: P-values based on heteroscedasticity robust standard errors (based on the Huber-White estimation method) in brackets. *, **, *** denote significance at the 10, 5, and 1 per cent level respectively. Additionally, I include a dummy for ecclesiastical ownership and a set of regional dummies. For discussion of the estimates of the aggregated price gap around 1500 see appendix 2.

7. Conclusion

I propose a hypothesis that serfdom, understood as lack of legal protection of the peasantry by the state, could have made urban settlements more resilient to a market crisis. I propose that the effect was channelled via higher monetary and labour duties charged by landlords to their enserfed tenant farmers. The higher duties could have fostered commercialisation of agricultural production that, otherwise, would not have found its way to a market. This could have aided urban population growth in a time of market crisis. I find some empirical support for this idea with use of a new dataset on urban settlements and market (dis)integration in early modern Poland. I identify a positive effect of the interaction between noble unconstrained legal jurisdiction over peasantry and market disintegration on urban population growth. However, because of numerous problems with the empirical analysis such as: poor quality of the data and endogeneity of both market conditions and surplus extraction, I admit that the conclusions of this study are not definite and that they should be interpreted as correlations rather than causality. Moreover, given that I do not observe levels of surplus extraction directly, the hypothesis that the identified impact of private legal jurisdiction in agriculture on urban population growth was indeed channelled via higher levels of surplus extraction from the peasantry requires further empirical investigation.

Having in mind these limitations, the hypothesis can be used to support either of the two main conflicting views on the role serfdom, and perhaps feudal institutions in general, played in economic development. On the one hand, the hypothesis speaks to the idea that institutions characteristic of the feudal era (that are often considered backward) could have been in fact an 'efficient' solution to various adverse economic and political conditions. Economic underdevelopment in feudal societies could have been primarily caused by, among other things, poor market conditions, and serfdom (as well as other feudal institutions) could have addressed some problems resulting from such a growth-discouraging environment. Only when market conditions improved, societies were ready to abandon serfdom (and perhaps other extractive feudal institutions) and implement the ones that allowed them to utilise growth opportunities offered by favourable market conditions better.

On the other hand, serfdom could have been just a rent-seeking practice introduced solely to benefit the landed nobility even at cost of the overall economic underdevelopment. It must be stressed that I do not claim that serfdom in Poland was introduced to combat adverse effects of market failures or support urban growth. To the contrary, the institution developed under relatively favourable market conditions in the 16th century and was promoted by the

landed nobility that opposed strong cities which could threaten its dominant political position. Landlords had incentives to increase rents and duties under unfavourable market conditions because it secured their incomes and control over peasantry. The beneficial impact of high rents charged to the peasants during a market crisis on urban growth could have been therefore in fact only an (welcomed but accidental) externality.

References

ACEMOGLU, D. and WOLITZKY, A. (2011). The economics of labor coercion. *Econometrica* **79(2)**, 555-600.

BARDACH, J. (1957). *Historia państwa i prawa Polskiego*. Warsaw: PWN.

BATEN, J. and WALLUSCH, J. (2005). Market integration and disintegration of Poland and Germany in the 18th century. *Economies et Societes* **33**, 1233-1264.

BATEN, J. and SZOŁTYSEK, M. (2014). A golden age before serfdom? The human capital of Central-Eastern and Eastern Europe in the 17th-19th centuries. MPIDR working paper WP2014-008.

BLUM, J. (1971). *Lord and peasant in Russia: from the ninth to the nineteenth century*. Princeton: University Press.

BOSKER, M., BURING, E. and VAN ZANDEN, J.L. (2013). From Baghdad to London: Unravelling urban development in Europe, the Middle East, and North Africa, 800–1800. *The Review of Economics and Statistics* **95(4)**, 1418-1437.

BOGUCKA, M. and SAMSONOWICZ, H. (1986). *Dzieje miast i mieszczaństwa w Polsce przedrozbiorowej*. Wrocław: Zakład Narodowy Im. Ossolińskich.

BRENNER, R. (1976). Agrarian class structure and economic development in pre-industrial Europe. *Past & Present* **70**, 30–75.

BUSH, M. (1996). Introduction. In: M. BUSH (ed.), *Serfdom and slavery. Studies in legal bondage*. London-New York: Longman.

CERMAN, M. (2012). *Villagers and lords in Eastern Europe, 1300-1800*. New York: Palgrave Macmillan.

CHAYANOV, A.V. (1966). *The theory of peasant economy*. D. THORNER, B. KERBAY, and R.E.F. SMITH (eds.). Manchester: Homewood.

DE LONG, J.B. and SHLEIFER, A. (1993). Princes and merchants: European city growth before the Industrial Revolution. *Journal of Law and Economics* **36(2)**, 671-702.

DOMAR, D. (1970). The causes of slavery or serfdom: A hypothesis. *Journal of Economic History* **30(1)**, 18-32.

DENNISON, T. (2011). *The institutional framework of Russian serfdom.* Cambridge University Press.

EPSTEIN, S. (2001). Introduction. In: S. EPSTAIN (ed.), *Town and country in Europe, 1300-1800.* Cambridge University Press.

FEDERICO, G. (2012). How much do we know about market integration in Europe? *The Economic History Review* **65**, 470-497.

FENOALTEA, S. (1975a). Authority, efficiency, and agricultural organization in medieval England and beyond: A hypothesis. *The Journal of Economic History* **35**, 693-718.

FENOALTEA, S. (1975b). The rise and fall of a theoretical model: The manorial system. *The Journal of Economic History* **35(2)**, 386-409.

FENOALTEA, S. (1984). Slavery and supervision in comparative perspective: A model. *The Journal of Economic History* **44(3)**, 635-668.

FÖLDVÁRI, P. and VAN LEEUWEN, B. (2011). What can price volatility tell us about market efficiency. *Cliometrica* **5**, 165-186.

GUZOWSKI, P. (2011). The influence of exports on grain production on Polish royal demesne

farms on the second half of the sixteenth century. *Agricultural History Review* **59**, 312-27.
GUZOWSKI, P. (2014). The role of enforced labour in the economic development of Church and royal estates in the 15th and 16th Century Poland. In: S. CAVACIOCCHI (ed.), *Serfdom and slavery in the European economy 11th-18th centuries*. Firenze.
KOCHANOWICZ, J. (1981). *Pańszczyźniane gospodarstwo chłopskie w Królewstwie Polskim w I połowie XIX wieku.* Wydawnictwa Uniwersytetu Warszawskiego.
KULA, W. (1976). *An economic theory of the feudal system*. London: Western Printing Services.
KUKLO, C. (2009). *Demografia Rzeczypospolitej przedrozbiorowej*. Warsaw: DiG.
MALINOWSKI, M. (Forthcoming). Market conditions in preindustrial Poland, 1500-1772. *Economic History of Developing Regions*.
MAŁOWIST, M. (2006). *Wschód a zachód Europy*. Warsaw: PWN.
MIRONOV, B. (1996). When and why was the Russian peasantry emancipated? In: M. BUSH (ed.), *Serfdom and slavery. studies in legal bondage*. New York-London: Longman.
NORTH, D.C. (1981). *Structure and Change in Economic History*. New York-London: Norton.
NORTH, D.C. and THOMAS, R.P. (1970), An Economic Theory of the Growth of the Western World. *The Economic History Review* **23**, 1-17.
NORTH, D.C. and THOMAS, R.P. (1971). The rise and fall of the manorial system: a theoretical model. *Journal of Economic History* **31(4)**, 777–803.
NORTH, D.C. and THOMAS, R.P. (1973). *The Rise of the Western World*. Cambridge University Press.
OGILVIE, S. and CARUS, A.W. (2014). Institutions and economic growth in historical perspective. In: P. Aghion and S.N. Durlau (eds.), *Handbook of economic growth*. Vol. 2. Burlington: Elsevier Science.
PERSSON, K. (1999). *Grain markets in Europe, 1500-1900*. Cambridge University Press.
SOSNOWSKA, A. (2004). *Zrozumieć zacofanie*. Warsaw: TRIO.
VAN DER SPEK, B., VAN LEEUWEN, B. and VAN ZANDEN, J. L., (eds.) (2015). *A history of market performance from Ancient Babylonia to the Modern World.* Routledge.
TOPOLSKI. J. (1994). *Polska w czasach nowożytnych*. Poznań: Wydawnictwo Naukowe UAM.
TRZYNA, E. (1963). *Położenie ludności wiejskiej w Królewszczyznach Województwa Krakowskiego w XVII Wieku*. Wrocław: Zakład Narodowy Im. Ossolińskich.
WYCZAŃSKI, A. (1960). *Studia nad folwarkiem szlacheckim w Polsce w latach 1500-1580*. Warsaw: PWN.
ZIELIŃSKA, T. (1977). *Magnateria Polska w epoce saskiej*. Wrocław: Zakład Narodowy Im. Ossolińskich.

Appendix 1: The mechanism

Here I propose a hypothetical mechanism that explains in detail how higher monetary and labour duties charged by landlords to the farmers could have made urban settlements more resilient to a market crisis. In order to outline the mechanism I do the following. First, I propose a static and simplistic 'model' of relations in a hypothetical region composed of three parties: a town, a demesne/landlord, and a commune of N tenant farmers. I discuss a range of relationships between those three parties and formalise them as a set of intuitive equations. I base the mechanisms on conventional knowledge and stylised facts from the literature of the subject. When necessary, I discuss possible overgeneralisations. The exercise does not aim to construct a functional economic model of the economy. It rather wishes to present the core idea behind the hypothetical relationship between surplus extraction and size of urban population in the clearest possible fashion. In order to analyse the comparative statistics of the model, I compute relevant derivatives. I also present the relations of interest graphically by calibrating the 'model' with use of probable values.

I assume that all the tenant farmers share the same conditions, i.e. (1) cultivate same-size plots of land, (2) require the same subsistence consumption, (3) have similar tools and capital goods, and (4) owe the same duties to the landlord. The tenant farmers pay the landlord for the right to cultivate their individual farms. They do it partially in monetary rent and partially in unpaid labour on the landlord's demesne: corvée. For the sake of simplicity I do not account for additional paid labour hired by the demesne or farmers.

I assume that urban growth is dependent on the numbers of births, deaths, and migration. Consequently, in the long run, the town's population is a certain function γ of food supply from the agricultural sector *SA*.

$$\triangle\, Urban\ Population = Migration + Births - Deaths \tag{1}$$

$$Urban\ Population = \gamma(SA) \tag{2}$$

Equation 2 is motivated by a simple reasoning that without surplus agricultural output there can be no secondary nor tertiary sectors that constitute a town. Simply put, the higher the food surplus the greater the potential share of people not involved in agriculture. Consequently, the higher the food supply *SA* – food surplus that is commercialised and therefore finds its way to a town – the lower the prices of food and, in consequence, the higher the median real wage of urban workers. High relative incomes positively affect urban population through three

channels. First, more food means that a family can increase its fertility. Second, better nutrition prolongs life expectancy and lowers mortality. Third, lower food prices stimulate migration to a town from dwellings with lower relative incomes.

The total supply of agricultural products available to a town SA is composed of the supply of food from all the individual tenant farmers SA_i and the supply generated by the demesne SA_d. For the sake of simplicity, and to focus on the mechanism of interest, I do not account for imports and exports. However, it must be stated that the grain markets in Poland were free and there was no formal restriction on trade between cities. Nonetheless, historical accounts indicate that most of the demesnes were linked only to the local markets. According to Wyczański (1960), demesnes producing for export were exceptional and most of them belonged to a few magnate families. The nobles who had only one manor controlled three times more demesnes than the magnates and contributed only 20 per cent of total exports.

$$SA = \sum_{i=1}^{N} SA_i + SA_d \tag{3}$$

The supply of an individual tenant farmer SA_i is a function T of commercialisation of his surplus agricultural output. T represents what share of his surplus a farmer is willing to trade and varies from zero to one. The surplus is what a farmer has left after his own fixed subsistence consumption C from his total agricultural output Q_i. The landlord extracts part of this surplus by monetary rent R. The rent cannot be greater than the surplus. Because a farmer has to raise money for the rent, he always has to sell the food equivalent of the rent to the town. For this reason, the amount of food that is commercialised at a farmers own discretion is the surplus $(Q_i - C)$ minus the rent. The supply of food generated by the demesne SA_d is a function of commercialisation T of the output after subtraction of the landlord's own subsistence consumption C. These relations are formalised by Equations 4 to 6.

$$SA_i = T_f(Q_i - C - R) + R \tag{4}$$

$$R \leq Q_i - C \tag{5}$$

$$SA_d = T_d(Q_d - C) \tag{6}$$

I propose that the total output of a tenant farmer Q_i is a linear function of productivity P and labour input L. Factors of production, such as technology and capital goods, were similar on demesnes and farms, as tenant farmers were usually expected to work on demesnes with their

own tools and animals. Building on these relations, I assume that P is primarily a function of motivation. I assume that productivity of farmers when they work on their own farms P_f is relatively high, as they are incentivised to work more effectively by the perspective of being able to make use of the fruits of their labour. Conversely, their productivity on the demesne P_d is smaller because their labour is coerced. If they can, farmers direct their labour input L_i to working their own fields. The amount of time they can spend there is diminished by the size of the corvée duties LD_i. Because the farmers also need to produce food for their own consumption, the maximum LD_i that a landlord can expect from his tenant farmers is smaller than maximum feasible L_i. It also decreases with an increase in the monetary rent R.

Our assumption that productivity is a linear function of labour input contradicts the gross of the theoretical literature dating back to Malthus, which advocates decreasing returns to labour and sees land as the crucial factor of production. I keep the linear relationship on board for the sake of simplicity. The lack of inclusion of land as a factor of production and no decreasing returns to labour can be, however, somehow plausible in the Polish case. This is because labour in the country was scarce whereas land was abundant (Domar 1970). Therefore the decrease in the returns to labour would have most likely been very small, whereas the decrease in the returns to land would have been very high. Equations 7 to 10 summarise the links between output, productivity, and labour input.

$$Q_i = P_f(L_i - LD_i) \tag{7}$$

$$Q_d = P_d \sum_{i=1}^{N} LD_i \tag{8}$$

$$P_d < P_f \tag{9}$$

$$LD \leq L - \frac{R+C}{P_f} \tag{10}$$

I propose that the share of the disposable surplus that is commercialised T depends on market conditions and risk-averseness. According to Chayanov (1966) – who studied relations in Russia – poor market conditions defined relations in preindustrial Eastern European agriculture. The author argued that, due to poor market conditions prevalent in the region, peasants had little information on the market price of their produce. High transaction costs hampered the exchange and transfer of information. Furthermore, frequent harvest failures increased price volatility, risk, and unpredictability of the future. For this reason, in Chayanov's view, the traditional rationality assumptions of classical economics were not valid for peasants

living under such harsh conditions. In contrast to people living in the urban sector, peasants evaluated the net benefits in qualitative not quantitative/monetary terms. They compared the proceeds of their crops with the disutility of physical labour. Furthermore, according to Chayanov, because peasants were disintegrated from markets they did not aim to maximise their profits but sought security. In short, their aversion towards risk dominated the desire to increase their monetary income. In Chayanov's view, market disintegration, risk, and information imperfections were the key features of market conditions that affected peasants' behaviour. According to the author, subsistence farmers were particularly risk-averse because they have little disposable surplus. Should an exchange go wrong, they risked losing precious resources. Because they are the food producers, they can limit their market participation to the minimum if they choose to do so. Since they live close to the subsistence level, they are willing to consume the surplus food rather than risk an unprofitable trade on the market. They can also simply restrain from additional work if they value leisure above additional consumption

Economic historians of preindustrial Eastern Europe problematized the ideas of Chayanov. According to Wyczański (1985: 303-307), Polish peasants refrained from commercialisation of their production and, in general, sold their produce primarily in order to pay their rent, until the beginning of the early modern period. The author argued that around the turn of the 16th century, the peasantry increased its voluntary market participation. Furthermore, Guzowski (2008: 150) analysed the size of the monetary duties (taxes and rents) of tenant farmers in the 16th century and compared those with information on their wealth (based on judiciary records). The author concluded that tenant farmers possessed significantly more coins than required to pay their duties. This indicates a voluntary market participation of the peasantry in the 16th century. These observations link to the findings of Malinowski (Forthcoming A, Chapter 4), who identified relatively favourable market conditions in Poland at the time. According to the author, market conditions in the country worsened in the 17th and 18th centuries. The historiography provides some scant information which suggests that market exposure/participation of the peasants also worsened at the time. The limited evidence comes from the labour market. Malinowski (Forthcoming B, Chapter 2) identified a high income-gap between the agricultural and urban sectors in Poland that persisted through the early modern era. Despite the formal restrictions on migration, this gap should have stimulated peasants to move to the urban sector (see Zurimendi 2014 on a model of peasant migration under the ban). Table 1 provides information about migration of villagers to the cities. It shows that in the 16th century, i.e. in the period of market expansion, former peasants accounted for a large share of new urban citizens. Conversely, in the period of market contraction, the share of former

peasants among all the new burghers dropped significantly. Additionally, Kula (1976) argued that in the Polish early modern literature a topic of 'a peasant coming to a market to sell his crops' was popular in the 16th century and nearly disappeared in the 18th century. These changes could indicate that under adverse market conditions the villagers preferred to stay off the market (or that the landlords managed to better enforce the ban on mobility in the 17th and 18th centuries).

Table 1: Share of former villagers among new urban citizens.

	1500-1600	1660-1750
Poznań	23%	9%
Chojnice	46%	15%
Cracow		12%
Gniezno		8%
Warsaw	50%	
Toruń		11%
Biecz	69%	47%

Note: Samples provided by the authors were assigned to either of the periods.
Source: Bogucka and Samsonowicz 1986.

Despite this limited empirical support, I build on Chayanov's ideas and propose that the harsher the market conditions the lesser market exposure of the peasantry and/or the smaller their voluntary labour input. Conversely, the better the market conditions, i.e. the more integrated peasants are with the market, the lower the risks related to exchange, and the more available the information, the higher the willingness of the peasants to maximise their profits by commercialising their production and/or increasing their labour input.

Surplus extraction enforces production and/or commercialisation of the production that would otherwise be kept in the agricultural sector. Building on these relations, I propose that willingness to trade increases with an improvement in market conditions and that richer people are more willing to trade their surplus. As discussed, reluctance to trade and unwillingness to work are two interchangeable/alternative effects of poor market conditions. For the sake of simplicity, I assume that the labour input of the farmers L_i is always the maximal possible one and the effect of poor market conditions is channelled through the reluctance to trade. This is because lack of commercialisation of farmer's surplus is, from the point of view of the town, one and the same with lack of production of any surplus in the first place. For this reason, the opposite interpretation that poor market conditions lower L_i but do not affect the willingness to trade would not change the predictions of the model.

Equation 11 proposes that the share of production that is commercialised by a demesne or a farmer *T* is inversely proportional to market conditions *MC*. *MC* equal to one indicates perfect market conditions, i.e. markets with no risk, costless exchange, and perfect information. Increases in *MC* denote that market conditions deteriorate, i.e. unpredictability of prices and/or transaction costs increase. By design, *MC* cannot be smaller than one.

$$T = \frac{1}{MC^{RA}} \tag{11}$$

The degree as to which changes in market conditions *MC* affect ones choices is modulated by risk-averseness *RA*. The more disposable surplus one has, the more risks one can take, the higher transaction costs one can accept, and the higher the opportunity costs of restraining from market participation. The underlying intuition is that rich people (landlords) are less easily discouraged to trade than the poor people (subsistence farmers). Risk awareness is therefore perceived as elasticity of worsening market conditions. Equation 12 exemplifies that *RA* of the richer demesne is higher than that of a tenant farmer.

$$RA_f > RA_d > 0 \tag{12}$$

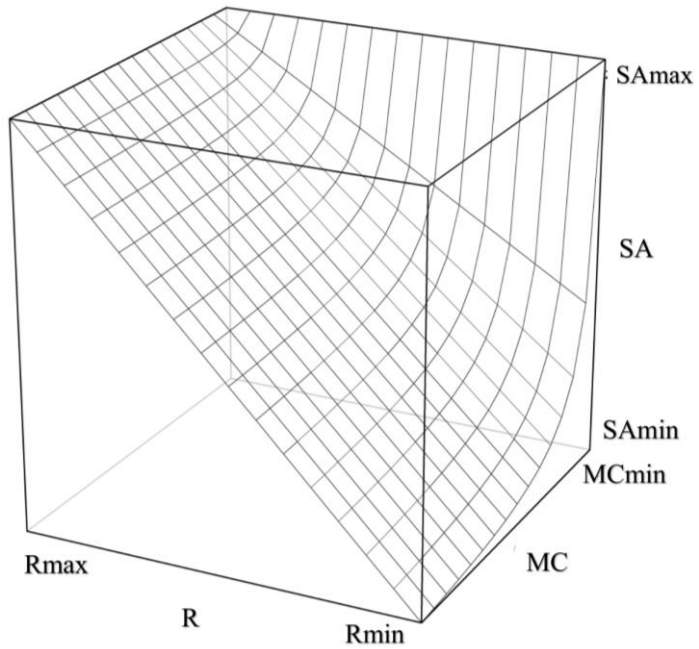
Now that I have outlined the basic relations, I can investigate how surplus extraction impacts the supply of food. Equation 13 summarises the impact of all the discussed phenomena on *SA*.

$$SA = \frac{N[P_f(L - LD) - C - R]}{MC^{RA_f}} + NR + \frac{P_d(N * LD) - C}{MC^{RA_d}} \tag{13}$$

The derivative of the size of monetary rent *R* in Equation 13 is $N - \frac{N}{MC^{RA_f}}$. When the *MC* is one, the derivative is zero. This means that, according to the predictions of the model, provided perfect market conditions, an increase in rents should not impact urban growth. However, the derivative increases with an increase in *MC*. The poorer the market conditions the lower the commercialisation rate *T* and the less food is sold by the peasants to the town. This effect can be mitigated by an increase in the monetary rent *R*. The higher the rent the bigger the mandatory market exposure of the peasantry. If the rent is equal to the surplus, an increase in *MC* does not affect the *SA* at all, because the peasants do not have any surplus left to withhold from the market. Figure 1 illustrates the relations identified by the derivative. It shows how different pairs of *MA* and *R* affect *SA*. I plot the relations using probable values of *P*, *N*, *L*, *RA*, and *C*. In this exercise I do not aim at perfect calibration of this simplistic model nor do I wish to

compute the exact size of an effect of the different forms of surplus extraction. I simply want to graphically present the relations identified by the derivative. Different combinations of various probable *P*, *N*, *L*, *RA* and *C* provide the same overall picture of the relations (not included).

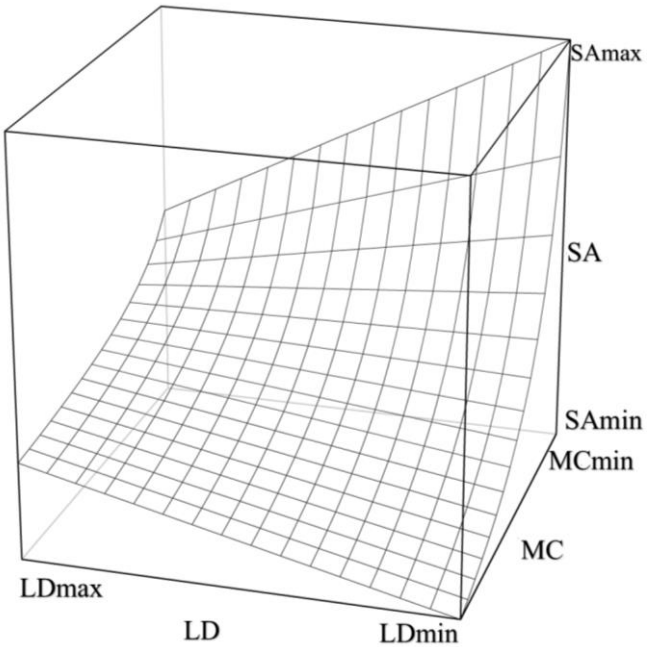
Figure 1: The relationship between market conditions *MC*, monetary rent *R*, and the total commercialised agricultural output *SA*.



Note: Based on Equation 13 and assumptions that N = 100 farmers; L = 6 days a week; C = 10; P_d = 5; $P_f = 10$; LD = 0 days a week; $RA_f = 1$; $RA_d = 0.2$.

The derivative of the size of corvée duties *LD* in Equation 13 is $N * \left(\frac{P_d}{MC^{RA_d}} - \frac{P_f}{MC^{RA_f}}\right)$. When market conditions are perfect – *MC* is one – the derivative is negative. This is because farmer's productivity on a farm P_f is greater than that on the demesne P_d. This implies that corvée duties hamper urban growth under favourable market conditions. However, since the landlord is less risk-averse than a subsistence farmer MC^{RA_d} increases at a slower rate than MC^{RA_f} with growth in *MC*. For this reason, because P_d and P_f are constant, the derivative is negative for high enough values of *MC*. This implies that corvée duties can increase the supply for food available to the town on a disintegrated and volatile market. Figure 2 plots the relationship between *MA*, *LD*, and *SA* and shows this prediction of the model graphically.

Figure 2: The relationship between market conditions *MC*, the extent of corvée duties *LD*, and the total commercialised agricultural output *SA*.



Note: Based on Equation 13 and assumption that N = 100 farmers; L = 6 days a week; C = 10; P_d = 5; $P_f = 10$; R = 0; $RA_f = 1$; $RA_d = 0.2$.

In sum, the simplistic 'model' predicts that surplus extraction in the forms of monetary rents and high corvée duties can mitigate the adverse effects of unfavourable market conditions.

References

CHAYANOV, A.V. (1966). *The theory of peasant economy*. D. THORNER, B. KERBAY, and R.E.F. SMITH (eds.). Manchester: Homewood.

DOMAR, D. (1970). The causes of slavery or serfdom: A hypothesis. *Journal of Economic History* **30(1)**, 18-32.

EPSTEIN, S. (2001). Introduction. In: S. EPSTAIN (ed.), *Town and country in Europe, 1300-1800.* Cambridge University Press.

GUZOWSKI, P. (2008). *Chłopi i pieniądze na przełomie średniowiecza i czasów nowożytnych*. Cracow: Avalon.

KULA, W. (1976). *An economic theory of the feudal system*. London: Western Printing Services.

MALINOWSKI, M. (Forthcoming A). Market conditions in preindustrial Poland, 1500-1772. *Economic History of Developing Regions*.

MALINOWSKI, M. (Forthcoming B). Little Divergence revisited: Polish weighted real wages in a European perspective, 1500-1800. European Review of Economic History.

MIRONOV, B. (1996). When and why was the Russian peasantry emancipated? In: M. BUSH (ed.), *Serfdom and slavery. studies in legal bondage*. London-New York: Longman.

WYCZAŃSKI, A. (1960). *Studia nad folwarkiem szlacheckim w Polsce w latach 1500-1580*. Warsaw: PWN.

WYCZAŃSKI, A. (1985). Uwagi o utowarowieniu gospodarki chłopskiej w dawnej Polsce. In: S.K. Kuczyński and S. Suchodolski (eds.), *Nummus et Historia*. Warsaw: PTAiN.

ZURIMENDI, I. (2014). Abolition of serfdom and the growth of cities in Eastern Europe. Paper presented at the ESSHC Vienna.

Appendix 2: Data on regional price gap as a proxy of market conditions[23]

In order to investigate market conditions, I analyse annual rye prices. The basic unit of observation is a series of annual retail rye prices in a specific market. Rye was chosen for this study as it was the most commonly traded grain on the domestic market. Furthermore, it was the most basic source of calories for the population (Wyczański 1969). The study uses price series for Gdańsk, Koenigsberg, Warsaw, Cracow, Lublin, Wrocław, and Lviv. Not all of the studied cities were part of the country. Koenigsberg was located in Ducal Prussia, which was a fief of the Polish king after 1525. Wrocław was located in the historical region of Silesia, which had been a part of the domain of the Polish King back in the 11th century. At that time, it was considered one of the main capitals of the kingdom. In 1335 it became part of the Czech domain and in 1526 it was claimed by the Habsburgs. Subsequently, in 1742 the city was assimilated by the Kingdom of Prussia. According to Wolański (1961), in spite of the border, Wrocław remained in close economic ties with Poland. Furthermore, Warsaw was incorporated into the Polish Kingdom in 1526. All the other cities were continuously located in Poland between 1500 and 1772.

Annual grain price data for Gdańsk, Cracow, Lviv, Warsaw, Cracow, Lublin, and Wrocław – the latter only until 1618 – have been collected from paperback editions of primary archival material (Hoszowski 1928; 1934; Furtak 1935; Adamczyk 1935; 1938; Siegel 1936; Pelc 1935; 1937, Wolański 1993) and standardised to a uniform measure of a price in grams of silver for one litre by the Global Price and Income History Group.[24] Standardised prices for Koenigsberg were taken from Allen-Unger Global Commodity Prices Database.[25] Prices for Wrocław for the 18th century were taken from David Jacks' webpage.[26] The latter data required standardisation.[27]

---

[23]This section partially overlaps with Chapter 4.

[24]http://gpih.ucdavis.edu/

[25]http://www.gcpdb.info/data.html

[26]http://www.sfu.ca/~djacks/data/prices/Poland/index.html

[27]Rye prices presented in silbergroschen per Berliner Scheffel. One Spesieztaler was 30 silbergroschen. In the late 17th century the taler contained 25.9839 g fine silver. From 1740 onward 1 taler was 19.4879 g fine silver. In 1750 Prussia debased the taler further to 16.7039 g and kept the level until the end of the studied period. The silver content in the period 1756-1763 is unclear and was left out from the data. One Berliner Scheffel was 62.3 litre. (Praun 1784; Ebeling and Brodhagen 1789, 490; Engel 1855).

Table 1: Descriptive statistics of the annual rye price data.

	Years	Coverage (%)	Mean	SD
Gdańsk	1501-1772	83	0.27	0.11
Cracow	1504-1772	55	0.07	0.04
Koenigsberg	1700-1772	93	0.23	0.09
Lublin	1570-1772	20	0.33	0.18
Lviv	1519-1759	28	0.27	0.16
Warsaw	1526-1772	27	0.17	0.1
Wrocław	1509-1618 & 1696-1772	87	0.3	0.19

Note: Prices in grams of silver for one litre of rye.

Epstein (2000) proposes to proxy the changes in the overall transaction costs with a study of market integration. I investigate the changes in market integration by estimating the aggregated silver price gap based on all price gaps between: Warsaw, Cracow, Lviv, Lublin, Konigsberg, Gdańsk, and Wrocław. In total I investigate 21 individual series. Table 1 presents summary statistics of the used annual rye price data. Table 2 depicts coverage of the data by city and time period. Table 2 indicates that there is no price information for Lublin and Koenigsberg available for the 16th century. Such changes in the composition of a sample can potentially result in biased results. However, even if I exclude the two cities from the sample the observed general trends remain the same (not included).

Table 2: Coverage of the dataset on annual rye prices by city and period, per cent.

	Cracow	Gdańsk	Lviv	Warsaw	Lublin	Koenigsberg	Wrocław
1501-1549	36	28	8	12			52
1550-1574	56	80	24	16			100
1575-1600	68	96	16	20	4		100
1700-1724	52	100	64	56	16	100	100
1725-1749	100	100	36	44	24	100	100
1750-1772	100	100	32	56	32	100	68

In more detail, the concept of market integration is defined differently across the literature. Here I understand market integration as price convergence and operationalise it with the use of the so-called law-of-one-price (for discussion of the other approaches see Federico 2012 and Jacks 2004):

$$\text{Price}_{a,t} = \text{Price}_{b,t} + \text{Transaction\_Costs}_{ab,t} \quad (1)$$

The theorem states that the price in a relatively dearer market is equal to the price in a relatively cheaper market plus the transaction costs. Therefore, I equate the price gap with the transaction costs in order to proxy the latter. By design, the lower the price gap the more integrated the market. The underlying assumption that allows equating the price gap with the transaction costs

is that of the efficiency of the market. Any rise of the price gap above the transaction costs is expected to be utilised by an arbitrage (Jacks 2004).

Van Bochove (2008) pointed at crucial problems with the use of a decrease in the price gap as an indicator of dwindling transaction costs. First, the author noted that markets that do not interact can still have similar levels of prices. Second, disintegration can potentially result in a shift in prices on the discrete markets to the new equilibria dictated by their regional configurations of supply and demand. Such a shift can result in a narrowing of the price gap and create a false impression of a decrease in the transaction cost. Third, the two discrete markets can still be indirectly co-dependent via a third market.

I proxy regional differences in the degree of market integration of a region with a study of aggregated regional price gaps through Poland. I calculate annual rye price gaps between seven cities: Gdańsk, Koenigsberg, Wrocław, Warsaw, Lviv, Lublin, and Cracow. Since I cover seven cities, there is six price gap series estimated for each of the cities. I divide the country into six regions: (1) Wielkopolska plus Voivodeships Brzesko-Kujawskie, Chełmińskie, and Inowrocławskie, (2) Małopolska plus Sieradzkie Voivodeship, (3) Podlaskie Voivodship, (4) Eastern Pomerania and Royal Prussia, (5) Voivodeships Rawskie, Płockie, and Mazowieckie, and (6) Voivodeships Bełskie, Podoslskie, and Ruskie. In order to proxy the overall market conditions in a region, I measure the degree of integration of a city located in the region with the rest of the country by calculating the average price gap between the city and the other six cities located – for the most part – in different regions. I calculate the average price gap for every region for periods 1500-1549, 1550-1600, and 1700-1772. I proxy the degree of integration of Region 4 with that of Gdańsk; Regions 1, 3, and 5 with Warsaw; Regions 2 with Cracow; and Region 6 with Lviv. Table 3 presents the obtained estimates of the regional price gap. The results show the disintegration of all the regions around the country between the 16th and 18th century. According to the results, the north of the country remained relatively better integrated with the rest of the economy in the 18th century. The average price gap between Cracow and all the other studied cities was relatively high due to low rye prices in the city at the time.

Table 3: Estimates of the regional price gap.

Period on which a sample is based	Average difference in price of 100 litres of rye denoted in grams of silver between a city representing a region and all the other cities			
	Gdańsk	Warsaw	Cracow	Lviv
1500-1549	5	4	5	4
1550-1600	9	6	13	8
1700-1772	15	15	25	19

References

ADAMCZYK, W. (1935). *Ceny w Lublinie*. Lviv: Instytut Popierania Polskiej Twórczości Naukowej.

ADAMCZYK, W. (1938). *Ceny w Warszawie w XVI i XVII wieku*. Lviv: Instytut Popierania Polskiej Twórczości Naukowej.

VAN BOCHOVE, C. (2008). *The economic consequences of the Dutch; Economic integration around the North Sea, 1500-1800*. Amsterdam: IISG.

EBELING, C.D. and BRODHAGEN, P.H.C. (1789). *Gottfried Christian Bohns wohlerfahrener Kaufmann*. Hamburg: Carl Ernst Bohn.

ENGEL, E. (1855). Die Geldprägungen nach dem Leipziger Münzfuße, dem Conventionsfuße und dem 14-Thalerfuße in dem Churfürstenthume und dem Königreiche Sachsen. *Zeitschrift des Statistischen Büreaus des Königl. Sächs. Ministeriums des Innern* **4**, 49-64.

EPSTEIN, S. (2000). The late medieval crisis as integration crisis. In: Idem, (ed.), *Freedom and Growth. The rise of states and markets in Europe, 1300-1750***.** New York-London: Routledge, 38-72.

FEDERICO, G. (2012). How much do we know about market integration in Europe? *The Economic History Review* **65**, 470-497.

HOSZOWSKI, S. (1928). *Ceny we Lwowie w XVI i XVII wieku*. Lviv: Instytut Popierania Polskiej Twórczości Naukowej

HOSZOWSKI, S. (1934). *Ceny we Lwowie w latach 1700-1914*. Lviv: Instytut Popierania Polskiej Twórczości Naukowej.

JACKS, D. (2004). Market Integration in the North and Baltic Seas, 1500-1800. *Journal of European Economic History* **33(3)**, 285-329.

PELC, K. (1935). *Ceny w Krakowie w Latach 1369-1600*. Lviv: Instytut Popierania Polskiej Twórczości Naukowej.

PELC, K. (1937). *Ceny w Gdańsku w XVI i XVII Wieku*. Lviv: Instytut Popierania Polskiej Twórczości Naukowej.

PERSSON, K. (1999). *Grain markets in Europe, 1500-1900*. Cambridge University Press.

PRAUN, G.A.S.V. (1784). *Grundliche Nachricht von dem Münzwesen insgemein, insbesondere aber von dem Deutschen Münzwesen älterer und neuerer Zeiten: und dann auch von dem Französischen, Spanischen, Niederländschen, Englischen und Dänischen Münzwesen.* Leipzig: Weygandsche Buchhandlung.

WOLAŃSKI, M. (1961). *Związki handlowe Śląska z Rzeczypospolita w XVII wieku*. Wrocław: Zakład Narodowy Im. Ossolińskich.

WOLAŃSKI, M. (1993). *The prices of corn, cereal products, fruits and vegetables in Wrocław from 1506 to 1618.* Wrocław: Wydawnictwo Uniwersytetu Wrocławskiego.

WYCZAŃSKI, A. (1969). *Studia nad konsumpcji żywności w Polsce w XVI i pierwszej połowie XVII Wieku*. Warsaw: PWN.

Appendix 3: Newly collected city-specific dataset

I construct a new database on population of settlements with city rights for the benchmark years 1500, 1600, 1650, 1660, and 1772 composed of 264 individual towns and cities. I base the analysis on benchmarks 1500, 1600, and 1772 (primarily due to limited information for the other benchmarks: 37 population estimates for 1650; 107 for 1660; and 26 for both). The study analyses towns and cities that were located in historical Poland around 1569 and are currently located in the country. It is only a sample of smaller settlements located in Poland. It, however, includes all the Polish cities above the 5,000 inhabitants threshold. In all the cases where the secondary literature reported multiple contradictory estimates of population, arbitrarily, the observation closer to the benchmark was selected to the database. If there were two observations for the same year that had different values the highest one was selected. To build the dataset I have combined various existing datasets of populations in cities bigger than five or 10 thousand inhabitants. For smaller settlements I have compiled information from the secondary literature.

Information on the bigger settlements came from: Bairoch et al. (1988), Chandler and Fox (1974), and Kuklo (2009). Bairoch et al. (1988) provide centennial population estimates for cities in Europe. The authors provide estimates for only few of the large Polish cities. I assume that population levels in 1800 reported by Bairoch et al. represent populations in 1772. Kuklo (2009) provided population estimates in Polish cities at benchmark years 1500, 1600, and 1790. I assume that the information regarding the year 1790 represents the situation in 1772. For Cracow, Kuklo reports population estimates both with and without suburbs/adjacent towns. I incorporated the higher figure based on the agglomeration into the sample. Chandler and Fox (1974) provide population data for various years rather than for few selected benchmarks. I assume that an observation from their dataset can be incorporated into one of the benchmarks if it represents a situation within 30 years from the benchmark (50 for the 1500 cross-section). To be classified for the 1650 benchmark an observation had to represent a situation no more than 25 years before 1655. For the 1660 benchmark an observation had to represent a situation within 20 years after 1660. This is motivated by the expected impact of the devastating war with Sweden that occurred between 1655 and 1660 and is believed to have decimated the urban sector in Poland (Bogucka and Samsonowicz 1986). I also want to avoid an overlap with the other benchmarks.

The information on population of towns – settlements having the city rights but less than 5,000 inhabitants – was based on the '*Miasta Polskie w Tysiacleciu'* Encyclopaedia

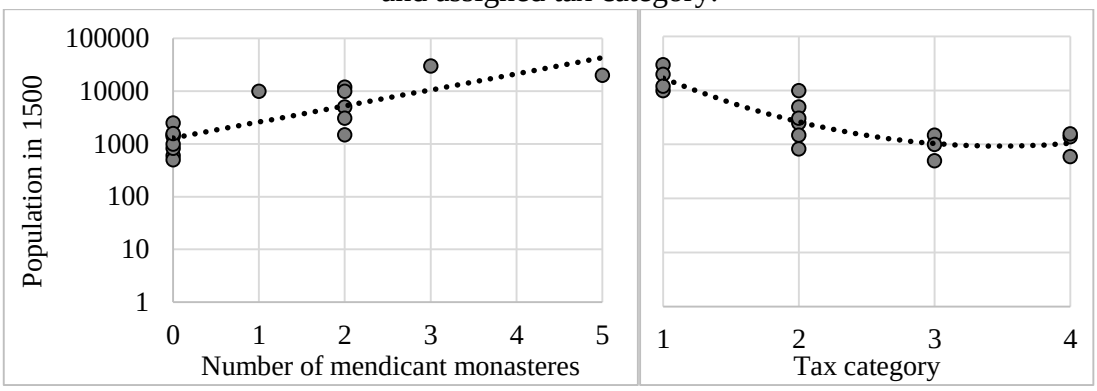
(Siuchiński 1965) and Bogucka and Samsonowicz (1986). The two-volume encyclopaedia provides an overview of the history of urbanisation in Poland from the time of the first settlements until the 1960s. It combines individual description of towns located in present day Poland. Each entry has been written by a regional historian specialising in history of an individual settlement/region. The encyclopaedia only describes settlements with city rights. City rights of many Polish towns were revoked in 1870 as a result of the January Uprising (1863-64). However, many of these towns regained their city rights before the 1960s when the encyclopaedia was created. The majority of the entries are short and do not provide any information about the historical population. For this reason the dataset represents only a selection of Polish towns for which sufficient archival material has survived and had been investigated before the 1960s. Bogucka and Samsonowicz (1986) wrote a monograph on the history of urbanisation in preindustrial Poland. It contains numerous cross-sections of urban populations as well as information on various characteristics of urban settlements (for example the time of the first location). To the best of my knowledge, there is no other compendium of information on historical urban populations of small towns in preindustrial Poland.

Next to the amount of the inhabitants, the secondary literature often provides a piece of information about the number of houses located in a settlement. In 25 cases there were information on both the number of buildings and the number of people in an urban dwelling available. According to the data, there were eight people living in a city per one house on average. This estimate was used to fill in the gaps in the data on urban populations in cases where only the number of houses was reported by the secondary literature. The data on the number of buildings was used to estimate missing populations in nine towns mostly for the year 1600 (Gniezno, Kęty, Koło, Kościan, Pyzdry, Rogoźno, Solec nad Wisłą, Środa, Sulmierzyce)

Furthermore, there were only 16 observations for the year 1500 available. In order to obtain more accounts of urban population around that date, more indirect evidence was used. Kłoczowski (1986) presented a map of mendicant orders in Poland in 1500. According to Le Goff (2007), what constituted a city in late medieval Europe was the ability to generate enough of a surplus to sustain such a monastery. Because alms, rather than endowments, were the main source of the income of this kind of an institution, the more mendicant monasteries a city hosted the bigger was its economy. Additionally, Bogucka and Samsonowicz (1986) constructed a database of economic importance of a range of late medieval Polish cities. The authors reported historical tax categories assigned by contemporary officials. There were four categories depending primarily on its size and position in domestic trade. These categories were: (1) first

order cities, (2) second order cities, (3) cities with a fair, and (4) cities without a fair. These categories primarily grouped the settlements according to their economic power.

Figure 1: Scatter-plotted log10 of population in 1500 and number of mendicant monasteries and assigned tax category.



The information on the number of mendicant monasteries as well as the assigned category was used to extrapolate the missing information on the population of the settlements that are known to have existed by 1500. Figure 1 plots the number of monasteries and the tax category against a logarithm of the population from the 16 cities with the known population around the year 1500. The figure shows a liner relation of the logarithm of the population with the number of monasteries and a second order polynomial relation with the assigned tax category. The population of 161 towns and cities in 1500 was predicted through use of estimation equation (based on the OLS estimation method):

$$LNPop1500_i = \beta_0 + \beta_1 mendicant\_monsteries_i + \beta_2 tax\_category_i + \beta_3 tax\_category_i^2 + \mu_i \quad (1)$$

Table 1: Descriptive statistics of the variables used to predict population in 1500.

Variable	No.	Min.	Max.	Mean	SD
Tax category	177	1	4	2.92	0.83
Tax category^2	177	1	16	9.26	4.81
No. mendicant monasteries	177	0	5	0.26	0.62
LN population in 1500	16	6.22	10.30	7.91	1.28

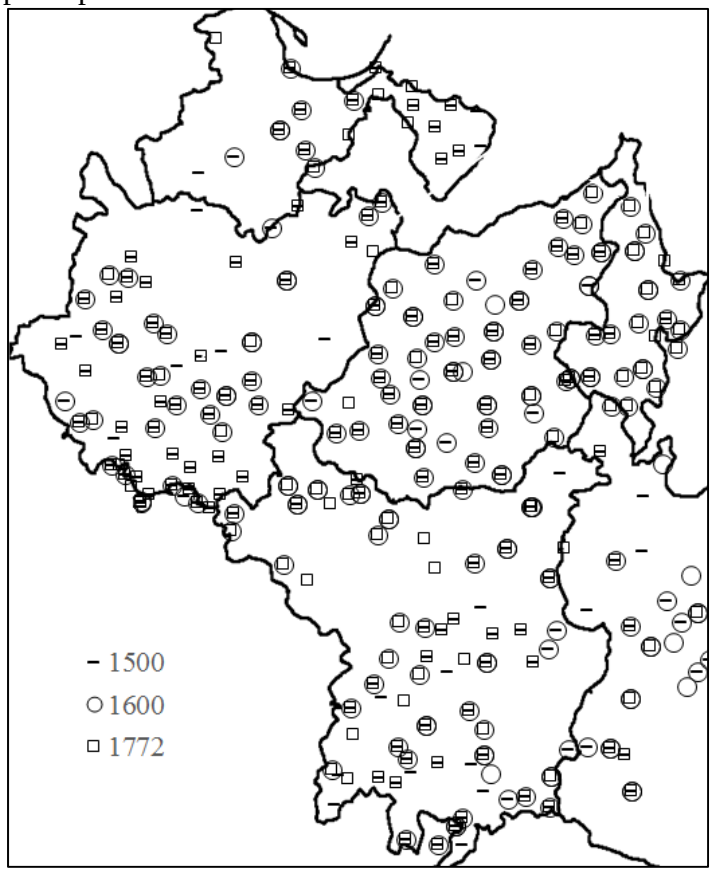
Table 2 presents results of regression analysis based on equation 1. The R^2 of the OLS regression analysis of the 16 known urban dwellings is 0.84. This indicates that the model provides a good prediction of the missing observations.

Table 2: Results of regression analysis used to predict urban populations in 1500.

LN population	I
Cross-section	1500
Tax category	-3.89*** (0.00)
Tax category^2	0.67*** (0.00)
No. of mendicant monasteries	0.33*** (0.00)
Constant	12.46*** (0.00)
Sample	Whole cross-section
R^2	0.84
No.	16

Note: Based on OLS regression model presented in Equation 1. Note: P-values based on heteroscedasticity robust standard errors (based on the Huber-White estimation method) in brackets. *, **, *** denote significance at the 10, 5, and 1 per cent levels respectively.

Map 1: Spatial distribution of urban settlements in the dataset.



The coordinates (longitude and latitude) of all the settlements were obtained with use of Google Maps. Map 1 presents spatial distribution of the cities. It yields that the sample covers the whole country (note that I do not investigate the Grand Duchy of Lithuania, Ducal Prussia, and the parts of the former Kingdom of Poland that are currently in Ukraine). There are numerous

settlements with known population in every region of the country in every time period. Also the 75 settlements that are a part of the balanced panel (I have information about 1500, 1600, and 1772) are scattered around the country.

Figure 2 plots distribution of population sizes (in log10) in the three cross-sections that I study in the main article. The figure shows that the samples are dominated by towns with populations between around 1,000 and 3,000 inhabitants. The figure shows that the average size of a settlement in the sample increased between 1500 and 1772. Moreover, whereas the populations of the settlements were relatively similar by 1500 and 1600, the distribution became relatively flatter (dispersed) by 1772 (See Table 2 in the main paper for the descriptive statistics). This was a result of urban growth in several cities and formation of new urban centres with population above 5,000 inhabitants (mostly private) mirrored by population drop in numerous towns. This dual development is explored in the main article and explained by private legal jurisdiction (serfdom).

Figure 2: Distribution of population levels in benchmark years 1500, 1600, and 1772.

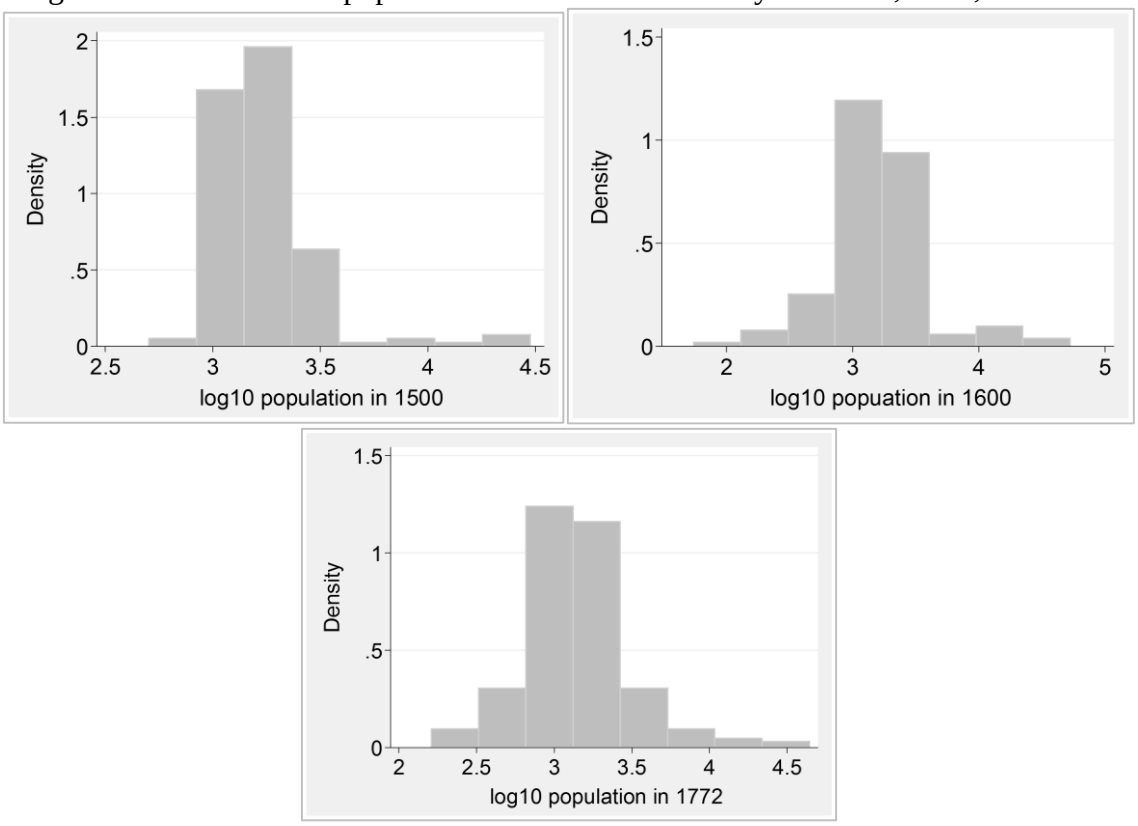


Figure 3 depicts percentage population growth of urban settlements in the database during the two time periods. It indicates that the 16th century was relatively a period of expansion and the 17th and 18th centuries were a period of contraction. This matches what is known about the overall trends in urbanisation levels in Poland (Bogucka and Samsonowicz 1986).

Figure 3: Distribution of population growth in periods 1500-1600 and 1600-1772.

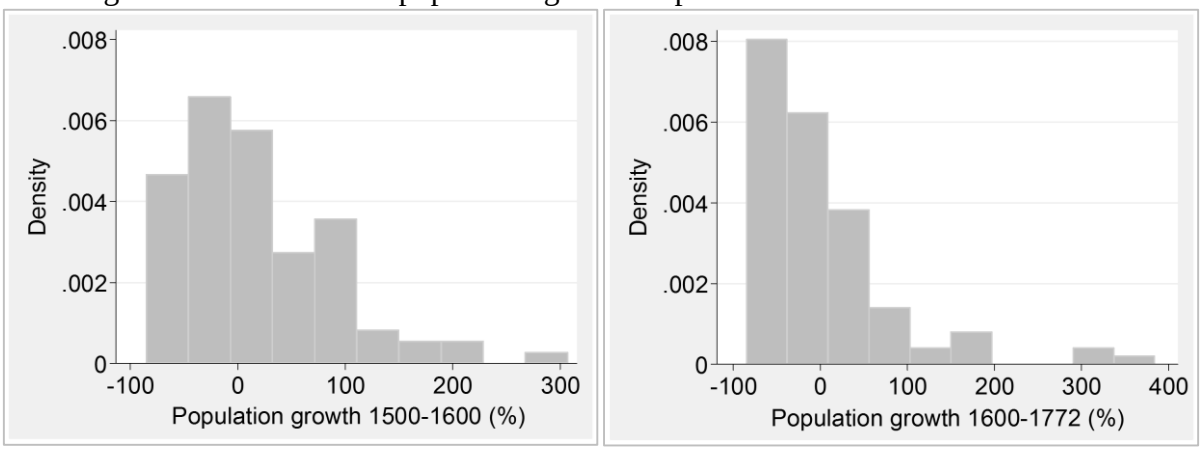
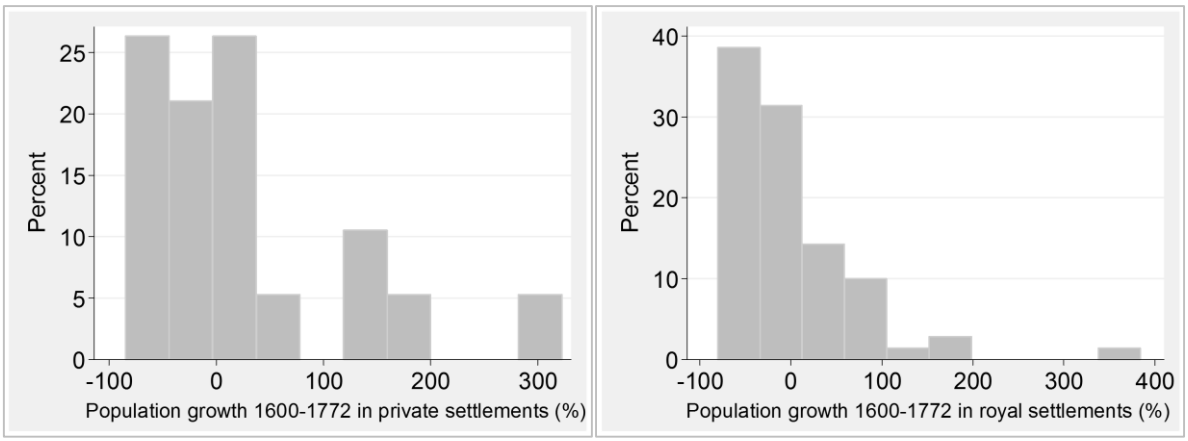


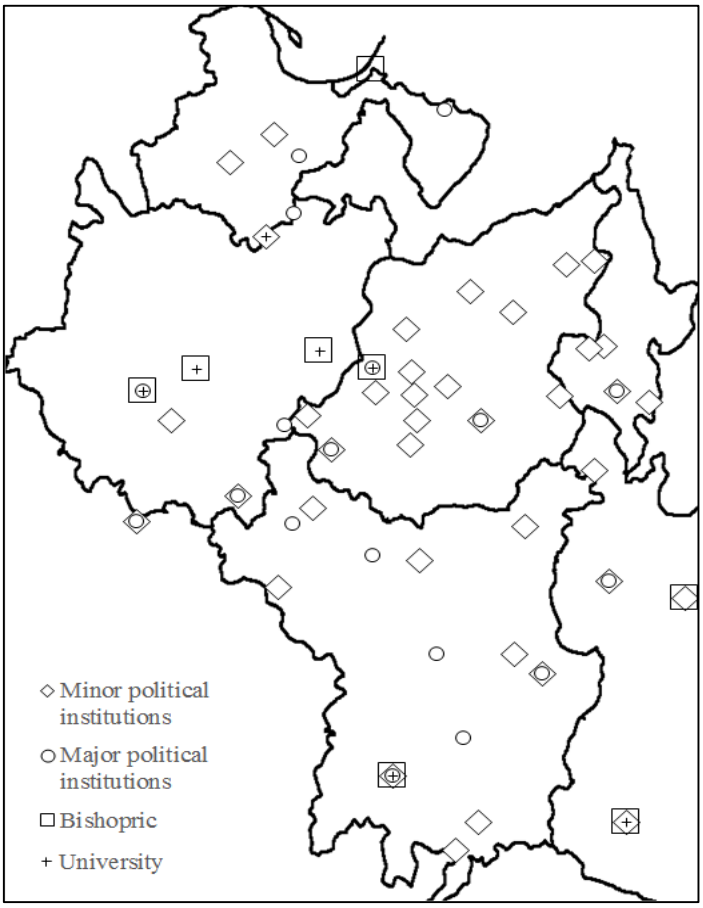
Figure 4 compares differences in distribution of population growth between noble and royal settlements. It shows that noble settlements were more resilient between 1600 and 1772. At the time nearly 70 per cent of state owned cities contracted in comparison to 45 per cent in the private estates.

Figure: 4: Differences in distribution of population growth between private (noble) and royal settlements between 1600 and 1772.



Information about ownership and whether a city hosted political institutions (i.e. major political institutions [tribunals, national parliament, and local dietines], or minor political institutions [headquarters of a starosty] was taken from '*Miasta Polskie w Tysiacleciu'* Encyclopaedia (Siuchiński 1965). Information about the existence of a bishopric, a university (or a branch of a university), and the access to land trade routes around 1600 was based on '*Atlas histori Polski*' (Jankowiak-Konik 2011). I arbitrarily assume that the main trade routes remained unchanged through the early modern era. According to my knowledge, there is no map available of land trade routes in the 17th and the 18th century. I also account for access to navigable rivers Vistula, Bug, Pilica, Wieprz, or Narew.

Map 2: Spatial distribution of various characteristics of settlements in the dataset.



Maps 2 shows the spatial distribution of the institutions. It indicates that the dataset accounts for at least one of each kind of institution in every region (except of Podlasie in the north-east where there was no bishopric and no university). However, there was much greater density of minor political institutions (starosties) in the Mazovia region (located in the centre) according to the dataset.

Table 3 presents descriptive statistics of these time invariant dummies. Since the value of a dummy variable is either one or zero the mean indicates the share of settlements in a sample that had a certain characteristic. The results indicate that the cross-sections investigate similar types of settlements. Also the settlements in the balanced panel are not qualitatively different to the settlements investigated in the cross-sections.

Two control variables are not entirely time invariant, i.e. value of the dummy for the same settlement changes between cross-sections of population levels. The major political institutions (tribunals, national parliament, and local dietines) developed in Poland throughout the 16th century. Furthermore, by 1500 there was only one university in the country (the Jagiellonian University in Cracow). The other universities developed throughout the 16th

century. For this reason, when the 1500 cross-section is included in the analysis of population levels (Equation 4 and Table 6 in the main article), the 'major political institutions' and the 'existence of a university' control variables both become time depended. The variables are time invariant if I analyse cross-sections of population levels in 1600 and 1772, and if I analyse growth periods 1500-1600 and 1600-1772.

Table 3: Mean of the control dummy variables.

Cross-section	1500 (N=177)	1600 (N=135)	1772 (N=204)	Balanced panel of growth (N=75)	1500-1600 growth (N=93)	1600-1772 growth (N=108)
River access	0.16	0.21	0.15	0.24	0.24	0.21
Trade route access	0.28	0.28	0.26	0.32	0.34	0.28
Bishopric	0.05	0.04	0.03	0.05	0.05	0.04
Lower political institutions	0.19	0.24	0.16	0.28	0.29	0.24
Major political institutions	0	0.1	0.09	0.15	0.12	0.13
University	Only Cracow	0.04	0.03	0.07	0.05	0.05

In order to reconstruct the foreign market potential (FMP), uniform data on population in the neighbouring countries was needed. The data on the present day Scandinavian countries, Germany, Austria, the Czech Republic, Slovakia, and Hungary were taken from Chandler and Fox (1974). The data on Russia, Lithuania, White Russia, and Ukraine were taken from Bosker et al. (2013). These editions presented only cities with populations above 10,000 inhabitants. Due to the lack of gaps in information, I account for Polish cities only if they had more than 5,000 inhabitants. Therefore, the FMP effectively indicates a potential to trade with the big cities or a proximity to urban 'giants'. The data on the geographical location of the foreign cities (longitude and latitude) was obtained from Google Maps. The matrix of the round-circle-distance between the cities was computed using Geographic Distance Matrix Generation software available at http://biodiversityinformatics.amnh.org/open_source/gdmg/index.php. The FMP was estimated with the equation:

$$FMP_{i,t} = \sum_{j \neq i}^{n} \frac{pop_{j,t}}{Distance_{ij}} \qquad (2)$$

Table 4 presents descriptive statistics of the estimates of the foreign market potential. They indicate a progressing increase in the FMP over time. The increase in the 18th century despite the overall decline in the urban population levels was primarily caused by urban sprawl of

Warsaw in the second half of the 18th century and by formation of few new private cities (settlements that crossed the 5,000 people threshold) at the time (see Kuklo 2009).

Table 4: Descriptive statistics of the estimates of the foreign market potential.

Sample	No.	Mean	SD	Min	Max
Whole cross-sections					
1500	177	1.13	0.46	0.43	2.68
1600	135	1.53	0.42	1.0	2.94
1772	204	2.45	0.39	1.95	3.72
In the balanced panel					
1500	75	1.04	0.38	0.43	2.68
1600	75	1.42	0.36	1.09	2.94
1772	75	2.36	0.32	1.98	3.36
Whole cross-sections					
In 1500 for the 1500-1600 growth period	93	1.01	0.38	0.43	2.68
In 1600 for the 1600-1772 growth period	108	1.4	0.36	1.05	2.94

References

BAIROCH, P., BATOU, P. and CHÈVRE, P. (1988). *La population des villes Européennes de 800 à 1850*. Genève: Librairie Droz.

BOGUCKA, M. and SAMSONOWICZ, H. (1986). *Dzieje miast i mieszczaństwa w Polsce przedrozbiorowej*. Wrocław: Zakład Narodowy Im. Ossolińskich.

CHANDLER, T. and FOX, G. (1974). *3000 Years of urban growth*. New York: Academic Press.

GOFF, L.J. (2007). *Długie Średniwiecze*. Wydawnictwo Uniwersytetu Warszawskiego.

JANKOWIAK-KONIK, B. (ed.), (2011). *Atlas histoii Polski*. Warsaw: Demart S.A..

KŁOCZOWSKI, J. (1970). Zakony męskie w Polsce w XVI-XVIII wieku. In: J. KŁOCZOWSKI (ed.), *Kościół w Polsce*. Vol. 2. Cracow: Znak.

KUKLO, C. (2009). *Demografia Rzeczypospolitej przedrozbiorowej*. Warsaw: DiG.

SIUCHIŃSKI, M. (1965). *Miasta polskie w tysiącleciu*. Vol. 1-2. Wrocław: Zakład Narodowy Im. Ossolińskich.

Name	Latitude	Longitude	Population in 1500	Population in 1600	Population in 1660	Population in 1772	Tax category ca. 1500	Mendicant monasteries 1500	Access to a navigable river	Access to a land trade route	Bishopric	Minor institution	Major institution	Private	Ecclesiastical	Royal	LogFMP1600	LogFMP1772
Andrzejowo				1000				0	0	0	0	0	0	0	1	0		
Biecz	49.73	21.27	1735	3700	462		2	0	0	0	0	0	0	0	0	1	1.22	2.21
Bielsk Podlaski	52.77	23.19	1410	3636	1260	1733	4	0	0	0	0	0	0	0	0	1	1.11	1.98
Bieżuń	52.96	19.89		300	250	756	4	0	0	0	0	0	0	1	0	0	1.37	2.32
Bolinów	52.08	20.16	1410	1956			4	0	0	0	0	1	0	0	0	1	1.31	2.23
Brańsk	52.74	22.84		1746	600	1086		0	0	0	0	0	0	0	0	1	1.12	2.01
Brok	52.70	21.85		2700	800	500		0	1	0	0	0	0	0	1	0	1.17	2.09
Chęciny	51.14	23.47		1830	288		2	2	0	0	0	1	0	0	0	1	1.11	2.08
Chełm	53.35	18.42	3281	1995				0	0	0	1	1	0				1.45	2.42
Ciechanów	52.68	22.50	2386	2426	318	996		0	0	1	0	1	0	0	0	1	1.12	2.03
Ciechanowiec	52.88	20.62		2200		1758	2	1	0	0	0	0	0	1	0	0	1.30	2.25
Czersk	53.80	17.98	1410	1200			4	0	1	0	0	1	0	0	0	1	1.45	2.44
Dąbrówno	50.17	20.99		570		900		0	0	0	0	0	0	0	0	1	1.24	2.21
drohiczyn	52.40	22.66		1968	680	1416		1	1	1	0	1	1	0	0	1	1.07	1.99
Dubienka	51.05	23.89		966				0	1	0	0	0	0	1	0	0	1.14	2.14
Elbląg	54.16	19.40	10000	15000		10733	1	1	0	1	0	0	0	0	0	1	1.97	2.98
Gąbin	52.40	19.74	1016	2112	90	1156	3	0	0	0	0	1	0	0	0	1	1.36	2.29
Gdańsk	54.35	18.65	30000	53000		44000	1	3	1	1	0	0	0	0	0	1	1.65	2.66
Gniew	53.84	18.82	1016	1000		1091	3	0	0	1	0	0	1	0	0	1	1.55	2.55
Goniądz	53.48	22.73		1716	84	1500		0	0	0	0	0	0	1	0	0	1.31	2.16
Grójec	51.87	20.87	1016	1260	96	468	3	0	0	0	0	0	0	0	0	1	1.21	2.14
Horodło	50.89	24.04	1398	490		1371	3	1	1	1	0	0	0	0	0	1	1.23	2.24
Hrubieszów	50.82	23.88	1016	1120			3	0	0	0	0	0	0	1	0	0	1.30	2.29
Iława	53.60	19.57		450		882		0	0	0	0	0	0	0	0	1	1.58	2.56
Jasło	49.74	21.47	2386	800		1000	2	1	0	0	0	0	0	0	0	1	1.21	2.20
Kamieńczyk	52.60	21.54	1410	1800		468	4	0	1	0	0	0	0	0	0	1	1.18	2.11
Kańczuga				1338				0	0	0	0	0	0	1	0	0		
Kielce	50.87	20.63	504	1500	245	2106	3	0	0	0	0	0	0	0	1	0	1.28	2.21
Kleczew	52.37	18.18	1016	456		1047	3	0	0	0	0	0	0	1	0	0	1.66	2.55
Kleszczele	52.58	23.32		2310	78	1086		0	0	0	0	0	0	0	0	1	1.07	1.95

Kłodawa	52.25	18.91	1410	570			4	0	0	1	0	1	0	0	0	1	1.53	2.43
Knyszyn	53.32	22.92		1494	540	1700		0	0	0	0	0	0	0	0	1	1.25	2.10
Kolno	53.41	21.93	1410	1600	100	1134	4	0	0	0	0	0	0	0	0	1	1.35	2.27
Kozienice	51.58	21.57		1062	364	1254	2	0	0	0	0	0	0	0	0	1	1.13	2.07
Kraków	50.06	19.94	20000	26000	8000	20000	1	5	1	1	1	1	1	0	0	1	1.43	2.38
Krasnystaw	50.98	23.18	1398	1995			3	0	1	1	0	0	0	0	0	1	1.16	2.13
Krosno	49.68	21.77	2386	1920		1200	2	0	0	0	0	0	0	0	1	0	1.21	2.21
Kryłów	50.68	24.06	1410	210		887	4	0	1	0	0	0	0	1	0	0	1.43	2.44
Kwidzyn	53.73	18.93		750		3170		0	0	0	0	0	0	0	1	0	1.54	2.53
Łańcut	50.07	22.23	2386	1785			4	0	0	1	0	0	0	1	0	0	1.28	2.24
Łaszczów	50.53	23.73		440		862	2	0	0	0	0	0	0	1	0	0	1.62	2.57
Latowicz	52.03	21.81		1590	108	1810	3	0	0	0	0	0	0	0	0	1	1.11	2.04
Łęczyca	52.05	19.20	1410	925	156	1529	2	1	1	0	0	1	1	0	0	1	1.51	2.40
Liw	52.37	21.96	1410	2046		786		0	0	1	0	1	0	0	0	1	1.12	2.05
Łomża	53.18	22.06	1735	3240	300	1166		0	0	1	0	1	0	0	0	1	1.26	2.17
Łosice	52.21	22.72		1164		1140	3	0	0	0	0	0	0	0	0	1	1.05	1.98
Łowicz	52.11	19.95	3096	3096		2178	2	0	1	0	0	0	0	0	1	0	1.34	2.26
Lubawa	53.50	19.76	1398	1200		625	4	0	0	0	0	0	0	0	1	0	1.55	2.52
Lublin	51.25	22.57	5000	10000	6000	7000	4	0	0	1	0	1	1	0	0	1	1.09	2.04
Maków Mazowiecki	52.86	21.10		1200	150		3	0	0	0	0	0	0	0	0	1	1.26	2.20
Małogoszcz	50.81	20.27	1410	876		1074	4	0	0	0	0	0	0	0	0	1	1.35	2.28
Mielnik	52.33	23.05		1512		648	3	0	1	1	0	1	0	0	0	1	1.05	1.96
Mikstat	51.53	17.97	1410	390	96	738	4	0	0	0	0	0	0	0	0	1	2.31	3.11
Mińsk Mazowiecki	52.18	21.57	1410	900	350		4	0	0	0	0	0	0	0	0	1	1.14	2.07
Mirosław	53.04	16.69	1410	870		1104	4	0	0	0	0	0	0	1	0	0	1.68	2.67
Mława	53.11	20.38	1016	2574	270	642	3	0	0	0	0	0	0	0	0	1	1.38	2.33
Mogielnica	51.69	20.72	1016	700		606	3	0	0	0	0	0	0	0	1	0	1.23	2.16
Mordy	52.21	22.52		720		174		0	0	0	0	0	0	1	0	0	1.07	1.99
Mrągowo	53.86	21.30		450		1200		0	0	0	0	0	0				1.77	2.74
Mszczonów	51.98	20.52	1410	600	200		4	0	0	0	0	0	0	1	0	0	1.26	2.18
Narew	52.44	20.73		1068	144			0	1	0	0	0	0	0	0	1	1.24	2.17
Nowe Miasto	52.66	20.63	1016	1644		1584	3	0	0	0	0	0	0	0	0	1	1.27	2.21
Nowe Miasto Korczyn	50.30	20.81	2386	888	434	1680	2	0	0	1	0	0	1	0	0	1	1.26	2.22
Nowe Miasto Lubawskie	53.42	19.59	1410	1000		854	4	1	0	0	0	0	0	0	0	1	1.50	2.47

Nowogród	53.23	21.88	1016	1800	150	966	3	0	1	0	0	0	0	0	0	1	1.29	2.21
Nowy Sącz	49.62	20.72	2386	5000	1500	3629	2	0	0	1	0	1	0	0	0	1	1.28	2.28
Nowy Targ	49.48	20.03	1016	576	504	960	3	1	0	0	0	0	0	0	0	1	1.41	2.41
Nur	52.67	22.32	1410	1578		432	4	0	1	0	0	1	0	0	0	1	1.13	2.04
Osiek	52.52	20.18		840		770		0	0	0	0	1	0	0	0	1	1.30	2.24
Osmolin	52.30	19.84	1410	1086	90	300	4	0	0	0	0	0	0	0	0	1	1.35	2.27
Ostrołęka	53.09	21.56	1016	2004		1800	3	0	1	1	0	0	0	0	0	1	1.28	2.21
Pabianice	51.66	19.36		978	462	542		0	0	0	0	0	0	0	1	0	1.54	2.42
Piaseczno	52.08	21.02	1410	1000	350	528	4	1	0	0	0	1	0	0	0	1	1.19	2.12
Piątek	52.07	19.48	834	1080		323	2	0	0	0	0	0	0	0	1	0	1.44	2.35
Piła	50.47	19.65	1410	918	804	1509	3	0	0	0	0	0	0	0	0	1	1.52	2.43
Płock	52.55	19.71	3281	5000	168	5000	2	1	1	0	1	0	1	0	0	1	1.36	2.29
Poznań	52.41	16.93	18231	20000		15992	1	0	0	1	1	0	1	0	0	1	1.88	2.78
Proszowice	50.19	20.29	1735	664	700	825	2	1	0	0	0	1	1	0	0	1	1.35	2.30
Przasnysz	53.02	20.88	1016	4134	600		3	0	0	1	0	1	0	0	0	1	1.32	2.26
Przemyśl	49.78	22.77	1500	2400		5000	2	0	0	1	1	1	0	0	0	1	1.55	2.48
Przeworsk	50.06	22.49	2386	3360		512	2	3	0	0	0	0	0	1	0	0	1.37	2.32
Rachanie	50.54	23.55	1410	724			4	0	0	0	0	0	0				1.57	2.51
Raciąż	52.78	20.12	1016	1800	500	990	3	2	0	0	0	1	0	0	1	0	1.33	2.27
Rawa Mazowiecka	51.61	16.85	2386	2646	192	1050	2	0	0	1	0	1	1	0	0	1	2.85	3.56
Rossosz	51.86	23.14		1452				1	0	0	0	0	0				1.02	1.96
Różan	52.89	21.39	1016	1980	25	390	3	0	0	1	0	1	0	0	0	1	1.24	2.18
Rzeszów	50.04	22.00	1000	3000			3	0	0	1	0	0	0	1	0	0	1.23	2.21
Rzgów	51.66	19.49	1410	1500	738	450	4	0	0	0	0	0	0	0	1	0	1.50	2.39
Sandomierz	50.68	21.75	3281	3360	2166		2	0	1	1	0	1	1	1	0	0	1.17	2.13
Sępólno Krajeńskie	52.51	21.07	1410	215		1619	4	0	0	0	0	0	0	1	0	0	1.21	2.14
Siemiatycze	52.45	22.88		1446		1710		0	0	0	0	0	0	1	0	0	1.07	1.98
Sieradz	51.60	18.73	2386	1992	792	1518	2	2	0	1	0	0	1	0	0	1	1.79	2.65
Sierpc	52.86	19.67	1410	2000	400	1104	4	0	0	1	0	0	0	1	0	0	1.37	2.32
Skaryszew	51.31	21.25	1016	900		1500	3	2	0	0	0	0	0	0	0	1	1.17	2.11
Skierbieszów	50.85	23.36	1410	490			4	0	0	0	0	0	0	0	1	0	1.24	2.21
Skierniewice	51.95	20.16	1410	1200		1000	4		0	0	0	0	0	0	1	0	1.32	2.24
Słupca	52.29	17.87	1735	3000		1775	2	0	0	0	0	0	0	0	1	0	1.76	2.64
Sochaczew	52.23	20.24	2386	1974	78	1050	3	0	1	1	0	1	0	0	0	1	1.29	2.22
Sokołów Podlaski	52.41	22.25	1410	1140		1380		0	0	0	0	0	0	1	0	0	1.10	2.02

Stanisławów	52.29	21.55		2400	240	504	4	0	0	1	0	0	0	0	0	1	1.15	2.08
Starogard Gdański	53.97	18.52	1016	1250		1246	2	1	0	0	0	1	0	0	0	1	1.53	2.52
Stary Sącz	49.56	20.63	1016	2500	1000	2564	2	0	0	0	0	0	0	0	1	0	1.30	2.29
Stężyca	51.58	21.55	1016	840	240	1200	3	0	1	0	0	1	0	0	0	1	1.13	2.07
Strzelno	52.62	18.17		800		706	3	0	0	0	0	0	0	0	1	0	1.57	2.49
Strzyżów	49.87	21.79		1000		200		0	0	0	0	0	0	1	0	0	1.22	2.20
Suraż	52.95	22.95		1116		594		0	1	0	0	0	0	0	0	1	1.15	2.02
Szadek	51.69	18.98		810	493	900		0	0	0	0	1	0	0	0	1	1.66	2.53
Szamotuły	52.61	16.58	1735	738		1120		0	0	0	0	0	0	1	0	0	1.83	2.79
Szczebrzeszyn	50.70	22.98		2120		2575		0	1	0	0	0	0	1	0	0	1.27	2.23
Szydłów	50.59	21.01	1735	1080	356	1176	3	0	0	0	0	0	0	0	0	1	1.23	2.18
Tarnogród	50.37	22.73		700		3391		1	0	0	0	0	0	0	0	1	1.37	2.32
Tarnów	50.01	20.99	1398	1600		4312	3	0	0	1	0	0	0	1	0	0	1.24	2.22
Tomaszów Lubelski	50.45	23.42		3955				0	0	0	0	0	0	1	0	0	1.64	2.57
Toruń	53.01	18.60	12000	15000		10000	1	0	0	1	0	0	0	0	0	1	1.46	2.41
Tuchów	49.89	21.05		230	1400		4	0	0	0	0	0	0	0	1	0	1.24	2.22
Tykocin	53.20	22.78		1422		2783	3	1	0	1	0	0	0	0	0	1	1.22	2.09
Tyszowice	50.62	23.70	1016	420			3	0	0	0	0	0	0	0	0	1	1.50	2.46
Warka	51.78	21.19	1398	2214	420	492	2	0	1	0	0	0	0	0	0	1	1.17	2.10
Warsaw	52.23	21.01	10000	20000	6000	28000		2	1	1	0	1	1	0	0	1	1.20	2.13
Warta	51.71	18.63		1560	306	1032	4	0	0	1	0	0	0	0	0	1	1.80	2.65
Wąsosz	51.56	16.69	1410	1800	150	751		0	0	0	0	0	0	0	0	1	2.94	3.63
Węgrów	52.40	22.02		2424		3011		0	0	1	0	0	0	1	0	0	1.12	2.04
Wizna	53.19	22.38	1016	1980	250	846	3	0	0	1	0	1	0	0	0	1	1.24	2.13
Wojsławice	50.92	23.55		1120		1037		0	0	0	0	0	0	1	0	0	1.22	2.19
Wolbórz	51.50	19.83		2405	270	867	3	1	0	0	0	0	0	0	1	0	1.42	2.32
Wyszogród	52.38	20.20	2386	2500	600			0	1	0	0	1	0	0	0	1	1.30	2.23
Zakroczym	52.44	20.61	1735	2226	400	558		0	1	0	0	1	0	0	0	1	1.25	2.18
Zambrów	52.98	22.24	1410	1050	135	564	4	0	0	0	0	0	0	0	0	1	1.20	2.10
Zamość	50.72	23.25		1662	1518			0	0	1	0	0	0	1	0	0	1.31	2.27
Zawichost	50.81	21.85	2386	756			2	0	1	1	0	0	0	0	1	0	1.15	2.11

List of figures

List of tables

Summary in Dutch (samenwatting)

Waarom zijn sommige landen rijk terwijl andere landen arm blijven? Wat zijn de oorzaken van de economische voorspoed van Noordwest-Europa - nog altijd een van de meest welvarende regio's ter wereld - en waarom is het voor sommige andere landen zo moeilijk om ook de vruchten te plukken van eenzelfde economisch groeitraject?

Discussies over timing en versnelling van economische groei van Engeland en Nederland tussen 1300 en 1800, en de redenen achter de onderontwikkeling van de economisch minder succesvolle landen, staan bekend als het Kleine Divergentie-debat. Er is minder bekend over de positie van Oost-Europa in dit debat. De bijdrage van deze dissertatie is tweeledig. Ten eerste identificeert het de Kleine Divergentie tussen de landen in het Noordzeegebied en het Koninkrijk Polen. Aan de hand van een grote hoeveelheid data over loonontwikkeling en inwoneraantal, laat deze dissertatie zien dat het bruto binnenlands product van de regio (Voivodeship) Krakow in de 16e eeuw al lager lag dan dat van Engeland en de Nederlanden in dezelfde tijd. Polen kende weliswaar een significante stijging van het inkomensniveau in de 16e eeuw, maar deze groei was niet voldoende om de inkomenskloof te dichten. De periode van economische groei werd gevold door een crisis. De inkomenskloof nam in de 17e en 18e eeuw opnieuw toe als gevolg van aan de ene kant de economische achteruitgang van het Voivodeship, en aan de andere kant de continue groei van de economieën in Noordwest-Europa.

Deze algemene conclusie over de trends van inkomensniveaus wordt versterkt door een vergelijking van reële lonen afgezet tegen de structuur van de werkgelegenheid. Aan de hand van een database van de jaarlijkse roggeprijzen van een reeks Poolse steden laat deze dissertatie zien dat er sprake was van een crisis in de integratie van de Poolse markten in de 17e eeuw. De situatie op de Poolse roggemarkt bleef ook na deze crisis slecht. De roggemarkt deed het in de 16e eeuw zelfs beter dan in de 18e eeuw. Ook in Europa fragmenteerde de goederenmarkt in de 17e eeuw, maar in tegenstelling tot Polen herstelden de Europese markten en vond er een hernieuwde integratie van de markten plaats in de 18e eeuw Daarom betoogt deze dissertatie dat er een divergentie had plaatsgevonden in de ontwikkeling van de markten in Polen en West-Europa in de 18e eeuw. Daarbij wordt in deze dissertatie aan de hand van een database een vergelijking gemaakt tussen lonen en prijzen in Londen en die van een reeks Poolse steden, uitgedrukt in een zogeheten subsistence ratio gebaseerd op een minimaal budget (bare-bones basket). De aldus gedefinieerde lonen laten zien dat Londen mogelijk rijker is geworden dan

welke Poolse stad dan ook in de achttiende eeuw. Daarbij laat de analyse zien dat de relatieve prijzen tussen de twee regio's uiteenliepen. Daarom kunnen de uitkomsten van een vergelijkend onderzoek naar relatieve inkomensverschillen afhankelijk zijn van de mate waarin bewerkte goederen deel uitmaken van het budget dat gebruikt wordt om nominale lonen om te zetten in reële loonsverschillen. Hoe meer industrieproducten en verwerkte graanproducten zoals bier en brood er in de basket zitten, hoe relatief armer Oost-Europa lijkt in vergelijking met Noordwestelijke gelegen landen. Als deze producten niet mee worden genomen in een dergelijke vergelijking, dan komt Oost-Europa er beter vanaf. Dit laat echter onverlet dat Polen economisch op achterstand stond. Bovenstaand effect kan mogelijk een verklaring geven waarom bij een vergelijking tussen de landen in het Noordzeegebied en het Oosten, de eerstgenoemde landen er zoveel beter uitkomen wanneer gekeken wordt naar industrieprodukten in vergelijking met oostelijk gelegen landen die zich specialiseerden in granen. Daarnaast is het goed mogelijk dat bewerkte producten in Polen relatief duur waren vanwege de hoge arbeidskosten voor geschoolde arbeiders. Polen had namelijk te maken met een hoge scholingspremie, wat vermoedelijk aangeeft dat er een tekort was aan opgeleide vakmensen. Dit kan ook worden verklaard door rent-seeking door het Poolse gildesysteem. Ten slotte is de hoge bierprijs te verklaren door de politieke economie van het land. Vanwege de politieke dominantie in Polen van de adel over de steden was de productie en handel in granen uitgesloten van belastingen. Aan de andere kant was de belasting op bier (betaald door de meeste burgers) een aanzienlijke inkomstenbron voor de staat.

Naast dat deze dissertatie in gaat op de Kleine Divergentie, biedt deze dissertatie ook een alternatieve interpretatie van één van de belangrijkste factoren ten aanzien van de onderontwikkeling, namelijk horigheid. Dit fenomeen is meestal beschreven als een gebrek aan juridische bescherming van de boeren door de staat, wat resulteerde in een hogere mate van exploitatie door de landeigenaren. Horigheid wordt meestal gezien als een remmende factor voor economische groei vanwege een aantal redenen: horigheid blokkeert de arbeidsmobiliteit tussen de agrarische sector en de middenklasse, het ontmoedigt agrarische productie, het verzwakt de opbouw van menselijk kapitaal en vermindert de koopkracht van de dorpelingen. Deze dissertatie komt met de hypothese dat horigheid ook een relatief positief effect had op bevolkingsontwikkeling in de urbane gebieden gedurende de crisis op de graanmarkt. Dit omdat de hogere lasten in huur in geld en arbeid die de horigen moesten afdragen, de commercialisering van landbouwproducten bespoedigde. Deze producten hadden anders hun weg niet naar de markt gevonden. Deze hypothese wordt in deze dissertatie ondersteunt met empirische bewijzen. Horigheid had inderdaad een negatief effect op bevolkingsgroei in

verstedelijkte gebieden onder ideale marktcondities, maar horigheid maakte de samenleving tegelijkertijd weerbaarder voor een crisis op de markt.

Deze dissertatie probeert de grenzen te verleggen over wat we weten over de onderontwikkeling van het vroegmoderne Polen. Echter, de discussie over de oorzaken en de exacte karakteristieken van de onderontwikkeling van de Poolse economie is hierna nog niet volledig voorbij. Zoals eerder besproken, identificeert deze dissertatie de fragmentatie van de Poolse goederenmarkt. Volgens de klassieke economische theorieën zou marktfragmentatie resulteren in een afname van de materiele levensstandaard. In tegenstelling tot wat mensen als Wallerstein beweren dat handel tussen West en Oost een negatief effect had op de economische groei in het Oosten, zien we nu dat een gebrek aan handel in het Oosten juist een remmende werking had op de Poolse economie. Echter, de vermeende link tussen marktcondities en verbetering in reële lonen of het BBP, is nooit empirisch gestaafd voor de pre-industriële periode. Als de slechte marktcondities een negatieve impact hadden op urbanisatie en reële lonen (de hoofdbestandsdelen van de BBP-extrapolatie) en waarschijnlijk een bijdrage leverde aan het voortbestaan van horigheid, dan is het cruciaal de oorzaken van de marktfragmentatie te onderzoeken.

Polen is een interessante case study voor economische historici omdat, anders dan in de meeste West-Europese landen met een gecentraliseerd regime, Polen een ander pad volgde: politieke macht werd van het centrum naar een lokaal niveau verplaatst. Deze politieke ‘herfeodalisatie’, oftewel een terugkeer naar besluitvorming op regionaal niveau zoals in de Middeleeuwen, opgeteld met de versterking van de horigheid, maakt de Poolse geschiedenis ook tot een nuttige achtergrond voor het aanwijzen van de cruciale factoren voor de modernisatie van de Westerse buurlanden van Polen.