Serfs and the city: market conditions, surplus extraction institutions and urban growth in the Kingdom of Poland, 1500-1772.

Mikołaj Malinowski
Utrecht University Economic and Social History Research Team

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ABSTRACT

This research analyzes a novel dataset of populations of big and small cities located in the kingdom of Poland between 1500 and 1772. The results indicate that a higher degree of surplus extraction in the neighbouring agricultural sector hindered urban growth in the period of market expansion between 1500 and 1600. Conversely, during the subsequent period of market contraction serfdom allowed for commercialisation of agricultural production and, in turn, urban growth. It was, however, insufficient to substitute the crucial role of the long-distance trade in the process of overcoming the 'Malthusian ceiling' on the formation of the big urban centres. The relatively low urbanization levels in Poland were a result of the destructive wars of the 17th century. The wars crippled the urbanization levels in the country and brought about a protracted market crisis that prevented the long distance-trade and, in turn, the formation of new urban centres.

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INTRODUCTION

The level of urbanization represents a capacity of an economy to overcome the 'Malthusian ceiling' on urban growth. This growth deepens with the capacity of a society to organise redistribution of resources between a city and both its agricultural hinterland and the other cities. Commercialisation of agricultural production and long-distance trade possibilities are therefore vital for urban growth.

Urbanization is typically defined as a share of population living in the cities bigger than 10,000 inhabitants (De Vries 1984; Malanima 2009). In the late Middle Ages most of Europe was characterised by similarly-low urbanization levels, with a profound exception of the Mediterranean economies. A gradual increase in the urbanization levels between the 16th and the 18th centuries in North-Western Europe set against their stagnation in the eastern part of the Continent is a vital part of what is known as the Little Divergence in economic performance within Early modern Europe. (Malanima 2009; Malinowski 2013a; Van Zanden 2009). Furthermore, the growth in urbanization levels in England was a result of an increase in the number of big cities in the country (Malanima 2009). Conversely, in the Kingdom of Poland between 1600 and 1772 no new big cities emerged, despite the fact that there was a significant growth in the size and the number of small and middle cities in the country (Cerman 2012; Bogucka 1981; Bàcskai 1995; Janaczek 2001; Kuklo 2009). This inability of the growing number of the middle-size cities to evolve into bigger urban units can be seen as a manifestation of the 'Malthusian ceiling'.

This stagnation and 'backwardness' of the Polish urban system in respect to the West coincided with a divergence in the legal standing of the villagers between the east and the west of Europe known in the literature as the rise of the 'second serfdom'. In general, the west of the Continent enjoyed relatively secured property rights. This allowed for accumulation of land and capital by the farmers that resulted in formation of big private farms, proletarization of the landless masses and progressive commercialisation of agricultural production. Conversely, territories located east to the river Elbe were dominated by the demesnes of the noble landlords that were fuelled by the surplus extracted from the serfs. Surplus extraction and weak property rights discouraged development of big farms own by the villagers. This divergence in socio-political systems between 'capitalistic' and 'feudal' mode of production have been argued to resolve in the different trajectories of economic growth (Brenner 1996; Gunst 1989). Conversely, serfdom has been also seen not as a direct cause of the progressing underdevelopment but as a symptom of a much deeper problem. Crisp (1976) summarized this motion by describing neighbouring Russia with the words: '[The country] was backward not because the serf relation dominated her economy. It was her backwardness that made the serf relations persist'.

In order to understand why the growth in urbanization levels in early modern Poland was marginal, this paper analyzes the drivers and inhibitors of the urban growth in the country with a use of a novel dataset of 270 small and big cities between 1500 and the first partition of the country in 1772. This research addresses the problem of the

'Malthusian ceiling' on urban growth and links it to economic geography and agricultural class structures. The research analysis the impact of both the phenomena in the context of market conditions in the country.

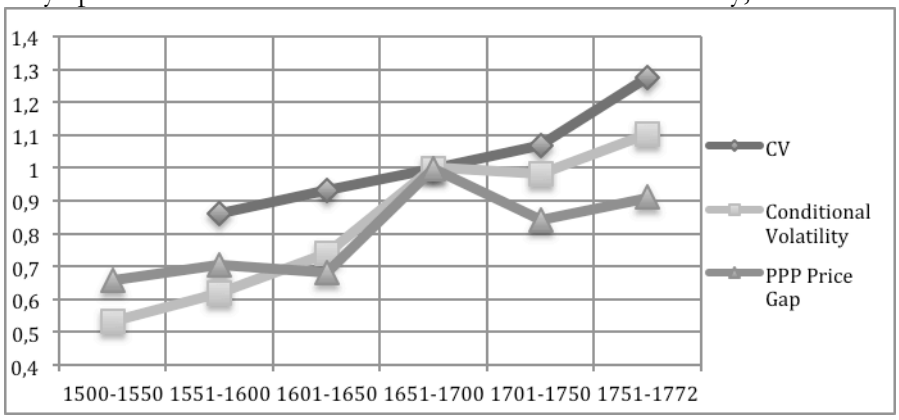
In more detail, Brenner (1985) famously argued that the economic impact of the agricultural class structures was subjected to market conditions. This motion is visible in the theoretical and empirical literature of the topic. In line with the mainstream economic literature that assumes efficient market structures, secure property rights and economic agency are conducive to growth (North & Thomas 1972; Hayek 1993, Helpman 2004). From that standpoint, serfdom is therefore inherently unfavourable to the Smithian growth processes. It is 'accused of': limiting labour mobility, discouraging agricultural productivity and decreasing the purchasing power of the villagers (Cerman 2012; Kula 1976; Dennison 2011).

Conversely, economic historians have traditionally argued that a gradual and sustainable improvement in market conditions, understood as lower transaction costs and price volatility, begun only in the 18th century and accelerated in the 19th (O'rourke & Williamson 2002; North and Thomas 1972). Domestic markets in the early modern period, especially in the case of 'landlocked' Eastern Europe have been regarded as thin and disintegrated. (Sachs 2005). Due to chronic market and harvest failures, serfdom, together with corvée, have been argued as an institutional design suitable for such imperfect conditions (Millward 1982; Kahan 1973; Bush 1996; Kula 1976). From the point of view of the landlords, serfdom could have been more than just a rent-seeking practice. According to Bush (1996), corvée duties provided a solution to the absence of wage labour and the unwillingness of peasants to commercialise their production in order to pay the rent. In turn, legal bondage provided the villagers with sustainable subsistence; serfdom protected the peasantry against price volatility by allowing it to transfer the costs of bad harvest and market failures on the demesne at the cost of the surplus extraction (Kula 1976). From the point of view of the cities, surplus extraction by the demesne allowed for indispensable large-scale commercial farming in the societies with scarce supply of labour and thin markets (Bush 1996, Mironov 1996, Kula 1976). Furthermore, due to the persistent high price volatility and the grim perspective of harvest failures, peasants were argued to have been risk- and market-averse (Chayanov 1966, Epstein 1991, Dennison 2011). As a result, even if the enserfed villagers had been provided with secure property rights, they would still have been unwilling to increase their market participation above the bare minimum and, in the long-run, they would have failed to accumulate enough land to resist market and harvest imperfections, as did their counterparts in the West (Epstein 2001). All in all, serfdom and surplus extraction could have been beneficial for the urban growth in the era when trade connections with the other cities and villagers were scanty. Recently Zurimendi (2013) empirically demonstrated that abolishment of serfdom in East-Central Europe could have had an adverse effect on urbanization. Additionally, Klein and Ogilvie (2013) argued that higher degree of serfdom in 17th century Bohemia correlated with a higher degree of non-agricultural productivity. All in all, secure property rights in agriculture have been argued as beneficial for urban growth for that they reinforced the opportunities provided by the

markets. On the other hand, serfdom has been seen as an apt response to market imperfections, which limited such opportunities.

Recently, Bateman (2011) challenged the traditional view that early modern period was characterised by chronically unfavourable market conditions solely. While studying Western Europe she identified the 16th and the 18th centuries as periods of relative integration of the domestic markets that were interrupted by the crisis of the 17th century. Furthermore, Malinowski (2013b) identified that domestic markets in Poland were well integrated in the 16th century, disintegrated as a result of wars and calamities between the middle of the 17th and the beginning of the 18th century, and did not recover before the late 18th century (see Graph 1). Given that serfdom was permanent in the country in the early modern period, in line with these findings, it operated under both favourable and unfavourable market conditions.

Graph 1: Metrics of market conditions in the Kingdom of Poland based on annual silver rye prices from seven cities located in or near the country, 1500-1772.



Source: Malinowski (2013b). The estimates for the period 1651-1700 = 1.

Recently, Bosker et al. (2008) proposed a model and an empirical method that allows analyzing the drivers of urban growth with a use of regression analysis. Their empirical strategy proposes as to how to address the issues related to economic geography and political institutions located in a city. There are two main shortcomings of the approach proposed by Bosker et al. (2008). Firstly, the methodology accounts only for the drivers of growth of the big cities. As a result, it overlooks the crucial issue of the evolution of smaller rural settlements into urban centres. Therefore, the framework does not help to understand where do the big cities come from in the first place. Secondly, the study does not address the issue of the agricultural class structures in the rural hinterland of a city. The latter issue has been, however, famously modelled by Kula (1976). This research combines the two models and builds a novel one tailored for analytical analysis.

The results of the empirical analysis exemplify that serfdom was disadvantageous for urban growth in the period of market expansion and beneficial in the time of market contraction. Therefore, it could not have induced the stagnation of the 18th century. Furthermore, the results suggest that the medium-size cities could not overcome the 'Malthusian ceiling' and evolve into bigger entities without the trade with the other cities regardless of the conditions in its rural hinterland. As a result, due to the trade privileges

of the existing big cities and the market disintegration urbanization in the 18th century was limited despite the growth of the small and medium cities fuelled by the surplus extraction.

POLISH URBANIZATION

Bogucka (1981)- a profound scholar of pre-industrial Polish economic development, branded cities in early modern era as 'capitalistic islands in a feudal sea'. This assessment can be understood in two distinctive ways that lead to two conflicting definitions of a city used in the historiography of the topic. According to the scholars that see a city as a mini-agglomeration, the phenomenon is defined as an urban dwelling of minimum 5,000 or 10,000 inhabitants. This approach is motivated not only by the obvious data limitations but also by a tacit assumption that after reaching this artificial threshold the 'mode of production' in such a dwelling is different to that of the rural proto-industry (Allen 2000; De Vries 1984; Bairoch 1988). Bogucka and Samsonowicz (1986) reinforced this intuition with the estimates of the changes in the occupational distribution within the Polish cities that indicate a correlation of the employment structure with a city size. Big cities in Poland were characterised by a marginal share of population working in agricultural production, whereas agricultural workers often dominated smaller cities. The second stream of literature focuses on a unique legal position of the city dwellers in a feudal society. According to this approach, a city is a settlement with distinct 'city rights'. It possesses a charter giving it judiciary and economic privileges that change the socio-political position of its citizens. Being considered a city is therefore independent from the population size. The literature concludes that Eastern Europe developed a network of small cities, but for a yet unidentified reason their growth into big cities was constrained (Cerman 2012; Bogucka 1981; Bàcskai 1995; Janaczek 2001). As a result, there is a considerate difference between various accounts for the Polish urbanization levels resulting from the two different operationalizations of the urban populations.

Table 1: Different accounts of urbanization levels in early modern Poland.

Based on urban population in cities bigger than 10,000 inhabitants						Based on population in all cities with city rights
	Europe	Great Britain	Poland (in present boarders)			
Year	Malanima (2009)	Bosker et al. (2008)	Wójtowicz (2006)	Bosker et al. (2008)	Malanima (2009)	Wójtowicz (2006)
1400	4.3	2.66		2.18	1.3	
c.1450			2.7			15
1500	5.6	2.1		3.28	5.4	
c.1550			2.7			25
c.1575						
1600	7.4	5.86		4.64	6.6	
c.1625			3.4			25
1660						15[b]
1700	8.2	11.32		3.13	3.8	
1750	8		3.3		3.4	20
1800	9	23.14	2.9[a]	3.07	4.1	19[a]

Source: As noted in the table. a) in 1810; b) based on Gieysztorowa (1989).

These accounts are presented in Table 1. The dissimilarities between the accounts stem from differences in: 1) the definition of a city; 2) used estimates of the overall population; 3) the estimates of the populations of the individual cities. Despite these differences the studies depict similar levels and trends of Polish urbanization. The only clear outlier is the estimate for the 16th century based on the 'big-cities specification' proposed by Wójtowicz (2006) that implies a lack of increase in urbanization in the Late Middle Ages and beginnings of the early modern period, whereas other estimates indicate a slightly more optimistic vision of the situation in the 16th century.

The gap between the Polish and the Western-European urbanization levels originated in the late Antiquity. Whereas the West became a part of the Roman Empire, the East was deprived of its civilisational benefits. Seeds of many of the Western cities were already laid in the Roman era, whereas the idea of a city was alien to the Slavs. In the East, the process of concentration of population and division of labour was linked to political centralisation at local levels. The patrimonial feudal prerogatives of the local princes (*lex ducale*) allowed them to demand poorly waged and preferably artisan labour from the villages that clustered around the ducal court. Urbanization in the early Middle Ages was, however, still marginal.

Table 2: Number of cities in the Kingdom of Poland compared with Europe and Wales, 1400-1772.

	No. Cities	No. new Cities	No. cities 5,000+	No. cities 10,000+	No. cities >10,000 in Wales	No. cities >10,000 in Europe
1400		305			4	118
1500	706	301	8	6	5	209
1600	932	256	16	9	7	290
1650	902	66				
1700					11	287
1750-1790	507a		26	9	22	361

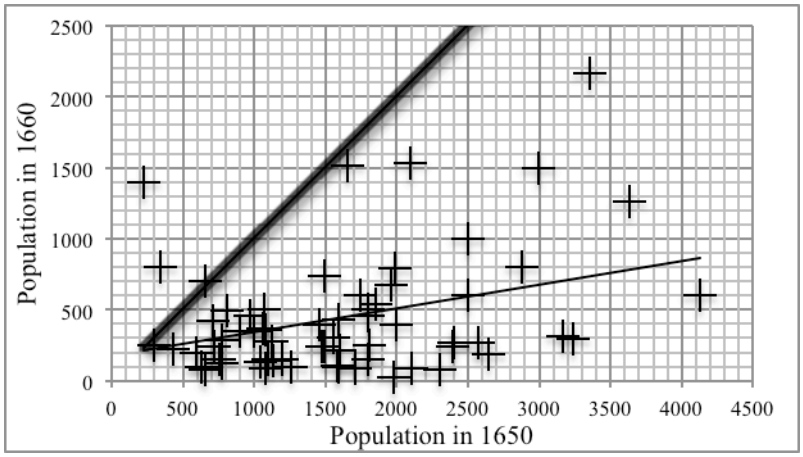
Source: Kuklo (2009), Gieysztorowa (1981), Bogucka & Samsonowicz (1986), Malanima (2009). A) located in the boarders as defined after the first partition of 1772.

The differences in urbanization levels induced migration from the West to the East of the Continent. Additionally, ever since the late Middle Ages the monetary revenue from the cities became increasingly more important to the feudal lords. These incentives bought about so-called 'city plantation movement' between the 13th and the early 17th century. At that time the 'Western model of urbanization' was transplanted into Poland. As a result of this process, most of the existent urban settlements were re-established with the 'Western' type of city rights based on the German example and, more importantly, hundreds of novel urban initiatives were undertaken. Sovereigns, together with the local noblemen, were setting up cities in their respective domains in hope for monetary income from the rents and the taxation of the growing trade. Given that a city had its own judiciary privileges, every urban initiative, even one undertaken by the noblemen in their respective domains, required a charter provided by the sovereign as it

effectively limited the royal prerogatives. The process that is known as 'Colonization based on the German law' resulted in the creation of a network of small cities (Wyrobisz 1966; 1981). Up until the beginning of the 17th century, around 300 urban location initiatives were undertaken each century. The average distance between the cities was 15-25 km, depending on the region (Kuklo 2009). The process resulted in an unprecedented and rapid increase in the urbanization levels in Poland. By 1500 the kingdom 'caught up' with the European average.

This on-going urban growth was interrupted by the European-wide crisis of the 17th century. In the Polish case it manifested itself primarily by numerous wars that had devastating impacts on the demographics of the country. The most severe wars occurred in the period around the 1650s when the Ukrainian uprising piled up with the Swedish Deluge and the War with Russia. According to various studies, up to a quarter of the overall population of the kingdom may have been killed at that time (Przyboś 1957). According to various authors the crisis was more severe for the urban sector. Numerous authors estimate the drop in the urban population of the country up to as much as 70 per cent (Gieysztorowa 1981; Przyboś 1957). A sample of 65 small cities based of the database used in this research indicate a roughly similar drop in the urban population (see Graph 2). Wars and outbursts of various epidemics lasted till the second quarter of the 18th century.

Graph 2: Scatter-plotted population in 1650 against the population in 1660 in 65 Polish cities with populations below 5,000 inhabitants.



Source: See the text. Malinowski (2013b).

These events induced institutional and political crisis that lasted until the second half of the 18th century. According to Malinowski (2013b), the wars destroyed the urban network in the country and made the land transport costly, effectively bringing about, after a period of favourable market conditions, a protected market disintegration in the country that lasted till the late 18th century.

The 17th century altered the patterns of Polish urban development. According to Bardach (1957), up to the early 17th century it was the royal urban initiatives that developed more successfully. At that time, nearly all of the cities with a population above

5,000 were associated with the king. Conversely, the researcher argues that, in the subsequent period, it was the private city initiatives, particularly located in the vast noble estates (*latifundia*) that begun to grow better than the royal ones. As presented in Table 2, the number of cities with more than 5,000 inhabitants nearly doubled between 1600 and the second half of the 18th century. 60 percent of these new middle-size cities belonged to the noble families. This expansion of the small cities located in the domains of the nobility into middle-size cities was an important qualitative change in the pattern of the Polish urbanization. Despite this vast increase in the number of middle-size cities the number of the big cities remained the same. As a result, urbanization levels stagnated in the 18th century.

SERFDOM

In the course of history, serfdom has manifested itself in numerous region-specific forms. For this reason, the definition of the phenomenon varies between individual studies that place the accent on different aspects on the phenomenon. Serfdom is closely related to or even in some cases interchangeable with: corvée, submission and legal bondage. Nevertheless, all these classifications seem to have shared some common denominators. They all boil down to surplus extraction from a villager by the landlord by means of supra-economic coercion. According to Blum (1971), 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 usually resulted in, among other effects: coerced exchange based on non-economic factors, constrains on spatial mobility, weak property rights and enforcement of occupation. All these features were arguably intended to allow for one-sided changes in contractual obligations and a subsequent surplus extraction from the serfs by the landlords (Kula 1976).

Manorial estates dominated the feudal environment of rural Poland. In general, the manors were divided between a demesne (*folwark*) and the land devoted to a rural peasant commune (*gromada*). Furthermore, the land leased to the peasant commune by their landlord was divided into the land-holdings of small farmers (*kmiecie*) and the common land. Throughout the agricultural cycle, parts of the land used by the kmiecie were used as common fields. Additionally, there is much evidence of trade in land between the members of the gromada (Guzowski 2011). Arguably, landlords used the 'independent' political organization of the gromadas to expand their influence on the inhabitants of their manors (Trzyna 1963).

The manors belonged either to the state/king (*the Crown of the Kingdom of Poland*), a noble family or the Church. The two latter groups held ancient rights to the land, bought it from the Crown or received it as a hereditary gift from the monarch. After 1571 the King of Poland was elected from among domestic nobles and foreign aristocracy. As a result, though the issue was often revisited and negotiated ever since the Middle Ages, the private land-holdings of a Polish nobleman that became the king were effectively separated from those of the state (Rutkowski 1947). The state's/royal land accounted for

around ten per cent of the total arable land in the country (Nowak 1975; Madurowicz & Podraza 1958). These holdings could have been leased to the noble families or served as a collateral for the public/royal debt. They were still formally part of the royal/state domain.

Next to the already mentioned plantation of the new cities, the 'Colonization under the German law' consisted of establishing of new villages. In order to attract new settlers from Western Europe, local lords offered them favourable rental conditions. The novel design of agricultural structures was gradually implemented, with local variations, in most of the country in order to prevent a migration within the country that could have been otherwise induced by inequality in the contractual obligations. According to this so-called 'German law': 1) the peasant families had the right to hereditary lease of the land; 2) they also had the right to transfer the lease provided the landlords gave consent; 3) the contracts stipulated the exact size of the rent in money and/or kind; 4) as well as specified the exact extend of the labour obligations for the landlord that were usually not greater than a few days a year; 5) the peasant families had the right to leave a village after fulfilling certain specified conditions; 6) the village had a right to its own political organization. All in all, the rights of the villagers were well defined and secure and there was little surplus extraction at the time of the installation of the new villages (Bardach 1957).

The reconstitution of serfdom in the country in the late 15th and the early 16th century altered these original deals. The process consisted of both a legal change on the country level and alterations of the original contracts on the local level. On the national level, the king and the parliament imposed new laws that worsened the position of the peasantry and allowed for extraction. Namely, in 1496 the peasants' mobility was constrained by the introduction of a new general law stipulating that only one son from a *kmiecie* family was allowed to leave a village for training in a city. In 1520, a subsequent law was passed that increased the duties of these farmers to one day of unpaid work per week per one *łan* (ca. 16–26ha.) of land they were entitled to. The most important change came in 1524, when the inhabitants of the lands belonging to the nobility lost the protection of the royal court. This effectively meant that there was no longer any legal constrain on the nobles to prevent them from disrespecting their contractual obligations. This opened avenues for a further surplus extraction. In more detail, on the local level the last legal change opened different development paths of the agricultural class structures in the lands belonging to the king and those belonging to the nobility. The peasantry from the first group could, at least officially, defend themselves in the royal court against the actions of the king's regional representatives, known as *Starosta* who could benefit the most from the surplus extraction. According to Bardach (1957), there were important differences between the organization of labour in the royal and the private domains. These were based primarily on the exact extent of the corvée duties and on the size of the demesne. Specifically, on the royal manors the workload performed above the legally specified corvée duties was much more likely to be remunerated. Conversely, the nobility in its own holdings was more likely to raise the corvée duties. According to Kochanowicz (1989), these duties increased to five days per week in the

17th century and even to six days in the 18th century. Moreover, the nobility could coerce the labour to work with their own tools and even demand working with helpers in order to increase the surplus extraction even further. As a result, villages often bought the right to substitute their corvée obligations with payment in money (quitrent). In any case, the overall obligations, regardless if paid in money or in labour, were higher in the privately owned domains. Furthermore, due to the weaker property rights, landlords could enlarge their own land holdings at the expense of the gromadas. Falniowska-Gradowska (1982) presented that, in the Voivodeship of Cracow in the 18th century, the share of the demesne in the total arable land of the manors was on average 25 per cent in the noble holdings against 10 per cent in the royal/state ones. The difference between the shares of the demesnes in the two types of manors was persistent despite the volatility of the exact levels between various regions of the country. According to Klein and Ogilvie (2013), this feature can be used as a proxy of a higher degree of serfdom in a region. Lastly, the exact arrangements in the country were not homogenous and there was a regional differentiation. For example, the degree of serfdom in the east and south east of the country was arguably greater (Mączak 1976). Conversely, inhabitants of the king's domain in the north of the country were exempted from unpaid labour altogether (Bardach 1957). It seems, however, that the peasantry living in the royal domain generally enjoyed more secure property rights than their counterparts in the private lands, who were in turn coerced to perform duties above their original contractual obligations. A study of the 19th century Polish rural economy suggests that the dissimilarity between the two types of domains that originated probably in the 16th century was persistent (Kochanowicz 1981). All in all, the small farmers in the king's domain in comparison to their counterparts resigning in the lands belonging to the nobility: 1) enjoyed the protection of the Crown against local officials; 2) had stronger property rights as the ancient mutual contractual obligations between the landlords and the peasants were still of some value; 3) had their payments and/or corvée obligations risen less after ca. 1500; and 4) were more likely to be remunerated for their additional work on the manor.

MODEL

A popular proverb states: 'all models are wrong, but some of them are useful'. Models, especially in economic history, unavoidably both oversimplify and overgeneralise the issues they represent. Nevertheless, in order to address a multidimensional issue such as urbanization analytically, one only has to focus on a limited set of the most important factors. In order to identify the drivers of urban growth empirically and push the frontier of our knowledge on pre-industrial Polish urbanization this study proposes a model of urban growth under feudalism. This hypothetical model is primarily intended for regression analysis, which will verify the alleged importance of the components of the model. For this reason it focuses on phenomena, which can be operationalized and quantified.

The model builds up on two prominent studies of pre-industrial urban growth and feudal economy conducted by Bosker et al. (2008) and Kula (1976). According to the

best knowledge of the author, there is no model of urban growth tailored for regression analysis that accounts for the degree of serfdom in the rural hinterland. Bosker et al. recently proposed a state-of-the-art method of empirical analysis of pre-industrial urban growth. Their model accounts for the crucial dimension of economic geography and political institutions that are located in a city. It focuses only on the big cities. Furthermore, Kula derived a theoretical model of feudal economy. Building on Levis (1955) he divided the economy into two sectors: a 'subsistence sector' and a 'capitalistic sector'. The core idea of the model is that economic growth can occur only in the capitalistic sector, which is dominated by the mechanisms of market economy. Conversely, according to Levis the 'subsistence' sector 'aims' only at substance and self-reproduction and limits commercialisation to a minimum. Kula challenged this motion and argued that villagers are always likely to sell the surplus production to increase their standards of living. This research proposes to address this fundamental issue by assuming that the 'commercial' sector is always linked to the markets, whereas the 'natural' sector limits its market participation under unfavourable market conditions.

The rest of this section reads as follows. First, the text presents the core elements and assumptions of the model. Second, it analysis what outcomes does the model predict given the changes in the degree of serfdom and market conditions. Lastly, the text discusses the issue of operationalization of the elements of the model.

ASSUMPTIONS AND ELEMENTS OF THE MODEL

(1) A city in order to both sustain its population and grow needs access to three 'resources': (a) food, (b) immigrants, and (c) outlets for its manufacture production. (2) A city can obtain these 'resources' only from another town, or its own hinterland. The hinterland consists of a demesne and villages. Due to the 'Malthusian ceiling' on per capita agriculture output and the constant possibility of harvest failures, a pre-industrial city could not relied only on its limited immediate agricultural surrounding (i.e. the one harvested by the citizens), not only to feed its growth but also to nourish a stable population. Additionally, due to a negative demographic-urban growth in the period, pre-industrial cities were dependent on an inflow of immigrants (Kuklo 2009; Baszanowski 1995). Lastly, since manufacturing productivity was the essence of a city, without an outside demand for its products, the development of industry and services in a city was severely limited.

(3) Next to the abovementioned market-based relations, a city can attract resources by means of political institutions located in a city. Weber proposed a distinction between 'producer' and 'consumer' cities. (Bosket et al. 2008) Whereas the growth in the first group was induced by a city's productivity, the second was a result of politically, as opposed to solely market, coerced redistribution of resources in a country. For example, a bishopric or royal court collect taxes from a larger area which 'triple down' from these institutions and fuel urban growth.

(4) City can obtain the 'resources' from another town only by means of trade. Cities are more likely to trade with each other under favourable market conditions. This 'trade potential' depends on the existence of the trade partners that is known in the

economic geography literature as the 'foreign market potential' (hereafter FMP) (Krugman 1996). Cities can benefit more from their FMP if they have access to trade routs (Helpman 2004). The issue of economic geography is recently gaining a significant momentum in the historiography. Unger (2008) considers that market integration can even allow a city to overcome the Malthusian limitations due to an increase in a city's supply basin. According to Bosker et al. (2008), FMP was a crucial driver of urban growth in Europe ever since the 15th century. The beginning of the importance of the FMP coincided with the late medieval improvement in the market conditions argued by Bateman (2011). Furthermore, Bosker and Buring (2010) have also shown that a decrease in transportation costs was vital for the increase in trade with these potential partners and growth of individual cities in the pre-industrial era. Furthermore, Jacks (2004) argues that commodity market integration and labour market integration come hand in hand. It is argued that labour market integration resolves in formation of an urban hierarchy that stimulates the growth of the big cities (Russel 1972).

(5) A big city and a small city react differently to the FMP. For the big cities the proximity to another urban centre translates into trade possibilities. On the other hand, big urban centres in Poland were armed with a set of political and trade privileges. The most important of these were: 1) the mandatory usage of trade routes that directed the merchants only to the selected cities (*przymus drogowy*); 2) staple right (*prawo składu*) that forced the merchants to trade in the cities that they had been directed to (Lewicki 1910; Rybarski 1958). As a result, the big cities that had formed in the late Middle Ages could have used these privileges to suppress the growth of the small ones by redirecting the 'resources' towards itself.

(6) Demesne is always producing for the market regardless of the market conditions. According to Cerman (2012), in opposition to the Western landlords, seigniorial income in Eastern Europe was primarily derived from operating commercial demesne economy, which accounted for 2/3 and 9/10 of their total income. According to Kula (1976), the demesne's production is always put on the market, i.e. for a city to buy, as it always generates enough food above the nutritional needs of the landlord. Furthermore, the landlord always needs to raise funds in order to pay for the work of the agricultural workers. Studies by Kamler (1990) indicate that most of the landlords were hiring additional labour from the market because the labour input from the corvée duties usually did not match the demand of the manors.

(7) Productivity of the villagers working on their own plots of land is always higher than their productivity when they work on a demesne. This is a very popular assumption widespread among the literature of the topic (Mironov 1996). The underlying assumption is that serfs (even people in general) are more motivated when producing for their own benefit.

(8) The agricultural output of the villagers is assumed to be around the level of subsistence. This has been theoretically argued by Chayanov (1966) and Kula (1976), and was recently empirically demonstrated by Malinowski (2013b).

(9) Villagers can restrain their market exposure to a minimum and are likely to do so under unfavourable market conditions. Interaction with the market takes form of

trade and provides with an incentive to move to a place with higher real wages. According to Zurimendi (2013) real wages in the cities are always higher than in the rural areas especially under serfdom. The minimum sum in money that a villager has to raise by selling his crops is his rent and the costs of a basket of indispensable manufactured products produced in a city. Under favourable market conditions, villagers engage in market exchange to improve their standards of living. Unfavourable market conditions translate into higher risk of market participation. Because villagers produce just enough food to sustain themselves, the expected returns on market participation after accounting for high risks of market failures are close to zero or can be even negative (see Epstein, Chayanov 1966).

Table 3: Percentage of the former villagers in the amount of all the new people acceptance to the city law in the time of market expansion and market contraction, various cities.

	1500-1600	1660-1750
Poznań	23%	9%
Chojnice	46%	15%
Kraków		12%
Gniezno		8%
Warsaw	50%	
Toruń		11%
Biecz	69%	47%

Source: Bogucka & Samsonowicz (1986). Samples assigned to either of the periods.

Historiography provides information that indicates that market exposure of the villagers was conditioned upon market conditions. Table 3 provides information about migration of the villagers to the cities. It yields that in the 16th century, i.e. in the period of market expansion, much more villagers were migrating to the cities and were granted with burgher rights. Conversely, in the century of market contraction after the wars of the middle of the 17th century, their share in all the new burghers dropped significantly. Additionally, Kula (1976) argues that in the Polish early modern literature a topic of a peasant coming to a market to sell his crops was much more popular in the 16th century and nearly disappeared in the 18th.

(10) There is no capital investment in agricultural productivity. According to Kochanowicz (2006) a Polish noble had neither opportunities nor incentives to maximise his commercial production. According to Kula (1976), capital investment in agriculture occurred primarily to offset decreasing terms-of-trade, i.e. to keep the profit steady rather than maximise it. Lastly, according to Brenner (1996), in feudal agriculture investment primarily took form of an increase in the political control over serfs that would increase labour input, rather than in the capital or technology.

(11) Landlord uses the most of the income of a demesne to purchase luxurious products from import. According to the Engle's law, due to his high individual income, he is argued to spend it on luxurious goods. These good are most likely to be produced in specialised urban centres or even abroad rather than in the local city.

(12) Peasantry uses the surplus income to purchase simple manufactured

products from the nearby city.

PREDICTED IMPACT OF SERFDOM

As has been previously described, in the private domain, where serfdom was more prevalent, the demesne accounted for a higher share of the manor in comparison to the royal/state manors. Additionally, the peasantry had to pay higher rents in corvée duties and/or money. In other words, due to the more severe surplus extraction, peasants either had to direct their productivity to the demesne or increase their market exposure to pay for the higher quitrent. Corvée was lowering the total output of a serf who could have otherwise produced more on his own land due to assumed higher productivity. As a result, the peasants enjoyed less disposable surplus that they could have spent in exchange for the products from the cities as their surplus based on land, labour or money was redirected to the nobleman via the demesne and was likely to be spent on luxurious products from abroad. Conversely, as has been mentioned, in the state/royal manors a peasant's labour on top of the contractual obligations was more likely to be rewarded with money. This allows the peasants to limit their market exposure even further as they could use this income to pay for the rent and basic manufactured products.

The impact on urban growth of the thus defined agricultural structures should differ depending on the different degree of serfdom and under different market conditions. Under favourable market conditions, the lower degree of serfdom should be more beneficial from the point of view of a city. This is because a city can obtain food both from the demesne and from the small farmers. The farmers are likely to direct their surplus to the cities in exchange for manufactured products. Nobility, on the other hand, is more likely to spend their income outside the small city. Therefore, the larger the disposable surplus of the small farmers the higher the chance of Smithian growth between the sectors. Consequently, the cities benefit from the limited size of the demesne. Additionally, the peasants are also likely to move to the cities due to labour market integration. In the areas with more intense serfdom this could have been much less likely, due to the limitations on labour mobility.

Under unfavourable market conditions, small farmers are likely to avoid markets and limit their exchange only to the extent that would allow them to pay for rent and the most basic products. As a result, the city can only trade with the demesne. In this scenario, it is in the best interest of a city for the demesne to be as large as possible. Additionally, the greater the surplus extraction from the peasants the more food will be redirected to the cities. Moreover, the greater the quitrent the higher the compulsory market exposure of the peasantry. Conversely, due to the partial payment in money for work in the state's/royal domain this exposure is limited even further. Due to labour market disintegration there is little incentive for the villagers to move to the cities.

OPERATIONALIZATION

Equation 1 presents the basic empirical model tailored for a regression analysis. An additional inclusion of interaction terms with the time dummies should allow for

investigation into different effects under different time periods characterised by different market conditions.

$$\begin{aligned}\text{LogPOP}_{i,t} \text{ (or) } \text{Pop}_{i,t} / \text{Pop}_{i,t-1} = \text{Const.} + \text{LogFMP}_t + \text{Access\_to\_River}_i + \text{Access\_to\_Land\_Trade\_Route}_i \\ + \text{LogFMP}_t*\text{Access\_to\_River}_i + \text{LogFMP}_t*\text{Access\_to\_Land\_Trade\_Route}_i + \text{Degree-of-Serfdom}_i \\ + \text{Consumer\_City\_Institutions}_i + \text{Other\_Control\_Variables} + u_{it}\end{aligned} \quad (1)$$

This paper disentangles two types of trade routes: one based on the access to navigable rivers (Vistula, Bug, Pilica, Wieprz and Narew) and the second on the land routes. The information on the land trade routes in pre-industrial Poland was based on the '*Atlas Historii Polski'* (Jankowiak-Konik 2011), which presents information on the situation in the 16th century. The relation between the land trade routs and urban growth could be endogenous, i.e. big cities could have, in turn, induced the appearance of new roads. Most of the big-cities and in turn land trade routs developed in the Middle Ages, i.e. before the studied period may, therefore, be treated as exogenous. This study, primarily due to the lack of better data and the petrification of the system of the big cities, assumes that the main routes stayed the same throughout the period and that their conditions, but not the existence, deteriorated after 1650s.

Furthermore, after Bosker et al. (2008) the FMP is operationalized a sum of all the populations of all the domestic and foreign cities weighted by the square of their distance from the studied city. Due to data limitations, and given that our primary interest is access to the cities with possible food surplus, this paper takes into consideration only the cities with 5,000 or more inhabitants, as they all served as important hubs in the grain trade.

$$\text{FMP}_a = \Sigma \text{Pop}_b / \text{Distance}_{(km)}^2{}_{a\text{-}b} \quad (2)$$

Bosker et al. (2008) also account for the market access in their computations of the FMP. They multiply the distance between any pair of cities by a certain weight depending on the market access of these cities. The researchers assume that the effect of market access is time invariant and, therefore, is not conditioned on market conditions. This research wished to incorporate the dimension of the changing market conditions into the analytical framework, therefore, does not weight the distances.

Furthermore, Weberian-type consumer city institutions are broken down into three categories: 1) bishoprics; 2) higher-order political institutions (tribunals, national parliament, provincial parliaments); and 3) lower-order political-institutions (headquarters of a *starosty*, dietines). These institutions are included as dummies in the regressions and serve as control variables. According to Bosker et al. (2008) the impact of political institutions (Capital effect) increased in Western Europe over time. However, this is not expected in the Polish case due to the anagogical weakness of the Polish state and the confederational character of its political structure. Additionally, all the regressions are also controlled for latitude, which captures the distance from the sea, and longitude, which captures the distance from the western markets, as well as a set of regional

dummies.

In order to inspect if an impact of a studied phenomenon was inherent or dependent on market conditions, the empirical investigation will be based on two different specifications of the dependent variable: 1) a 'level' specification based on a logarithm of the population of a city in 1500, 1600 or 1772, and 2) a 'dynamic' specification based on the ratio between the population levels in two consecutive periods, i.e. 1500-1600 and 1600-1772. The first specification sets the size of a city against the others. Conversely, the 'dynamic' specification captures the 'short-term' percentage growth of a city.

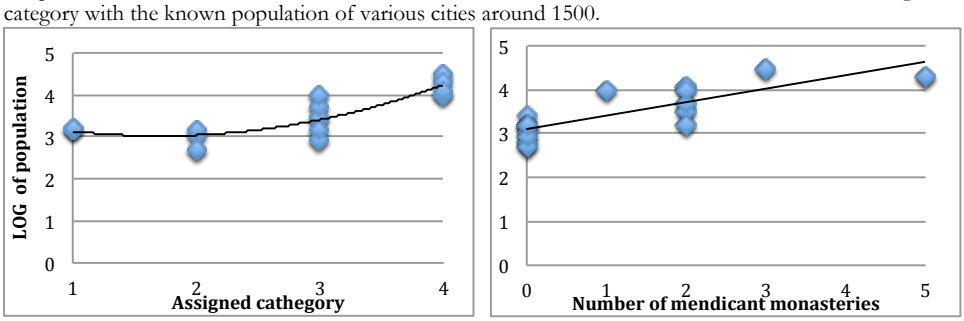
Furthermore, these dependent variables will be analyzed with a use of a 'time-specific' and a 'time-unspecific' specifications, i.e. with or without accounting for the time of the observations. A study of the significance of the independent variable should suggest whether the effect of the phenomenon was inherent or time/conditions dependent. In more detail, if the influence of a phenomenon in question is inherent and it is studied with the use of the 'level' dependent variable, in the 'time-unspecific' specification the effect of the independent variable should be significant, whereas in the 'time-specific' specification only the base result should be significant. If the influence is studied with the 'dynamic' dependent variable, the variable of interest should be insignificant in both the 'time-specific' and 'unspecific' specifications. Conversely, if the effect of a phenomenon is time/conditions dependent, the independent variable should be insignificant when being analyzed with the use of the 'level' dependent variable in the 'time-unspecific' specification, and significant with use of the interaction terms with the time dummies in the time-specific specification.

DATA

The database on the urban population consists of foreign big cities as well as domestic small and big cities for the period 1500-1772. The information on the demographics of the Polish cities with population greater than 5,000 inhabitants was taken from: Bosker et al. (2008), Chandler & Fox (1974) and Kuklo (2009). The information on the population of the dwellings having the city rights but having less than 5,000 inhabitants was based on the '*Miasta Polskie w Tysiacleciu'* Encyclopaedia (Siuchiński 1965) and Bogucka and Samsonowicz (1986). Due to a controversy arising from multiple changes in Polish borders throughout history, the study analyzes the cities that were located in the Kingdom and Ducal Prussia around 1525, i.e. without Silesia and western Pomerania and are currently located in the country. The database presents the population in a few benchmark years, namely 1500, 1600, 1650, 1660 and 1772. The observations of the population of the small cities from around 1500, 1600 and 1772 are the core of the empirical analysis. The information from the middle of the 17th century, due to the dominant exogenous impact of wars, is not used in the analysis. They represent only a sample of this type of dwellings in the country, whereas the database includes all the cities above the 5,000 inhabitants threshold. In the cases of contradictory information on the population in a city, the highest values were preferred.

Next to the amount of the inhabitants, the secondary literature often provides a piece of information about the number of houses located in a city. A comparison of the obtained data showed that, on average, there were eight people living in a city per one house. This estimate was used to fill in the gaps in the data on a city's population, provided the number of houses was reported. Furthermore, there were only 15 observations for the year 1500 available. In order to obtain more accounts of urban population around that date, more indirect evidence was used. Kłoczowski (1970) presented a map of mendicant orders in the Kingdom of 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 revenue of this kind of institution, the more mendicant monasteries a city hosted the bigger was its economic potential. Additionally, Bogucka and Samsonowicz (1986) constructed a database of economic importance of a range of late medieval Polish cities. Each city was assigned one of four categories depending primarily on its size, position in domestic trade, paid taxes and the frequency of hosted fairs.

Graph: Relation between the number of mendicant monasteries and of the assigned category with the known population of various cities around 1500.



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 cities that are known to have existed by 1500. Graph 3 plots the number of monasteries and the category against a logarithm of the population from the 15 cities with the known population around the year 1500. The graph shows a liner relation of the logarithm of the population with the number of monasteries and a second-order polynomial relation with the assigned category. The latter relation stems from the observation that there is little difference between the sizes of the cities in the first two categories, which only differ in the frequency of the fairs organised in a city. The R^2 of the OLS regression of the logarithm of the population on: 1) the number of monasteries, 2) the assigned category, and 3) the square of the assigned category, is 0.83, which indicates a fairly good prediction of the missing observations.

Lastly, in order to reconstruct the FMP, uniform data on population in the Polish cites and the neighbouring countries was needed. FMP for 1772 was used with the available data for 1800. 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. (2008). These editions presented only cities with populations above 10,000 inhabitants. Therefore, FMP effectively indicates a potential to trade with or a proximity to the big cities. The data on the geographical location (longitude and latitude) was obtained from Google Maps. The matrix of the round-circle-distance between the cities was computed with the use of Geographic Distance Matric Generation software.[1]

Table 4: The descriptive statistics of the urban populations data.

	All cities	All small cities	Balanced panel	Balanced panel of small cities
			1500	
No.	179	172	65	57
Mean Pop	2023	1494	3002	1524
Std. Deviation	3093	546	5000	573
% Private	27	28	15	18
% Royal	50	48	70	65
			1600	
No.	131	122	65	57
Mean Pop	2908	1525	4327	1590
Std. Deviation	6605	878	9071	823
% Private	22	24	15	18
% Royal	60	57	70	65
			1772	
No.	210	196	65	57
Mean pop	2811	1502	3481	1224
Std. Deviation	8806	755	7325	748
% Private	32	33	15	18
% Royal	45	43	70	65

Source: see the text.

All in all, the database presents information on 270 individual cities. There are 520 observations available. There are 65 cities (for 1500 mostly predicted) with known population in all of the three benchmark years (balanced panel). Table 4 presents descriptive statistics of the used data. It yields that the sample is biased towards the royal cities. Whereas this type of city accounted for a more modest share of around 40 per cent in 1500 and 27 per cent in 1775 of the settlements (Kuklo 2009), this category accounts for between 45 and 70 per cent of the used samples. The bias is caused by the fact that the state/royal domain was subjected to audits (*lustracje*), which controlled the state of the 'public finance' and, as a result, left behind rich and uniform source material that is lacking especially in the case of small noble land-holdings.

EMPIRICAL ANALYSIS

The aim of this research is to analyse the suspected drivers/inhibitors of pre-industrial urban growth in Poland. In particular, this study wishes to investigate the role of serfdom

[1] http://biodiversityinformatics.amnh.org/open_source/gdmg/index.php

in the process. Furthermore, as has been established, there was a period of favourable market conditions that lasted through the 16th century, which after the 1650s, was followed by a crisis of market contraction (Malinowski 2013b). This paper wishes to analyse the significance of this change for the impact on: 1) trade opportunities; proximity of the potential trade partners (FMP) combined with the access to trade routes; and 2) serfdom.

Table 5: Results of the regression analysis.

	1	2	3	4	5	6	7	8
	LogPOP	P_t/P_{t-1}	LogPOP	P_t/P_{t-1}	LogPOP	P_t/P_{t-1}	LogPOP	P_t/P_{t-1}
LogFMP	-0.258***	-0.151	0.016	0.7	-0.312***	-0.872*	0.05**	0.047
	(0.00)	(0.8)	(0.7)	(0.18)	(0.00)	(0.06)	(0.02)	(0.91)
LAND_TR	0.224*	0.52	0.153**	0.62	-0.002	-0.34	-0.024	0.36
	(0.06)	(0.26)	(0.03)	(0.23)	(0.99)	(0.56)	(0.79)	(0.65)
RIVER	0.274**	-0.1	0.207***	0.323	0.47**	-1.98	0.221	-2.31
	(0.02)	(0.87)	(0.01)	(0.57)	(0.03)	(0.168)	(0.23)	(0.21)
LAND_TR* LogFMP	0.224*	0.52	0.153**	0.62				
	(0.06)	(0.26)	(0.03)	(0.23)				
Base					0.659**	0.907	0.45***	0.004
					(0.02)	(0.23)	(0.01)	(0.99)
1600					0.063		0.006	
					(0.56)		(0.95)	
1772					-0.209	-0.58*	-0.189*	-0.17
					(0.18)	(0.1)	(0.06)	(0.69)
RIVER* LogFMP	0.002	0.126	-0.198*	-0.616				
	(0.99)	(0.86)	(0.07)	(0.4)				
Base					-0.559	3.39	-0.292	3.92
					(0.33)	(0.17)	(0.56)	(0.22)
1600					0.249		0.101	
					(0.21)		(0.58)	
1772					0.363	-1.33	0.082	-1.79
					(0.33)	(0.22)	(0.8)	(0.2)
PRIVATE	-0.211	0.59	0.028**	0.78				
	(0.11)	(0.13)	(0.04)	(0.11)				
Base (1500/1600)					-0.16	-0.624*	-0.009	-0.121
					(0.13)	(0.08)	(0.77)	(0.78)
1600					-0.229**		-0.048	
					(0.05)		(0.44)	
1772					0.097	2.08***	0.128***	1.57***
					(0.28)	(0.00)	(0.00)	(0.01)
NO.	195	130	547	228	195	130	547	228
BALANCED	YES	YES	NO	NO	YES	YES	NO	NO
CONTROLED	YES	YES	YES	YES	YES	YES	YES	YES
R2 Overall	0.5	0.11	0.27	0.12	0.51	0.29	0.28	0.16
R2 Between	0.58	0.28	0.28	0.15	0.57	0.28	0.29	0.15

P-values based on autocorrelation and heteroskedastically robust standard errors in brackets. *, **, *** denote significance at the 10%, 5%, 1% respectively. Dummies and discrete variables indicating: 1) belonging to the Church; 2) having political institutions of lower order 3) having political institutions of higher order; 4) latitude; 5) longitude; 6) five regional dummies added as control variables; 7) existence of a bishopric. Results obtained using a panel data estimator allowing for random city-specific effects.

The results of the empirical analysis are presented in Table 5. This empirical investigation signifies that serfdom had different effects on urban growth under different market conditions. The higher degree of serfdom in the surrounding agriculture is proxied by the private-ownership dummy. Specifications 1, 2 and 4 indicate that there was neither an inherently negative nor positive impact of serfdom. Specifications 5 and 7 indicate that, by 1500, cities located in the state's/royal domain developed similarly to the ones located

in the private domains of the nobility. This is because by 1500 serfdom was not yet fully (re)introduced in the country. At that time, the inhabitants of the domain of the nobility, at least officially, still enjoyed the legal protection of the royal court. However, specifications 5 and 6 indicate that serfdom had an inherent impact on urban growth under favourable market conditions between 1500 and 1600, i.e. when the serfdom was already in place. According to these specifications, the private cities at that time grew less and were on average smaller. Conversely, specifications 6, 7 and 8 show a very high and strongly significant impact of serfdom on urban growth. This is because of the different response to the market contraction. The cities that grew under the previous market regime became impoverished, whereas the cities in which the growth-rate had been moderate relatively flourished under opposite market conditions. According to the database, on average, the small cities in the royal/state domain grew by around 210 people between 1500 and 1600, whereas the private cities declined by 300 people in the same time period. Conversely, in the period of crises between 1600 and 1772, it was the private cities that grew, on average, by about 370 people, while the royal ones declined by around 200 people.

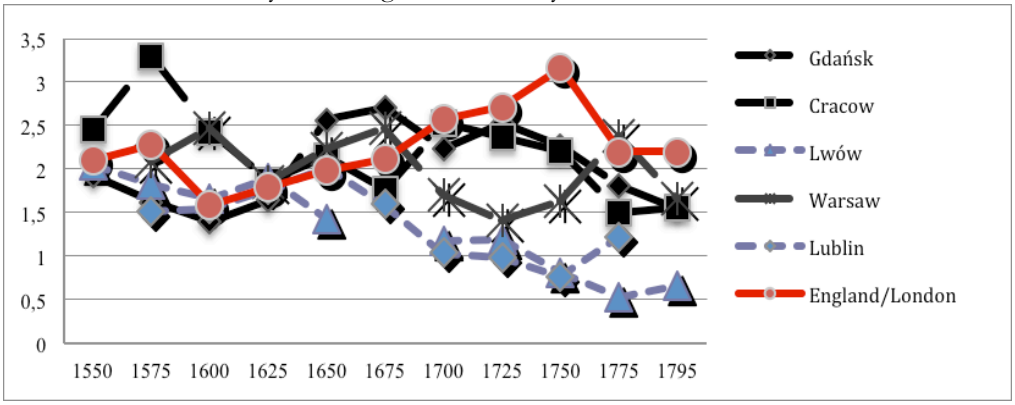
The outcomes indicate that a city could only benefit from the existence of trade partners if it had proper access to trade routes. Once accounting for having access to a trade route, the results indicate that a high FMP could have been disadvantageous for the cities, which did not have such market access. This could have been induced by the institutional factors. The metrics of the FMP are based only on the population of the big cities. These entities were endowed with a set of trade privileges that forced commerce to go through them, diverting it from the neighbouring underprivileged cities. Supplementary regressions (not included in the text) based on narrower samples show a negative effect of FMP for a subset of only the small cities and a positive effect for a subset of only the big cities as has been identified previously by Bosker et al. (2008).

Moreover, the results indicate a different impact resulting from the access to a navigable river than the access to the land trade routes. Access to a river had an inherent beneficial impact; a river could not be destroyed by military operations. Additionally, the interaction term with the FMP, which is nearly always insignificant, indicates that a city could have overcome the limitations of the economic geography and connected with much more distant markets. This was most likely linked to the very low costs of transportation on water, especially in comparison to transport over land. After accounting for the FMP, access to a land trade route is insignificant. It indicates that the 'landlocked' cities could use the benefits coming from the economic geography only to the extent of their FMP, but could not exceed it as in the case of the rivers due to the high costs of transportation over land.

Conversely, the impact of the trade routes depended on market conditions. Their beneficial effect could have been smaller or even adherent in the period of market contraction, i.e. high transportation costs. The real wage evidence supports the motion that the cities that lost their market access after the destruction of the land trade routes suffered a blow to their prosperity. In detail, Graph 4 presents real wages in a range of Polish cities. It yields that Lublin and Lwów, the only two cities in this sample of real

wages that did not have access to a river but were connected with the other cities via the land routes, became impoverished after the 1650s most probably as a result of disintegration (Malinowski 2013b).

Graph 4: Real wages of several real wages series expressed in the subsistence-ratios, centred 11-year averages in selected years, 1550-1795.



Source: Malinowski (2013a)

All in all, the results of regression analysis suggest that serfdom inhibited the urban growth in the 16th century and stimulated it in the 18th. It therefore could not have been 'responsible' for the lack of formation of new big cities in the 18th century. The growth of big cities was most likely mostly driven by the trade with the other urban centres and was conditioned upon market conditions. In order to support the hypotheses that the impact of serfdom and the formation of the big cities via trade were dependent on market conditions, this study proposes two supplementary evidences.

FACTOR ANALYSIS

Factor analysis is a statistical method used to estimate variables/factors that influence the variability of the dependent variable. The method is design to create a variable which effect is predicted by the theory but cannot be directly observed. In this example, the theoretical model predicts an impact of serfdom on urban growth. Serfdom cannot be measured directly because of the tentative nature of the concept. In this research it is proxied by the use of the 'private-ownership' dummy. If the theory is correct, one of the factors generated by the factor analysis of the urban growth data should represent and quantify the impact of serfdom.

This section analyzes the percentage changes in urban population (balanced panel) with a use of principal-component factor analysis. The analysis retains only one factor of the *eignenvalue* above one and equalled to 1.42. The factor captures 71 per cent of the total variance. The correlation between the generated factor and the percentage change in the urban population between 1500 and 1600 is equal to -0.85. Conversely, the correlation between the factor and the change in urban growth between 1600 and 1772 is equal to 0.85. This indicates that the factor had a strong negative effect on urban growth in the period of market expansion and a strong positive effect in the period of market contraction.

In order to identify which of the phenomena proposed by the theory the generated factor represents, the factor was regressed on the variables: 1) the proxy of serfdom; 2) access to a river; 3) access to land trade route; 4) existence of political institutions ; 5) FMP in 1500. The only statistically significant independent variable was the proxy for serfdom. In addition, the correlation between the 'private-city-dummy' and the factor was 0.36 and was by far the highest one among all the investigated connections. Lastly, by design the mean of the factor is equal to zero. The mean of all the generated observations for the set of non-private cities is close to zero and equal to -0.14. Conversely, the mean for the sub-set of the private cities is much higher and equal to 0.93, which indicates that this subset accounts for the most of the impact of the factor. The evidence suggests that the generated factor represents the suspected impact of serfdom on urban growth. The low correlation between the proxy and the factor could have been a result of the imperfections of the proxy, which is a dummy variable. All in all, the results of the factor analysis reinforce the motion that serfdom had a positive effect on urban growth under unfavourable market conditions and negative in the period of market expansion.

THE RANK-SIZE-RULE

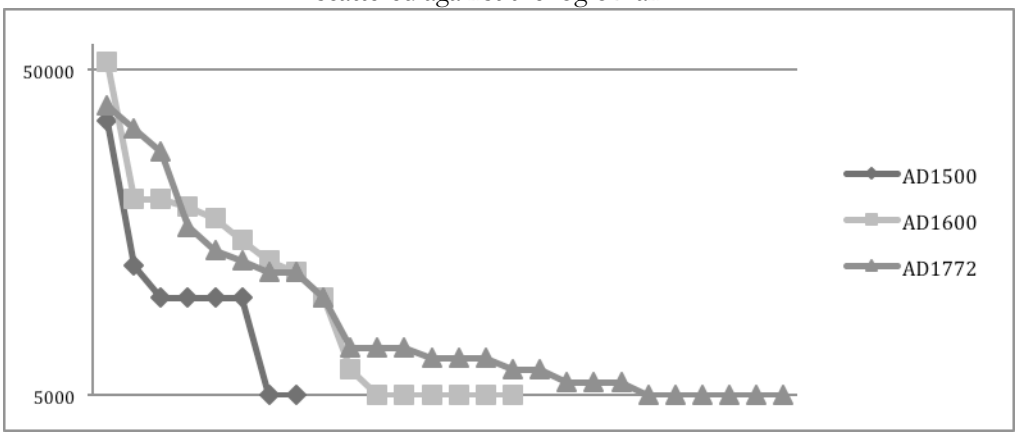
New Economic Geography investigates the relation between market conditions and urban growth. According to Krugman's (1996) theoretical model, there are numerous regions on the market and there is a clear distinction between the rural and the urban sector in a region. The model does not allow for migration of the agricultural workers between the sectors and regions. This assumption somehow corresponds to the Polish reality under serfdom, especially in the 18th century as presented in Table 3. Furthermore, if the transport costs are very high, the trade between urban sectors in different regions is too costly and the regions develop independently. Additionally, as it has been mentioned, city growth is limited by the 'Malthusian ceiling' (Unger 2008). A decrease in transport costs makes arbitrage between the cities profitable. This in turn: broadens the food supply. This development allows crossing the Malthusian threshold and stimulates migration of labour between the cities. As a result of a tendency towards clustering and pooling of labour, an urban hierarchy evolves by transferring population from the lower levels to 'feed the growth' of selected few cities. All in all, the theory predicts that market integration, allows the cities to cross the Malthusian ceiling and form a certain pyramid of sizes, with the urban centres at the top and their peripheries below. Krugman (1996) and Jacks (2004) argue that the pyramid should follow a Rank-Size-Rule. It's a variation of the Zipf's law that predicts that there should be a 1:1 lineal relation between the log of a city size and the log of its rank. All in all, if the urban system in a country approaches such a distribution can be measured with a use of the equation 3.

$$LOGpop = const.+ Z * LOGrank + u \quad (3)$$

According to Jacks (2004), 'Z' that represents the Zipf's coefficient and in the absolute terms varies from 0 that indicates equal size of all the cities and their separate

development to 1 that indicates a fully formed urban-hierarchy. The steeper the slope of the urban hierarchy the bigger the supply basin for the agglomerations on the top of the pyramid. Conversely, the flatter the line, the less chance for an agglomeration to develop and the more cities locked by the Malthusian ceiling.

Graph 5: Urban hierarchy in the Kingdom of Poland 1500, 1600, 1772. Log of population scattered against the log of rank.



Source: Urban population in all the cities in the Kingdom with population above 5,000 inhabitants based on Kuklo (2009). Kuklo proposes urban populations for 1790. In the last few decades of the country after the first partition Warsaw witnessed an unprecedented urban growth when its population exceeded 100,000. The population for Warsaw around 1772 taken from Chandler & Fox (1974).

Graph 5 demonstrates the urban hierarchies in the country. It shows that by 1600 the slope of the urban system was most steep and the hierarchy was formed the most. It also indicates that by 1772 most of the cities were developing independently and were most likely trapped under the 'Malthusian ceiling'. The estimates of the Zipf's coefficient support these assessments. In 1500 the score was equal to 0.795, it increased to 0.873 and by 1772 it plunged down to 0.723. These results support the argument that the Polish big cities grew as a result of favourable market conditions between 1500 and 1600 and that the following market contraction limited the growth of the middle size cities.

DISCUSSION OF THE EMPIRICAL RESULTS

All in all, analysis of the Polish urban system suggests that the Polish urbanization levels in the 18th century were relatively low and behind the European ones mostly because of the disastrous set back of the 17th century. By the 16th century the kingdom of Poland was dominated by a set group of few big cities. This set did not increase between 1600 and the beginning of the partitions of the country in 1772. This occurred despite the growth of small and medium cities in the country. In the 16th century it was mostly royal cities (big and small) that grew due to suitable market conditions that allowed to trade with other cities and to benefit from the relatively secure property rights in agriculture. All of the new big and nearly all of the new middle-size Polish cities that formed at that time belong to the king. Conversely in the 18th century it was mostly the cities located in the private land's of the nobility that withstand the market crisis and grew, thanks to the demesne economy in their rural hinterlands. Cities in the more 'liberal' state domain were

less resilient to the crisis. Surplus extraction from agriculture allowed the private cities to grow and even evolve into middle-size cities. This was, however, not enough to make them develop all the way into true big urban centres. As a result of market disintegration in the country, these medium cities could not trade with the other cities as to overcome the Malthusian limitations. This, together with the trade privileges possessed by the big cities, tailored to protect their superiors position set a ceiling on the development of the middle-size cities into big cities.

CONCLUSION

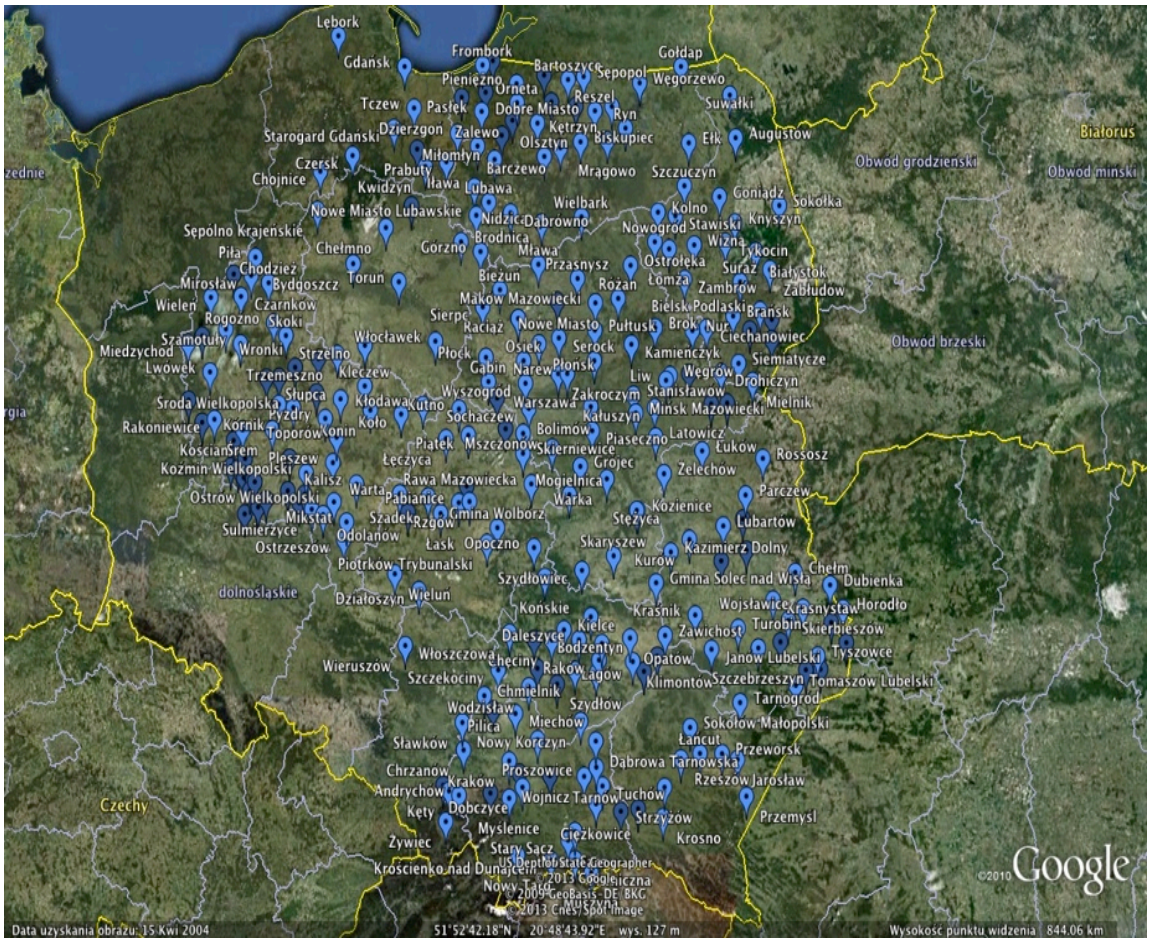
All in all, this study concludes that it was trade and making use of the opportunities provided by the economic geography in tandem with market access that drove the long-term growth in urbanization levels in pre-industrial Poland. The rapid development of urbanization levels until 1600 was, most probably, driven by favourable market conditions reinforced by this trade infrastructure. The wars of the mid 17th century set the urbanization levels back by a few centuries. Additionally, they induced market contraction and undermined these drivers of urbanization.

The main novel empirical finding of this research is that serfdom could have hindered the effects of the Smithian growth processes between the rural and the urban sector in the periods of favourable market conditions. However, surplus extraction by the demesne could have allowed for greater commercialisation of agricultural production and, as a result, could have partially mitigated the effects of market contraction.

These findings invite a speculation about the reasons behind the divergence in urbanization levels between the West and the East of Europe in the early modern period. If urban growth depended on trade with other cities and the rural hinterland, provided that both the regions enjoyed favourable market conditions in the 16th century, the enserfment of the population in Poland could have slowed the urban growth in that period and, as a result, initiated the dissimilarity in the urbanization levels. In addition, the calamities and the pan-European of the 17th century were arguably more severe for the Polish urbanization levels what widened the gap. The market recovery of the 18th century allowed the West to return to its growth in the urbanization levels. Conversely, the protracted market crisis in Poland hindered the trade between the cities that widened the dissimilarity even further. However, had serfdom not been in place in the 18th century, the urban crises could have been even more severe. From the point of view of the landlords, the cities and the peasantry, serfdom could have been, to some extent, a sound institutional design for coping with the market's imperfections.

APPENDIX

Map 1: All the cities used in the regression analysis.



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