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Abstract:
Motivated by the lack of previous research on historical inequality in Central Europe, this paper constructs wealth inequality statistics for a larger town in South Bohemia, Budweis. The data sources are rare detailed local tax censuses from 1416 and 1523 and a national tax register from 1654 as reported in the literature, further adjusted for lowest social groups and processed to create social tables. If the underlying data are accurate, the wealth inequality Gini coefficient in 1416 was between 0.739 and 0.777. The estimated wealth share of the top 1% evolved from 22.6% in 1416 to 9.6% in 1654, values significantly lower than in the pre-industrial UK or France, as well as in the contemporary Czech Republic.

1   Introduction

Inequality is not just a recent phenomenon. While economic growth before the Industrial Revolution was virtually nonexistent (Clark, 2008), variation existed between states in terms of their per capita income and inequality. Milanovic et al. (2010) construct income inequality statistics for 28 pre-industrial societies and their estimated Gini coefficients vary from 0.25 in 1880 China to over 0.63 in today's Mexico in the late 18th century. The main source of data for Milanovic et al. are *social tables*, which group together various social classes or occupations, rank them from richest to poorest and assign each class an estimated average income and share in the population. None of the 28 observations is from Central Europe and this paper attempts to fill the gap by computing inequality statistics for a larger Bohemian town of approximately 4000 inhabitants, Budweis (in Czech České Budějovice).

Data sources for the computations are rare and detailed wealth tax registers from years 1416 and 1523, processed by Czech researchers in the mid-20th century and reported in a tabulated form (Kavka, 1956; Borská-Urbánková, 1964). Based on these reports, the present paper constructs social tables resembling those employed by Milanovic et al. (2010) and uses them to compute inequality statistics[1,2]. Crucially, the local tax registers

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[1] Direct comparison with Milanovic et al. (2010) is, however, not possible since they study the inequality of *income* while the Budweis tax registers record the distribution of *wealth*.

[2] The author of this paper was not able to access the raw microdata. While these would improve the precision of the estimates, it is still possible to construct the upper and lower bounds of the true Gini coefficient for 1416, as explained in detail in Section 4.2.

make it possible to account for all members of the Budweis society, including propertyless maids and varlets, as well as for all main categories of wealth. The analysis is complemented with a 1654 national tax register, *Berni rula*, from which the occupational structure of Budweis at that time is taken and completed with average wealth data and counts of the missing social classes from 1523.

The methods applied in this paper allow for the computation of the upper and lower bound of the Gini coefficient. If the underlying data are accurate, the wealth inequality Gini coefficient in 1416 was between 0.739 and 0.777. The estimated wealth share of the top 1% evolved from 22.6% in 1416 to 9.6% in 1654, values significantly lower than in the pre-industrial UK or France, as well as in the contemporary Czech Republic.

The following section introduces the Bohemian society and the position of towns in that society. Section 3 describes the data sources used to create social tables and estimate wealth inequality in Budweis: two local and detailed tax registers from 1416 and 1523, and a (less detailed) national tax register from 1654. Section 4 reports various inequality statistics computed from the social tables and Section 5 concludes.

2 Socio-economic context

2.1 History and social hierarchy

Czech lands were formally part of the Holy Roman Empire but enjoyed a special status of an independent kingdom, confirmed by the *Golden Bull of Sicily* in 1212. The Bull established the autonomy of the Czech Kingdom and assigned the Czech king only formal obligations with respect to the Empire (Vaníček, 2000).

In the 16th century, the Czech Kingdom was integrated under the rule of the House of Habsburg under the so-called *Habsburg Monarchy*. Tensions between the protestant Czechs and the catholic House of Habsburg culminated with the *Defenestration of Prague* in 1618, in which several representatives of the Crown were thrown out of the window by Czech protestant lords. This event marked the beginning of the *Thirty Years' War* which killed an estimated 10 to 40 percent of the Czech population (Cerman, 1994). The protestant uprising was unsuccessful and followed by a period of recatholisation[3] and the consolidation of power by the House of Habsburg (Čornejová et al., 2000).

The socio-economic system of Bohemia in the examined period can be characterised by two terms: *estates* and *serfdom*. Citizens of the Czech Kingdom were divided into social categories, estates, which determined their rights and obligations. *Berní rula*, a national tax register from 1654 (see

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[3]Also referred to as counter-reformation.

section 3.3), lists four estates present in Czech lands: clergy, titled nobility, lower nobility (mostly knights) and burghers (i.e. townsmen) (Červený and Červená, 2003). The majority of citizens in rural areas did not belong to any of these categories and was classified as serfs. Serfs were obliged to pay rents to the local nobility and to work on their property for free for a certain amount of days. Before 1618, this amount ranged from 12 to 20 days per household per year. After the Thirty Years' War, during the so-called second serfdom, this number increased to three days a week, or about 150 days a year[4] (Hora-Hořejš, 1995). Furthermore, serfs were not allowed to move without the explicit consent of the nobility.

This system, until 1781 when serfdom was abolished, meant that "Bohemia had little claim to be a prosperous economy" (Klein and Ogilvie, 2016). However, it did not prevent market structures from arising, which was one of the main findings of the project *Social Structures in Early Modern Bohemia*[5] that ran from 1996 to 1999. While researchers involved in this project examined various socio-economic aspects of different Bohemian regions, their conclusions have one common aspect: they refute the then-prevailing assumption that the second serfdom prevented economic thinking of rural inhabitants and the development of economic activity other than agriculture (Gates, 2003).

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[4]Note that this number is again *per household*, i.e. a farmer could send a varlet with a horse, for example (Hora-Hořejš, 1995). Also, the number could increase during harvest but in that case serfs would be paid a wage.

[5]Detailed information about the project is available at the following webpage: https://homepage.univie.ac.at/cermanm5/HP/P_BoeEng.htm

A similar inference is made by Klein and Ogilvie (2016), who analyze occupational structure in the Czech lands using the 1654 Berní Rula tax register. With data on 6983 villages, authors find that a notable share of households practicised occupations outside agriculture, ranging from butchers, bakers and tailors to merchants, petty-traders or tavern-keepers. On average, 6.7 percent of households engaged in non-agricultural occupations, with a standard deviation of 15 percent. This number is nonetheless notably lower than in Western countries such as England and the Netherlands, where the estimates for non-agricultural activity in rural areas range from 22 to 40 percent (Klein and Ogilvie, 2016).

2.2 Towns in Bohemia

In cities, however, the picture was drastically different. Large towns such as Budweis, which is analysed in this paper, were a center of crafts and trade and were thus, in terms of food consumption, almost completely dependent on the agricultural production of the countryside (Kavka, 1956). Furthermore, large so-called "royal" towns were appointed by the King and were independent of the nobility, enjoyed a significant amount of self governance and were only accountable to the Crown. Eduard Maur writes in Horská et al. (2002) that while these towns were still an integral part of the feudal society, they were also, with their emphasis on freedom and rationality, a "prototype of the capitalist society" which Bohemia experienced only after World War I.

There were 39 royal towns in Bohemia by the year 1500 (Hoffmann, 1992)

and Budweis was one of them. It was also one of the largest, with an estimated population of around 4 000 people in the 15th and 16th century, and 2 500 people in the 17th century – mainly a consequence of the Thirty Years' War (Kopáček et al., 1998). Each royal town was a legal unit with its own assets, principles of governance and laws. All members of the burghers estate were formally equal and town laws were in place to guarantee property rights and individual safety. There was no such thing as an obligation to work on nobility's property or to pay them rents, as was the case in rural Bohemia (Horská et al., 2002).

While one might be tempted to infer that towns enjoyed freedom in the economic sense as well, town markets resembled a monopolistic market or a cartel much more than perfect competition. Craftsmen and tradesmen organised themselves in *guilds* intended to protect the interests of the members by limiting the number of craftsmen, quality and quantity checks and elimination of foreign competition. To again paraphrase Eduard Maur, the ideal of equality, solidarity and brotherhood seems to have prevailed over the ideal of individuality and economic freedom. That is not to say that towns were not open to new citizens as the numbers of craftsmen varied considerably in different years (Borská-Urbánková, 1964; Kavka, 1956).

In addition to limiting competition, guilds negatively influenced the overall level of technology by refusing or slowing down the adoption of new techniques and processes (Janáček, 1984). They can therefore be considered a force discouraging innovation and inhibiting long-run economic growth, much

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like serfdom. In the early 18th century, the state began regulating the existence of guilds, leading to their abolition in 1859 (Kopáček et al., 1998).

The monopolistic nature of towns was strengthened with the existence of *town privileges*, which were awarded by the king and enhanced the economic position of the town, mainly at the expense of neighbouring villages and traders. The *Encyclopedia of Budweis* (Kopáček et al., 1998) describes several such privileges that were awarded to the town analysed in this paper. Some of them were related to the political power of Budweis, while other notably distorted the market in a way that favored citizens of Budweis. One of the most stark examples was the privilege that ordered all traders travelling on certain routes (e. g. from the Austrian town of Freistadt to inland Bohemia) to travel through Budweis and to offer their goods on the local market. Another important privilege that benefited the burghers was the so-called mile law (in Czech *mílové právo*, in German *meilenrecht*), which forbade crafts and trade from taking place in the area of one mile[6] around the city.

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[6]One historical mile is equal to around 7.5 kilometers.

3 Data

3.1 Year 1416

Data for the year 1416 are taken from a paper by Milena Borská-Urbánková (1964), in which she analyses city tax registers of Budweis in 1396 and 1416[7]. According to the author, this is one of the very few tax records preserved from that era[8]. It is still mechanically damaged (some lists are loose and other tattered), but the author was nevertheless able to recover the data and to report on them in a paper. Crucially for this study, these tax registers also include estimates of citizens' wealth as the tax was paid as a share of taxpayers' property.

It perhaps won't come as a surprise that the reported value of the citizens' assets was notably lower than it's market value[9]. Author examines trade documents from this time period and lists several examples of property being sold for five to six times its value recorded in the tax register. Since we need relative, not absolute wealth to study inequality, this fact should not cause major issues provided the level of misreporting was around the same magnitude for the whole town (which the provided examples suggest).

Another fundamental question that requires answering before one can

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[7]Year 1416 was preferred for this paper because for that year the analysis is more detailed.

[8]The book is bound in cow leather, strengthened with wood and locked with a, now damaged, lock.

[9]Further, author mentions cases of obvious typos in the property value, such as the value of a house measured in incorrect units. She corrected these typos, but their mere existence calls for caution.

proceed to analysis is: Who was and who was not included in the register? Fortunately, and contrary to the national register from the 17th century described in Section 3.3, the social class of *inmates* (in Czech podruh, in German hausgenose) was recorded in the 1416 register. These people were formally not part of the burghers estate, although town law and rules applied to them as well (Horská et al., 2002). Inmates typically worked for burghers (either for a wage, for accommodation or for both) and most of them were virtually propertyless. In the 1416 register, however, they too were subject to a tax – not to a wealth tax per se but to a "craft tax", which was de facto a lump-sum tax. Table 1 from Borská-Urbánková (1964) gives a basic overview of the data and shows that the inmate group formed a significant portion of the population of Budweis – there were 397 inmates recorded in the tax register, slightly more than the total number of burghers. In table 2, author groups the data into five wealth categories (plus the estimated propertyless varlet group has been added) and gives a basic idea about the distribution of wealth in the city: the two richest groups, while forming less than 2% of the population, owned over 30% of the town's wealth. On the other side of the wealth distribution, the poorest 66% owned only 9.4% of total wealth.

While the methodological aim of this paper is to make as few adjustments in the data as possible, one social group will be added into the 1416 dataset – the perhaps lowest social class of varlets (or menials) and maids. Their occupation was typically concerning housework or agriculture (Kavka, 1956)

Table 1: Summary of the 1416 Budweis tax register

Social group	Number of people	Share	Wealth share
Burghers	349	34.0%	82.1%
Suburban residents	91	8.9%	9.4%
Inmates	397	38.7%	8.5%
Varlets and maids	188	18.3%	0.0%

Source: Borská-Urbánková (1964). The number of varlets and maids is estimated from the 1523 register (Kavka, 1956) assuming a constant burgher/varlet ratio. The zero wealth of this social group is also an assumption, based on Kavka (1956) and Kubák (1956).

and a significant part of their wage came in the form of provided accommodation and food. Varlets and maids are most likely not included in the inmate class[10], but they are included in the 1523 dataset described in section 3.2. Kavka (1956) and Kubák (1956) both mention that the 1523 tax register is a rare and valuable source because it includes inmates as well as varlets and maids, and it will therefore be used to infer their counts in years 1416 (and 1654). The inference will be made by assuming a constant ratio of varlets and maids to craftsmen as in 1523. Nevertheless, all the results will be reported also without this adjustment in the Appendix, and the sensitivity of results to this adjustment will be discussed.

Ideally, the data should also account for family size and for social classes such as housewives or beggars, but these data are unfortunately not available, to the best of my knowledge. By including the richest craftsmen, traders and

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[10]Borská-Urbánková does not mention them and it is unlikely also given the relative size of the inmate class compared to 1523. Further, most of the inmates are classified according to a craft, but grooms and maid typically did not perform any craft.

Table 2: 1416 Budweis tax register in wealth classes

Wealth group	Number of people	Share	Wealth share
0	188	18.3%	0.0%
0-1	486	47.4%	9.4%
1-5	200	19.5%	17.9%
5-15	111	10.8%	27.7%
15-30	22	2.1%	14.2%
30-50	9	0.9%	10.9%
50+	9	0.9%	20.0%

The 0 wealth group consists of the estimated propertyless maids and varlets.
Upper and lower wealth bounds are in local units.

nobility as well as the propertyless inmates, the 1416 tax register nevertheless provides a representative picture of a larger Bohemian city in the early 15th century.

Another advantage of the data is that Borská-Urbánková divides it not only according to the craft, but groups the individuals in each group also according to their reported wealth, reducing the variation in wealth within each group. For the purpose of my analysis, I work with data aggregated into 11 categories of craft or trade and further grouped into 6 wealth classes. This gives 37 entries into the social table as the remaining 29 craft-wealth groups are empty. Out of the the 837 people recorded in the register, only 600 fall into one of these categories. Wealth of the remaining 237 people (of which 31 are agriculture workers and 204 are of unknown occupation) will be calculated as residual from the aggregated data sorted by wealth (i.e. by subtracting the craftsmen and their wealth from the overall data) and so it

will be divided into the same 6 wealth classes as the rest of the data.

3.2 Year 1523

Data on the occupational and economic structure of Budweis in the 16th century are taken from the paper by František Kavka (1956), who analyses preserved city tax registers for years 1514, 1523, 1537 and 1543. The register for the year 1523 was chosen for this analysis because it is the only one of the four recording not only "self-employed" members of the burghers estate, but also the wage labor. This social group comprised of inmates as well as menials and maids and typically had no taxable property. While other registers only collected information on citizens with taxable property, tax in 1523 required also the wage labor to pay a "per-head tax", in principle similar to the "craft tax" of 1416[11]. While not all wage labor was virtually propertyless (i.e. only paid the per-head tax), most of it was – only 17 out of the 703 wage laborers were subject to a wealth tax. Similarly, not all craftsmen were subject to a wealth tax – 28 out of 392 craftsmen or tradesmen only paid the per-head tax.

Inmates, menials and maids who did not pay the wealth tax are treated as propertyless (i.e. with zero wealth) by Kavka (1956) when he reports the data. While a few of the records include data about the exact wage paid to a certain laborer (Kubák, 1956), inferring wealth from these data would be

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[11]The 1523 tax is being referred to as the Turkish tax (Kavka, 1956; Kubák, 1956) as the purpose of this tax was to finance the Ottoman–Habsburg wars. This is also the likely explanation for why wage labor was included in this year's register and not in others.

tricky to say the least, especially without the knowledge of laborers' age etc. It seems appropriate, however, to at least take into account the distinction between the two lowest classes, inmates on one hand and menials and maids on the other, especially since the 1416 tax register contains information on the average reported wealth of inmates. By dividing two cells in Table 1, one can compute that an inmate owned, on average, 0.02137% of total reported wealth. For 1523 (and 1654 as well), it will be assumed that this number did not change and inmates' wealth will be calculated using this assumption. This seems more appropriate than assuming a constant *level* of inmates' wealth as there might have been differences in price levels and in measurement between 1416 and 1523. The remaining class, varlets and maids will be treated as propertyless, in accordance with Kavka (1956).

Kavka (1956) also provides the decomposition of wealth into housing, craft value, land and movables, unfortunately only for the year 1514 and only for craftsmen with known occupation. Table 3 reproduces his findings, which show that the share of housing on total wealth increases with wealth, as does the share of land. In contrast, the value of a burgher's craft becomes less important with wealth and the share of movables remains negligible. A possible interpretation of this result is that craft value, as estimated by the tax officers, remains relatively stable in absolute terms and wealth inequality is therefore driven by house values and land owned. Kavka (1956) mentions that land was a convenient way for wealthier burghers to store their savings, as it was more easily accessible and required lower initial investment than

housing. The table also suggests that estimates based on housing registers overestimate inequality, which does not seem plausible as such estimates are typically rather low (e.g. citace vs probate records). Perhaps it was not common in most housing records to distinguish between house and craft value, which were often part of the same physical building.

Table 3: Wealth decomposition of craftsmen in 1514 Budweis

Wealth group	Housing	Craft value	Movables	Land
0-3	41 %	49 %	0 %	10 %
3-5	59 %	33 %	1 %	8 %
5-10	60 %	22 %	4 %	15 %
10-15	53 %	17 %	3 %	27 %
15-20	74 %	8 %	0 %	17 %
20+	64 %	7 %	2 %	27 %
Overall	58 %	23 %	2 %	17 %

The values are based on the reported wealth of 253 craftsmen with known occupation in the 1514 register. Upper and lower wealth bounds are in local units.

So far, two assumptions have been made in the two tax registers beyond what was reported by Kavka (1956) and Borská-Urbánková (1964) – the number of varlets and maids in 1416 has been inferred from the 1523 register, and the wealth share of inmates in 1523 was taken from the 1416 register. These "cross-assumptions" are a toll for working with 15th and 16th century data but it should be noted that they are independent of each other. It should also be stressed that zero wealth of menials and maids may be a strong assumption but it is not unrealistic (in contrast, assuming zero income would mean that a person would starve to death). To give one example, even in the

21st century over 19 percent of US households have negative or zero wealth (Collins and Hoxie, 2015).

The 1523 tax register is likely to suffer from similar issues as the 1416 one. For example, we cannot even say with certainty that it is really from year 1523, as the register is not dated. However, it is the most likely year as it's the only one for which all members of the Budweis city council are also named in the register (Kubák, 1956). The level of detail and the fact that it includes not only those with taxable property nevertheless make it a rare and useful source of data for studying pre-industrial inequality.

Contrary to Borská-Urbánková (1964), this dataset is grouped by crafts but not further divided by income groups. While such a social table resembles more closely those reported in Milanovic et al. (2010), it will not satisfy the zero overlap assumption. The social table built on Kavka (1956) will have the following entries:

- 47 crafts

- "Traders" group

- "Services" group

- Wage laborers subject to property tax

- Citizens of unknown occupation, grouped into three categories according to their reported wealth

- Nobility residing in Budweis (only five people)

- Inmates (with wealth estimated from the 1416 data)

- Propertyless maids and varlets

Altogether this gives 56 social classes, notably more than in the majority of tables reported in Milanovic et al. (2010). Based on the statistics provided in Kavka (1956), it is unfortunately not possible to separate those 28 craftsmen not subject to the wealth tax and they are therefore grouped together with craftsmen with taxable property. On the other hand, wage laborers with taxable property are separated from the rest and treated as a separate social group.

3.3   Year 1654

Tax census of the year 1654 is by far the least comprehensive and will therefore require many additional assumptions taken from the previous two tax registers. The reason for that is also the reason why it is included in this paper, despite its limitations: it is a *national* tax register and data were collected in a standardised way for the whole Bohemia. It might thus be informative for future research on inequality in Bohemia as a whole because the previous two local registers were rather rare (data availability was also the reason why Budweis was preferred over other towns for the analysis). To the best of my knowledge, detailed local tax registers are not available for Budweis for the 17th century[12].

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[12]Besides the review of history and demography journals, Daniel Kovář, , head of the State District Archive in Budweis, confirmed to me that the structure of city records has

The name of the 1654 tax register is *Berní Rula* and it was the first comprehensive record of property in Bohemia, along with its owners. Since the majority of Bohemians lived in villages, the main information that were collected were regarding their land holdings or the amount of cattle owned (Červený and Červená, 2003). This information is not sufficient to infer wealth or income of burghers – even though some of them might own also land, their main source of income typically was craft or trade. This was recorded only in the "comment" part of each entry. Taxpayers were divided only into very broad categories and their wealth was thus not properly estimated nor recorded (at least this was the case for townsmen, for farmers one could theoretically try to estimate wealth from the size of land owned and the amount of cattle).

Like the previous tax censuses, Berní Rula does not include information about age or family size of burghers. It also does not record inmates or varlets, so the only information it provides for the purpose of this analysis is the change in occupational structure since 1523. Out of the 338 records of owners of non-empty holdings, only 13 of them are not assigned a craft or trade. Information on wealth and the numbers of members of other social classes is thus estimated based on the 1523 tax register (which was preferred over the 1416 one because it captures a larger fraction of the population – specifically varlets and maids – and it is closer in time). The resulting social

changed in the 17th century and that data analogous to years 1416 and 1523 are unlikely to exist.

table and the assumptions used to construct it are as follows:

- 57 crafts with their average wealth taken from the 1523 tax register (for crafts not represented in the 1523 census, average wealth of their respective craft category[13] is taken).

- Traders and services, both with their respective 1523 average wealth.

- The quantities of nobility, inmates, and maids and varlets are estimated from 1523 – they're scaled according to the new number of burghers and their average wealth is preserved from 1523.

- 13 citizens of unknown occupation are grouped into three wealth categories as in the 1523 register, keeping the relative size of each wealth category and its average wealth constant.

- The 1523 category "wage laborers subject to property tax" is ignored as these people should be recorded in Berní Rula.

4 Analysis

4.1 Top percentile shares

Income or wealth shares of the top 0.1, 1 or 10% are a metric heavily used in Piketty's *Capital in the 21st Century*, perhaps because they are more easily

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[13]For example, watch makers, cutlers or blacksmiths belonged to the "metal workers" category. There are nine such categories and this categorization is fairly consistent in the literature.

understandable for the general public than, for example, the Gini coefficient. While the top wealth shares only tell part of the story and one might even "miss the big picture about inequality" (Acemoglu and Robinson, 2015), they give an idea about the potential "elite vs commoners" or "bourgeoisie vs proletariat" divide in a society.

Table 4: Wealth inequality in a pre-industrial Bohemian town: Wealth shares of top percentiles & comparison

Society	Year	Top 1% share	Top 10% share
Budweis	1416	22.6	61.6
Budweis	1523	14.2	50.6
Budweis	1654	9.6	44.7
United Kingdom	1670	48.9	82.7
United States	1774	16.5	59.0
France	1810	45.6	79.9
Paris	1810	53.7	
Czech Republic	2018	40.1	67.9
United Kingdom	2018	24.6	59.4
United States	2018	35.3	75.9
France	2018	20.6	53.1

Sources of comparison data: Lindert (1986), Jones (1977), Piketty (2014), 2018 Global Wealth Databook.

Top percentile wealth shares were constructed with an assumption of zero variation in wealth within social classes, which is considered the most transparent approach[14]. Table 4 presents the results and compares them with several pre-industrial wealth inequality estimates from the literature.

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[14]Also, given the large number of social classes, assuming variation within classes will change the results minimally, as will be apparent in Section 4.2

For comparison, contemporary wealth inequality data are also included for the United Kingdom, United States, France and the Czech Republic.

Results show a declining trend in wealth inequality in Budweis over the examined period. Wealth share of the richest one percent declined notably, from 22.6% to 14.2% between 1416 and 1523, a 37 percent decline. Top 10% wealth share follows a similar path, declining by 17.8 percent between the 15th and 16th century. For results for these two years based on unadjusted data (i.e. data without the additional corrections described in Section 3.2), see Table 6 in the Appendix. Results are fairly robust to these adjustment as they don't change the top 1% share by more than 2.6 percentage points.

The further decline of wealth inequality in the last analysed year, in 1654, is driven by a decline in the quantity of the "burghers with unknown occupation" social group. While Kavka (1956) records 105 such individuals in the 1523 tax census, in Berní rula only 13 burghers do not have a stated occupation (typically the note next to their name simply says "burgher"). As mentioned in Section 3.2, Kavka divides these people into three groups according to their wealth, and the richest of these groups turned out to be also the richest social group overall in the constructed 1523 social table. Due to scaling, the number of citizens belonging to this group declined from 11 to 1.

Comparison with other pre-industrial and even with contemporary societies suggests that Budweis were an unusually equal society. For the pre-industrial era, only the 18th century United States give comparable levels of

inequality. The comparison is especially stark with Paris on the eve of the Industrial Revolution, where the top 1% owned over one half of total wealth, a share more than three times as large as in Budweis in 1523. Interestingly, contemporary Czech Republic ranks among countries with a higher level of wealth inequality. Regional differences and a large number of people in debt traps are some of the factors that might cause this unfavorable ranking, but this analysis is beyond the scope of this paper.

The question that now arises is: Was the Bohemian countryside more or less unequal than Bohemian towns? The answer would surely depend on the quantification of nobility's wealth and of serfdom duties of peasant households. Unfortunately, the Berní rula national tax register will not be of much use for this purpose because it does not record nobility's property. Even though Paris in 1810 was more unequal than France as a whole (at least in terms of the top 1% wealth share), my expectation would be that rural inequality was higher because of serfdom and the presence of the elite and rich nobility.

4.2 Gini coefficients

Gini coefficients are a more complex way to measure inequality in the sense that they take into account all the available income or wealth data. Nevertheless, the Gini coefficient is still subject to criticism, for example, Liao (2006) states that it "is less sensitive to how the population is stratified than how individual values differ". In this paper, I calculate Gini coefficients from

social tables using the same formula as Milanovic et al. (2010), who adopt the methodology from from Gastwirth (1972) and Kakwani (1980):

$$G = \sum_{i=1}^{n} G_i p_i \pi_i + \frac{1}{\mu} \sum_{i}^{n} \sum_{j>i}^{n} (\mu_j - \mu_i) p_i p_j + L, \qquad (1)$$

where social groups are ordered in an ascending order, G_i denotes the Gini coefficient *within* social group i, p_i is the share of people belonging to the social group i, π_i = proportion of wealth owned by group i, μ_i is the social group's mean wealth and L is the overlap term. This term is assumed to be zero in Milanovic et al. (2010) and thus here as well, which means imposing an assumption that all members of a lower social group are poorer than any member of a richer social group. Milanovic et al. (2010) calculate two Gini coefficients, one where zero inequality *within* social groups is assumed (Gini1) and another which assumes "maximum within-class inequality compatible with social-tables" but still under the zero overlap assumption (Gini2)[15]. While the Gini1 computation follows from formula 1 (after imposing $G_i = 0 \forall i$), authors do not explain how they calculated the maximum within-class Gini G_i. However, formulas for upper-bound G_i are derived in Kakwani (1980):

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[15]Milanovic et al. (2010) also compute the *Inequality Possibility Frontier*, maximum feasible income Gini index given the mean income of a society (so that every individual earns at least a subsistence minimum). This, however, does not apply to *wealth* inequality, where the maximum feasible Gini coefficient is in principle 1 and so this part of the analysis will not be reproduced in this paper.

$$G_1 \leq 1 - \frac{\mu_1}{x_1}, \tag{2}$$

$$G_i \leq \frac{(\Delta x_i)\, \delta_i \, (1 - \delta_i)}{\mu_i}, \tag{3}$$

$$G_n \leq 1 - \frac{x_{n-1}}{\mu_n}, \tag{4}$$

where x_{i-1} and x_i denote the wealth bounds of the i-th social group, $\Delta x_i = x_i - x_{i-1}$ and $\delta_t = (\mu_t - x_{t-1})\,/\,(\Delta x_t)$. Milanovic et al. do not describe their estimation procedure for x_i, and this paper will take an average of the means of two neighboring social groups to estimate the upper and lower bounds.[16]

If the zero overlap assumption was correct and the wealth bounds were known, the unobservable true Gini coefficient would lie between Gini1 and Gini2 (Kakwani, 1980). For that reason, the two Ginis were constructed also based on the simple Table 2 in Section 3.1, in which Borská-Urbánková aggregates the entire dataset into 5 *wealth* categories[17]. The only but crucial advantage of this table is that the wealth groups are clearly defined and the zero overlap assumption therefore satisfied[18].

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[16]The lower bound of the lowest social group and the upper bound of the highest one are not needed, as is apparent from equations 2 and 4 respectively.

[17]Sixth category – propertyless maids and varlets estimated from the 1523 data – is added, consistent with the constructed 1416 social table.

[18]Another advantage of clearly defined wealth groups is that the upper and lower wealth bounds don't have to be estimated like in the more detailed tables.

Table 5: Wealth Gini coefficients

Society	Year	No. of classes	Gini1	Gini2
Budweis	1416	44	0.747	0.747
Budweis wealth groups	1416	6	0.739	0.777
Budweis	1523	56	0.691	0.692
Budweis	1654	65	0.650	0.650
United States	1774			0.694
Czech Republic	2018			0.758
United Kingdom	2018			0.747
United States	2018			0.852
France	2018			0.687

Sources of comparison data: Jones (1977), 2018 Global Wealth Databook.

Table 5 reports the results, which confirm that pre-industrial Budweis was a society with relatively low inequality, as well as its declining tendency. Thanks to the zero overlap between classes in the general 1416 table, it can be claimed that if the underlying data are accurate, the *true* wealth Gini coefficient in 1416 Budweis was between 0.739 and 0.777. The difference between the Gini1 and Gini2 coefficients in other cases is minimal, an expected result given the large number of classes in the social tables used (Milanovic et al., 2010). Out of the four pre-industrial societies presented in Table 4, only one source of the data presented also the Gini coefficient – Jones (1977). The wealth Gini for 1774 United States is almost identical to the Gini of Budweis in 1523. Comparison with four contemporary societies confirms that Budweis was relatively equal even by modern standards. In-

terestingly, while contemporary Czech Republic came out far worse than the UK when comparing the top percentile shares, their wealth Gini coefficients are almost the same. This supports the claim from Acemoglu and Robinson (2015) that the top percentile shares may leave out important information.
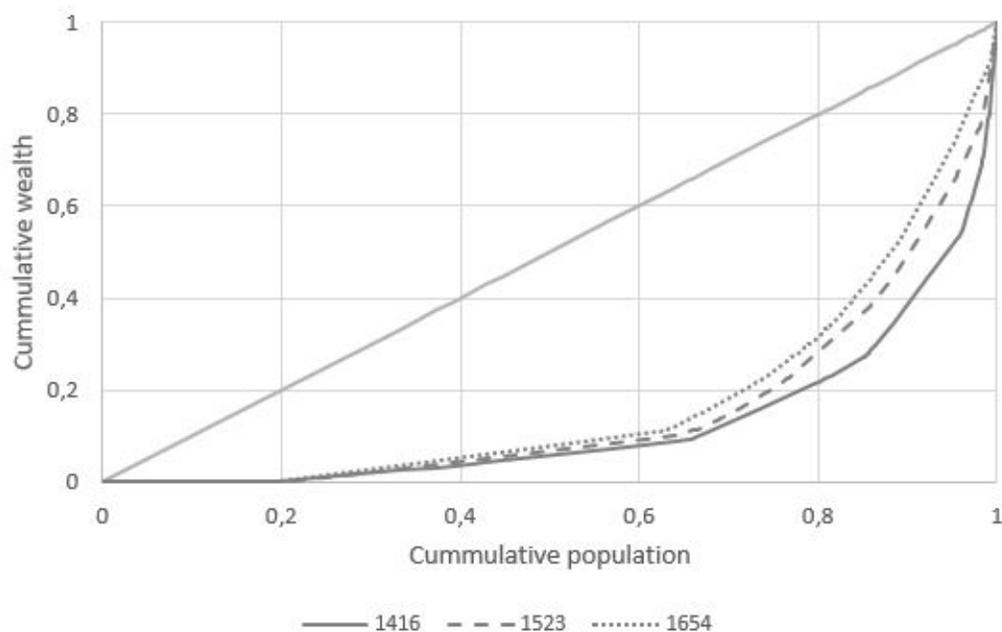
Figure 1: Lorenz curves for the three examined years

Figure 1 compares the Lorenz curves for the three examined years and confirms the that 1654 is the year with the lowest estimated inequality. Table 7 in the Appendix shows the sensitivity of Gini coefficients to the two adjustments made in the dataset. Assigning inmates in 1523 an average wealth based on the 1416 data (as opposed to treating them as propertyless as in Kavka (1956)) decreases the estimated 1523 Gini from 0.78 to 0.69. This is in contrast to the top percentile shares, where the sensitivity to this adjustment

was lower.

5   Conclusion

This paper estimates wealth inequality in Budweis, one of the largest Bohemian towns, between the 15th and 17 century with the aim of complementing the existing literature on historical inequality. It introduces pre-industrial Bohemian towns as places where various crafts and trade could thrive under relative freedom, without the constraint of serfdom so typical for Central Europe in this era. The prosperity of townsmen was strengthened by monopoly rights awarded by the kind and the presence of guilds, which however also impeded innovation by refusing or slowing down the adoption of new techniques and processes.

Results suggest that the Bohemian towns were notably less individualistic and more egalitarian than their Western counterparts – the richest 1% in the examined town owned only 14% of total wealth in 1523, compared to almost 54% in 1810 Paris. The resulting inequality estimates are low also when compared to contemporary societies.

The next step in examining historical inequality in Bohemia would be to look at the rural areas and to estimate inequality in a representative rural estate. It is expected to be larger than in Budweis because of the presence of a rich "top 0.1%" group – the nobility to which countrymen were serfs.

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Appendix

Table 6: Comparison of adjusted and unadjusted data – Top percentile shares

Society	Year	Top 1%	Top 10%
Budweis	1416	22.6	61.6
Budweis - unadjusted data	1416	20	56.8
Budweis	1523	14.2	50.6
Budweis - unadjusted data	1523	15.7	55.9

For the description of the two adjustments, see Section 3.2.

Table 7: Comparison of adjusted and unadjusted data – Wealth Gini coefficients

Society	Year	No. of classes	Gini1	Gini2
Budweis	1416	44	0.747	0.747
Budweis - unadjusted data	1416	43	0.690	0.690
Budweis wealth groups	1416	6	0.739	0.777
Budweis wealth g. - unadjusted data	1416	5	0.681	0.727
Budweis	1523	56	0.691	0.692
Budweis - unadjusted data	1523	56	0.782	0.783

For the description of the two adjustments, see Section 3.2.

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